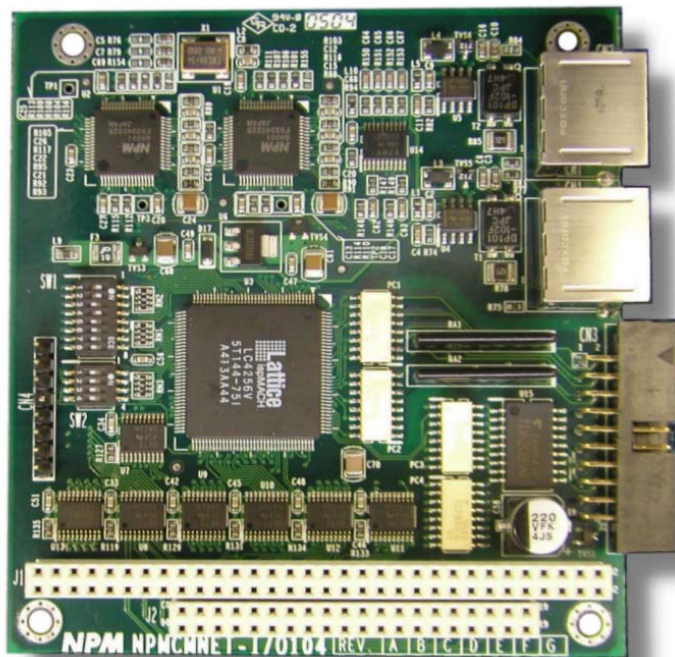


Motionnet[®]
Remotel/O & RemoteMotion

Center Board (PC/104)

NPMCMNET-I/O104

Instruction Manual



NPM

Nippon Pulse Motor Co., Ltd.

Table of Contents

1. Preface	1
2. Features	3
3. Precautions	4
3-1. Safety precautions	4
3-2. Handling precautions	4
4. Warranty period and coverage	4
5. Specifications	5
6. Configuration	7
7. Connector Pin Assignments	8
7-1. CN1 (serial communication line 1 connector)	8
7-1. CN2 (serial communication line 2 connector)	8
7-3. CN3 (General-purpose I/O connector)	8
7-4. J1 (PC/104 bus connector)	9
7-5. J2 (PC/104 bus connector)	10
7-6. Connectors used	10
8. Individual signals and their functions	11
8-1. Serial communication (RS485+1, RS485-1, RS485+2, RS485-2)	11
8-2. General-purpose inputs (IN1 to IN8)	12
8-3. General-purpose outputs (OUT1 to OUT8)	13
9. Status display	14
9-1. Cyclic communication LED (MSYN)	14
9-2. Communication error LED (MERR)	14
10. Address Setting	14
10-1. Assigning addresses	14
10-2. Setting base address	15
10-3. Address map	16
11. PLD register	18
11-1. Device ID (DEV_ID_REG)	18
11-2. Card ID (CARD_IDREG)	18
11-3. G9001A #1 control register (RING0_CNT_REG)	18
11-4. G9001A #2 control register (RING1_CNT_REG)	19
11-5. G9001A interrupt control register (G9001_IRQ_REG)	19

11-6. General-purpose input (GPIO_IN_REG)	20
11-7. General-purpose output (GPIO_OUT_REG).....	20
12. Serial communication cable	21
13. Device driver installation (Windows version).....	22
13-1. Operating environment	22
13-2. Installation.....	22
14. DLL.....	32
15. Connector and switch layout	33
16. External dimensions	34

1. Preface

Thank you for purchasing a Motionnet series ultra-high speed serial communication system center board.

□

The NPMCMNET-I/O104 is a PC/104 bus board equipped with two G9001A center devices, which support the Motionnet ultra-high speed serial communication system. In addition to the serial communication function, this board has 8 general-purpose inputs and 8 general-purpose outputs. This board is used together with local boards that can be controlled by serial communication.

□

Motionnet[®]

Motionnet is an ultra-high-speed serial communication system created by NPM (Nippon Pulse Motor). Using our four specially developed devices (G9001A, G9002, G9003, and G9004) as core chips, this serial communication system is a complete system for reducing wiring while affording remote operation by emulating a CPU and handling CPU message communications at transfer speeds of 20 Mbps. It offers all of the high-speed features and serial I/O control needed for complete motion control.

Device

G9001A: Center device

This is a central controller that manages local devices. It can be connected to any type of CPU. This device has 256 bytes of RAM for I/O control, and 512 bytes for data communication. This device can be operated from a remote CPU just like accessing memory. It can be connected to a maximum of 64 local devices (G9002, G9003, and G9004).

G9002: IO device

This is a local I/O control device that can control 32 separate I/O signals.

G9003: PCL device

This is a local device containing a pulse control LSI that has been developed and polished by NMP for use in motion control over many years. It also has a serial communication function. It can control a single-axis pulse input type stepper motor and servomotor.

G9004: CPU emulation device

This is the most sophisticated local device in the Motionnet series, and it can remotely control other LSIs that need a connection to a CPU (for example a PCL6045B, made by NPM). By connecting a CPU to its local side, it can also communicate messages between CPUs.

Remotel/O

If a Motionnet line is only used for input and output control, it can send and receive signals for 2048 points on 64 local devices in 0.97 msec (using a 20 Mbps data transfer speed). (If a smaller number of devices are connected, the data transfer time will be proportionally shorter.)

RemoteMotion

If a Motionnet line is only used to control motors, it can control up to 64 axes. With this type of control, individual devices can control pulse-input type stepper motors and servomotors. They can execute continuous operations at constant speed, perform linear acceleration/deceleration, S-curve acceleration/deceleration, carry out preset positioning operations, and zero return operations.

A system combining the devices and types listed above is also possible.

Although it depends on the number of devices connected and the data transfer speed selected, the cable length can be extended up to 100 m using an ordinary CAT5 LAN cable.

The serial communication uses a receive-respond type protocol. This protocol adds a CRC number to the communication frame to detect errors, thus offering higher reliability. You can use it without worrying about the accuracy of the communication.

□

This instruction manual describes the specifications and methods for using the NPMCMNET-I/O104. We want you to read this manual thoroughly and get full use of the functions offered by this board.

This instruction manual does not describe the detailed functions of the G9001A LSI for ultra-high-speed serial communication systems.

For details about the functions and their registers, please read NPM's "Motionnet Remotel/O & RemoteMotion G9001A/G9002 (Center device / I/O device) User's Manual."

2. Features

Motionnet

Two lines

Data transfer speed

20 Mbps, maximum

Cyclic communication cycle

Cyclic communication time when 64 devices are connected: Maximum 0.97 msec
(Data transfer speed: 20 Mbps, using our recommended 50m cable)

Number of devices supported

Maximum 64 devices / line

Connection method

Multi-drop connections using LAN cables

Serial communication types

Three types of communication are available.

1) System communication

By polling the Motionnet line, the number of local devices that are connected, the device numbers, device types, and I/O port allocation status can all be checked.

2) Cyclic communication

The system starts communication with the local device that has the lowest device number. When the communication cycle reaches the device with the highest device number, the system starts over again, communicating with the device that has the lowest device number. The process of communicating with all active devices, from the lowest to the highest device, is one cycle. The system repeats this communication cycle automatically.

The main status conditions (such as the pulse output status) are read and the general-purpose I/O data on the G9003 is also managed using cyclic communication.

3) Data communication

This communication type is used to handle data between a PCL device and CPU emulation device. Write data into a FIFO in the center device, and issue a send command. This communication will be sent and received automatically by interrupting the cyclic communication.

Data communication is also used to write operation commands and registers in the G9003.

Communication error detection

Errors can be detected by adding CRC numbers to the serial communication frames.

General input/output

- Number of I/O points: 8 points input, 8 points output
- Input interface: Photocoupler input
- Output interface: Darlington transistor output (photocoupler insulation)

3. Precautions

3-1. Safety precautions

When you use this board to control a stepper motor, take the utmost care that no one can get within the zone in which moving components are being operated by the motor.

In addition, provide an emergency stop mechanism to stop the motor operation instantly if a person is in danger.

3-2. Handling precautions

Inputting power

Do not connect or disconnect connectors while this board or peripheral circuits are supplied with power.

Static electricity

This board uses a CMOS device. Therefore this board must be stored in a package in which it was shipped until you actually use it, in order to prevent damage from static electricity.

Switch settings

This board is equipped with switches to set details for serial communications and input/output ports. Be sure to shut off the power supply to the board before changing these switches.

Connections to electrically noisy devices

Interference from excessively noisy devices or from power surges on the power and I/O circuits may cause the board to malfunction. To connect to a device that may generate electrical noise, we recommend taking countermeasures, such as attaching a protective circuit to the input/output circuits. However, it is best not to share the same power supply with noise generating sources.

4. Warranty period and coverage

Warranty period

12 months after being shipped from our factory.

Warranty coverage

During the warranty period, we will repair without charge any problems on the board that occurred while it was being used appropriately, and where the cause of the problem is due to us.

However, the following cases will not be covered by the warranty, even if the warranty period has not expired.

- Problems caused by inappropriate handling or use.
- Problems caused by using parts not made or approved by us.
- Problems caused by modifications made to the board that were not authorized by NPM.
- Problems caused by disasters, accidents, or fires.

We warranty only the product as delivered, and we do not accept responsibility for any loss caused by a fault in our product. We will repair the board when it is sent to our plant by the user.

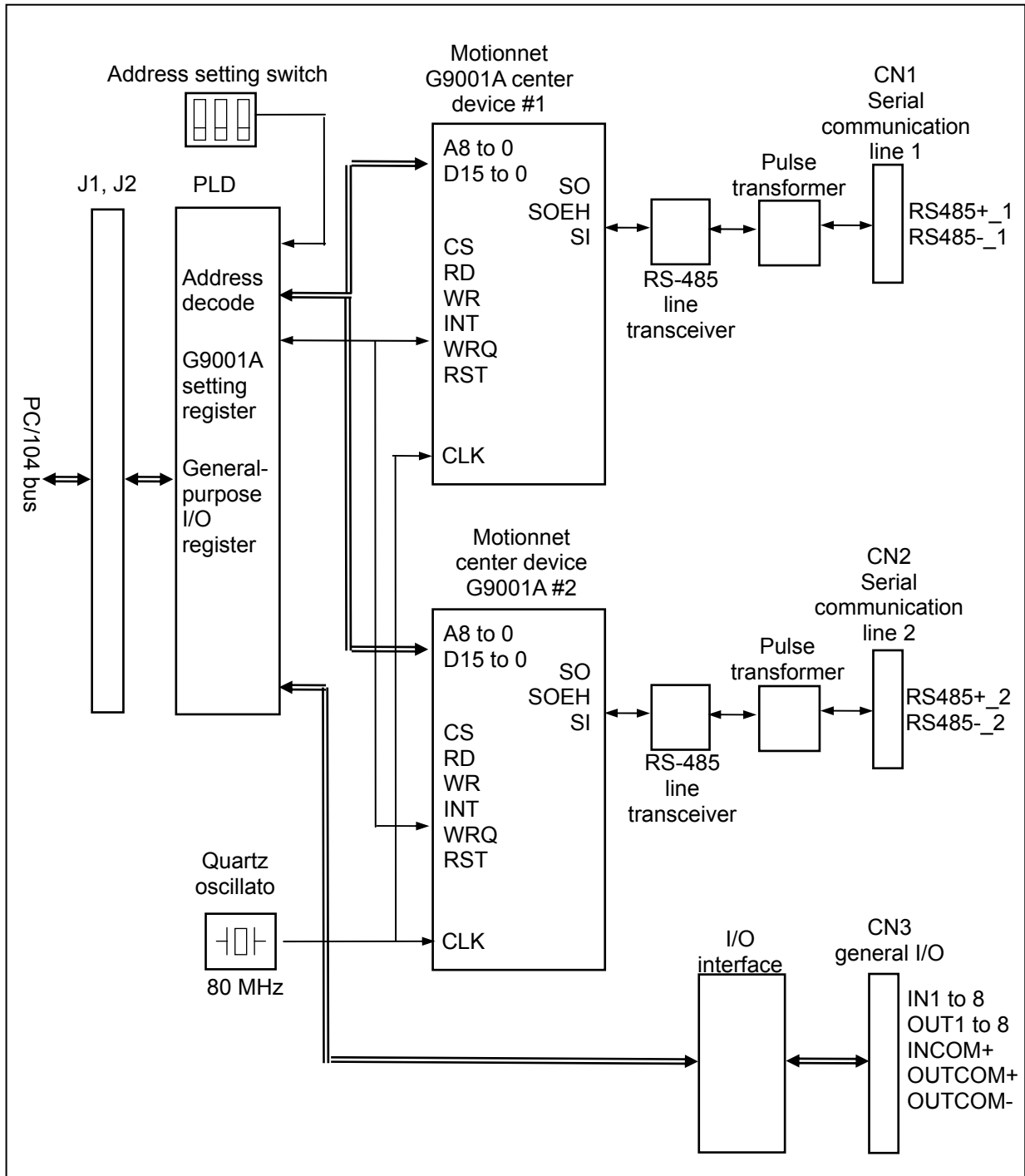
5. Specifications

Item	Signal name	Specifications
Bus line		PC/104 bus version 2.4 compatible. 16-bit data bus
User address space		IO addresses/memory addresses (Selected using switches)
Occupied address space		1536 bytes (5FFh)/48 bytes (2Fh) (Set the base address using switches At 1536 bytes: A19 to A11, At 2F bytes: A15 to A6)
Interrupt signal	IRQ	Select IRQ9, 10, 11, or 12 (Set in the PLD register. Can be set independently for each device)
Signal communications		Motionnet: 2 lines (Equipped with two G9001A center devices)
Serial communication interface		RS-485 compatible pulse transformer and line receiver
Cyclic communication cycles		Maximum of 0.12 msec., when using 8 devices. #1 Maximum of 0.24 msec., when using 16 devices. #1 Maximum of 0.49 msec., when using 32 devices. #1 Maximum of 0.97 msec., when using 64 devices. #2 (Data transfer speed: 20 Mbps, when using our recommended cable #1:100m, #2: 50m)
Total serial communication line length		Maximum of 100 m (At a data transfer speed of 20 Mbps with 32 devices connected) Maximum of 50 m (At a data transfer speed of 20 Mbps with 64 devices connected) Maximum of 100 m (At a data transfer speed of 10 Mbps with 64 devices connected) (Using our recommended cables)
Serial communication protocol		Our proprietary protocol
Serial communication sign		NRZ signed
Serial communication method		Half-duplex communication
Serial communication transfer speed		20 Mbps/10 Mbps/5 Mbps/2.5 Mbps
Connection method		Multi-drop connection using a LAN cable.
Serial communication status display		Cyclic communication: display LED Communication error: display LED
General-purpose inputs		- Number of points: 8 - Photocoupler input (supports sink type outputs) - Input signal voltage: 24 VDC - Input signal current: 4.2 mA/point (Typ.) - Response time: 55 µsec (Typ.)

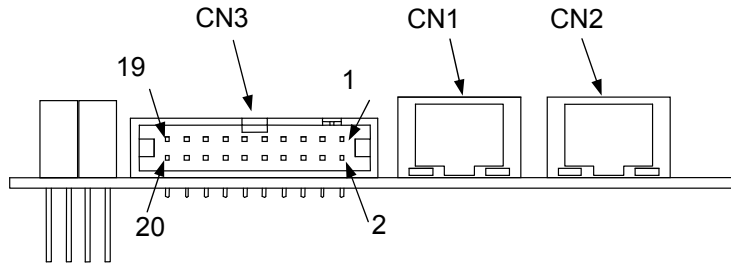
Item	Signal name	Specifications
General-purpose output		<ul style="list-style-type: none"> - Number of points: 8 (8 points / common) - Open collector output (Darlington transistor, sink type) - Maximum rated voltage: 50 VDC - Recommended activation voltage: 12V to 24 VDC - Maximum output current (when turning on 8 circuits at the same time) <ul style="list-style-type: none"> 80 mA/point (Pulse length: 25 msec, Duty cycle: 50%, at 24 VDC) 20 mA/point (Normally ON, at 24 VDC) - Response time: 55 μsec (Typ.) (When loaded 24 VDC, 20 mA) - Overcurrent protection: 2.5 A (8 points as a unit) · Output saturation voltage: $V_{ce(sat)} = 0.9$ V (Typ.) ($I_c = 100$ mA)
Required power		5 VDC \pm 10%, 0.5 A (Typ.)
Operating temperature range		0 to +40°C
Operating ambient humidity		80%RH or less (Non condensing through the +10°C to +40°C range)
Vibration proof		Complies with JIS C0040
Dimensions		90.2W x 95.9H(Unit: mm)

6. Configuration

A block diagram is shown below.



7. Connector Pin Assignments



7-1. CN1 (serial communication line 1 connector)

Connect Motionnet serial signal line number 1.

No.	Signal name	Function	No.	Signal name	Function
1	N.C.	-	2	N.C.	-
3	RS485+_1	Serial line 1 data +	4	N.C.	-
5	N.C.	-	6	RS485-_1	Serial line 1 data -
7	N.C.	-	8	N.C.	-

Note 1: "N.C." means not connected.

7-1. CN2 (serial communication line 2 connector)

Connect Motionnet serial signal line number 2.

No.	Signal name	Function	No.	Signal name	Function
1	N.C.	-	2	N.C.	-
3	RS485+_2	Serial line 2 data +	4	N.C.	-
5	N.C.	-	6	RS485-_2	Serial line 2 data -
7	N.C.	-	8	N.C.	-

Note 1: "N.C." means not connected.

7-3. CN3 (General-purpose I/O connector)

Connect general-purpose I/O signals.

No.	Signal name	Function	Signal direction	No.	Signal name	Function	Signal direction
1	IN1	Input 1	I	2	IN2	Input 2	I
3	IN3	Input 3	I	4	IN4	Input 4	I
5	IN5	Input 5	I	6	IN6	Input 6	I
7	IN7	Input 7	I	8	IN8	Input 8	I
9	INCOM+	Input common +		10	INCOM+	Input common +	
11	OUT1	Output 1	O	12	OUT2	Output 2	O
13	OUT3	Output 3	O	14	OUT4	Output 4	O
15	OUT5	Output 5	O	16	OUT6	Output 6	O
17	OUT7	Output 7	O	18	OUT8	Output 8	O
19	OUTCOM+	Output common +		20	OUTCOM-	Output common -	

Note 1: "N.C." means not connected.

Note 2: The signal directions above refer to the signal flow direction as seen from the board: "I" = Input and "O" = Output.

7-4. J1 (PC/104 bus connector)

J1/P1 connector of the PC/104 bus.

No.	Signal name	Signal direction	Function
A1			
A2	SD7	I/O	Data bus
A3	SD6	I/O	"
A4	SD5	I/O	"
A5	SD4	I/O	"
A6	SD3	I/O	"
A7	SD2	I/O	"
A8	SD1	I/O	"
A9	SD0	I/O	"
A10	IOCHRDY	I	Wait Request
A11	AEN	O	Decode conditions
A12			
A13			
A14			
A15	SA16	O	Address bus
A16	SA15	O	"
A17	SA14	O	"
A18	SA13	O	"
A19	SA12	O	"
A20	SA11	O	"
A21	SA10	O	"
A22	SA9	O	"
A23	SA8	O	"
A24	SA7	O	"
A25	SA6	O	"
A26	SA5	O	"
A27	SA4	O	"
A28	SA3	O	"
A29	SA2	O	"
A30	SA1	O	"
A31	SA0	O	"
A32	GND		Ground

No.	Signal name	Signal direction	Function
B1	GND		Ground
B2	RESETDRV		Reset
B3	+5V		Power, +5VDC
B4	IRQ9	I	Interrupt
B5			
B6			
B7			
B8			
B9			
B10			
B11			
B12			
B13	/IOW	O	Write command strobe
B14	/IOR	O	Read command strobe
B15			
B16			
B17			
B18			
B19	/REFRESH	O	Refresh cycle
B20			
B21			
B22			
B23			
B24			
B25			
B26			
B27			
B28	BALE	O	Decode condition
B29	+5V		Power, +5VDC
B30			
B31	GND		Ground
B32	GND		"

Note 1: The signal directions above refer to the signal flow direction as seen from the board: "I" = Input and "O" = Output.

Note 2: Signals with a slash mark in front of their names use negative logic.

Note 3: Blanks mean not connected.

7-5. J2 (PC/104 bus connector)

J2/P2 connector of the PC/104 bus.

No.	Signal name	Signal direction	Function
C0	GND		Ground
C1			
C2	LA23	O	Address bus
C3	LA22	O	"
C4	LA21	O	"
C5	LA20	O	"
C6	LA19	O	"
C7	LA18	O	"
C8	LA17	O	"
C9	/MEMR	O	Write command strobe
C10	/MEMW	O	Read command strobe
C11	SD8	I/O	Data bus
C12	SD9	I/O	"
C13	SD10	I/O	"
C14	SD11	I/O	"
C15	SD12	I/O	"
C16	SD13	I/O	"
C17	SD14	I/O	"
C18	SD15	I/O	"
C19			

No.	Signal name	Signal direction	Function
D0	GND		Ground
D1	/MEMCS16	I	16-bit memory cycle
D2	/IOCS16	I	16-bit I/O cycle
D3	IRQ10	I	Interrupt
D4	IRQ11	I	"
D5	IRQ12	I	"
D6			
D7			
D8			
D9			
D10			
D11			
D12			
D13			
D14			
D15			
D16	+5V		Power, +5 VDC
D17			
D18	GND		Ground
D19	GND		"

Note 1: The signal directions above refer to the signal flow direction as seen from the board: "I" = Input and "O" = Output.

Note 2: Signals with a slash mark in front of their names use negative logic.

Note 3: Blank means not connected.

7-6. Connectors used

The model names of the connectors used on this board are shown below.

No.	Mfg.	Model name	Remarks
CN1	Hirose Electric	TM11R-5L-88 or equivalent	8-pin modular jack connector
CN2	"	"	"
CN3	3M	7620-5002SC or equivalent	MIL standard, 20-pin box pin header

This board does not come with any connectors. The user is responsible for fabricating his own connecting cables. When choosing connectors, we recommend the following items.

No.	Item name	Mfg.	Model name	Remarks
For CN1	Modular plug	Hirose Electric	TM11P-88P	Modular plug with a shield
For CN2	"	"	"	"
For CN3	Connector	3M	7920-6500SC	1.27 mm pitch, flat cable, crimp-type connector

8. Individual signals and their functions

8-1. Serial communication (RS485+1, RS485-1, RS485+2, RS485-2)

Function

These are all Motionnet serial signals.

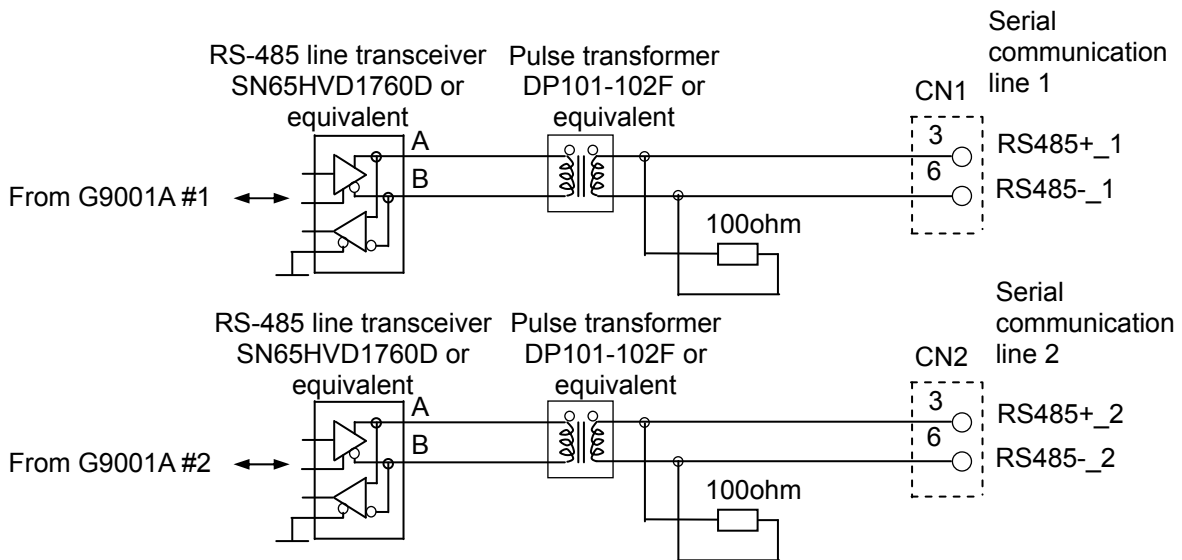
Interface

1) The serial communication signals are isolated from the line voltage using a pulse transformer. They are input and output through line transceivers (SN65HVD1176D or equivalent) that meet the RS-485 specifications.

The board handles the input and output of the positive phase of the line transceiver through the RS485 plus terminals and the reverse phase through the RS485 minus terminals.

2) Termination resistance

A termination resistor is present in order to prevent reflections of the serial communication line signals.



8-2. General-purpose inputs (IN1 to IN8)

Function

Receive input signals.

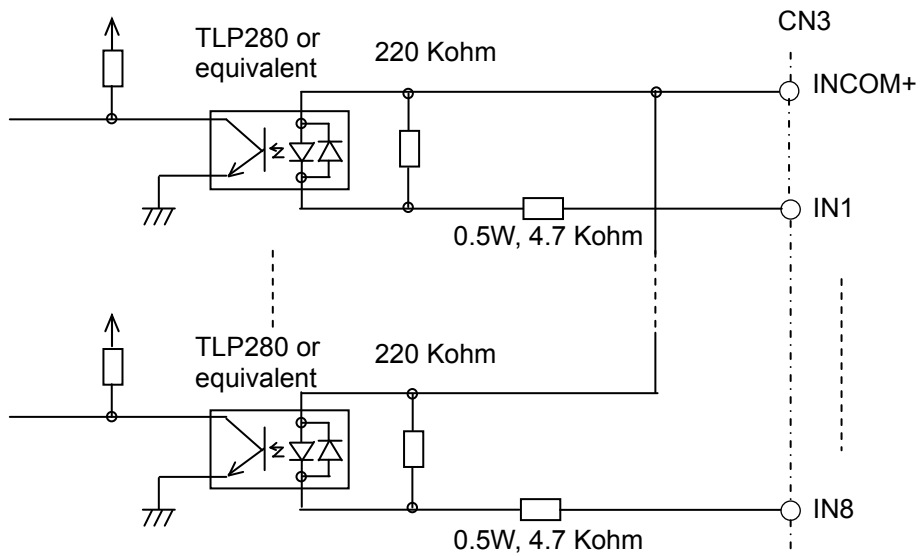
Input interface

The input interface for these signals is a photocoupler input (TLP280 or equivalent).

When the photocoupler goes on, the input signal will change to 1 (active high (positive logic)).

[Input specifications]

- Input current: 4.5 mA (Typ.) (When 24 VDC is supplied)
- Response time: 55 µsec (Typ.)



8-3. General-purpose outputs (OUT1 to OUT8)

Function

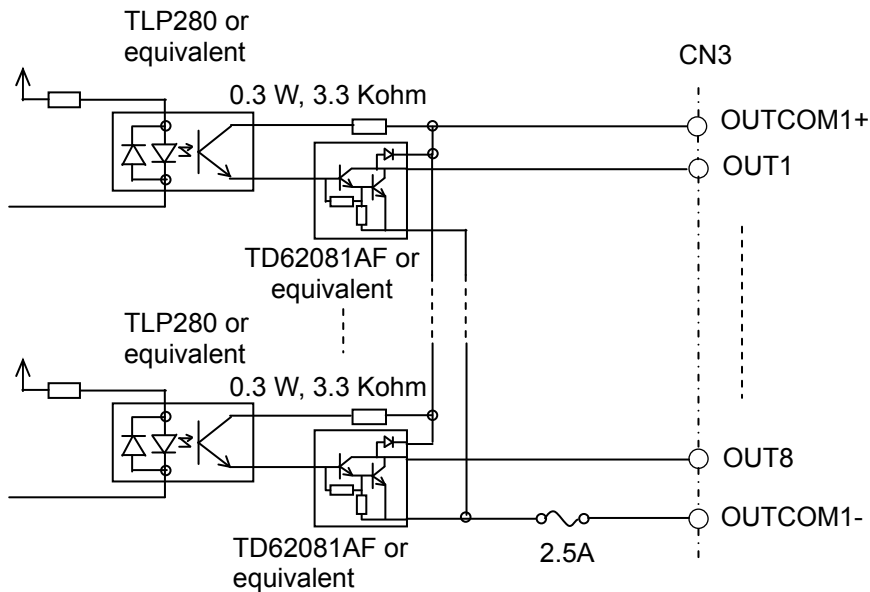
Transmit output signals.

Output interface

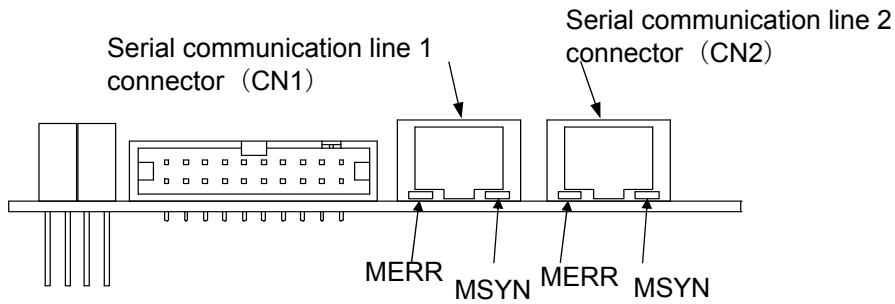
- The outputs are isolated from the internal power supply by using photocouplers with an open collector output (Darlington transistor TD62081AF or equivalent containing 8 elements).
- A single 2.5A fuse is installed on the transistor emitter side for every 8 points.
- Signal logic
The transistor goes on when active high (positive logic).
(Write a 1 to an output bit and the respective transistor will go on.)

[Output specifications]

- Recommended operating voltage: 12 to 24 VDC
- Maximum output current (when 8 circuits are turned on at the same time)
80mA/point (pulse length: 25 msec, Duty cycle: 50%, when 24 VDC is supplied)
20mA/point (normally ON, when 24VDC is supplied)
- Output saturation voltage: $V_{ce(sat)} = 0.9\text{ V (Typ.) (I}_c = 100\text{ mA)}$



9. Status display



9-1. Cyclic communication LED (MSYN)

This LED indicates the status of the MSYN terminal on the G9003. This LED lights each time one cyclic communication is complete. This LED is green.

9-2. Communication error LED (MERR)

This LED indicates the status of the MERR terminal on the G9001A. This LED lights when the G9001A receives an error frame. This LED is yellow.

10. Address Setting

10-1. Assigning addresses

The addressable area of this board can be set to a memory address area or an IO address area using a switch.

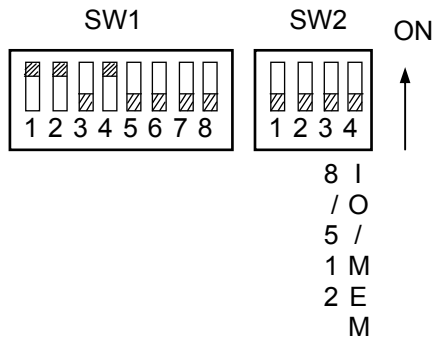
On the G9001A you can select an 8 byte address area in order to save resources in addition to the 512 byte address area.

For this reason, with this board, you can use the 8 byte area just for IO addresses. Note carefully that when this function is selected, the base address setting method will change.

Set the function above using switches SW2-3 and 2-4.

	G9001A address area	
	512 bytes	8 bytes
IO address area	SW2-4: ON, SW2-3: OFF	SW2-4: ON, SW2-3: ON
Memory address area	SW2-4:OFF, SW2-3: OFF	x

The combination of SW2-4 set off and SW2-3 set on is prohibited.

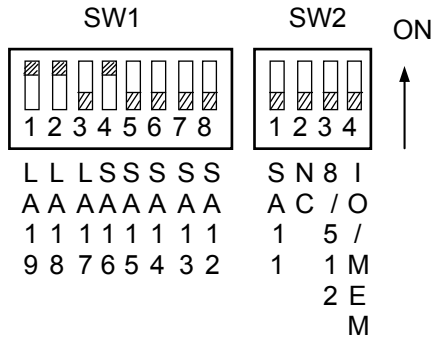


10-2. Setting base address

- 1) When using the 512 bytes area on the G9001A as a memory area.
 The switches control the address lines: 1=ON and 0=OFF
 (Address lines LA20 to LA23 are always decoded to L.)

[Setting example]

To set the base address to 0x0D0000.

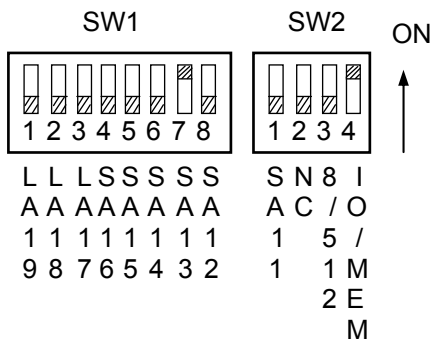


Note: "NC" means not used.
 These switches should always be set off.

- 2) When using the 512 byte area in the G9001A as an IO address area.
 The switches control the address lines: 1=ON and 0=OFF

[Setting example]

To set the base address to 0x2000.

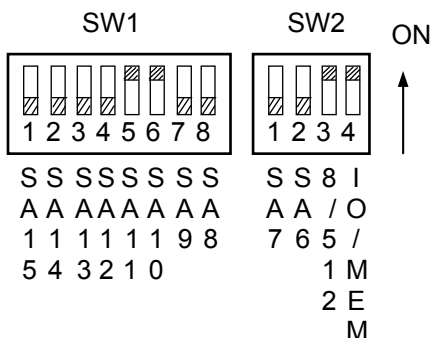


Note: "NC" means not used.
 These switches should always be set off.

- 3) When using the 8 byte area in the G9001A as an IO address area.
 The switches control the address lines: 1=ON and 0=OFF

[Setting example]

To set the base address to 0x0C00.



10-3. Address map

1) When setting the 512 byte area in the G9001A for joint use as a memory address area and an IO address area.

With this selection, the 512 byte address area is mapped in this order: G9001A #1, G9001A #2, and PLD. The G9001A settings and general-purpose input/output signal registers are included in the PLD. The offset values from the base address are shown below.

Offset value	Writing	Reading	Device
+000 to 001h	Command	Status	G9001A #1
+002 to 003h	Invalid	Interrupt status	
+004 to 005h	I/O buffer	I/O buffer	
+006 to 007h	Data sending FIFO	Data receiving FIFO	
+008 to 077h	- (Data written here is ignored)	- (Always reads 00)	
+078 to 0B7h	Device information	Device information	
+0B8 to 0BFh	Reset the I/O communication error flag	I/O communication error flag status	
+0C0 to 0DFh	Set the input port change interrupt	Input port change interrupt setting	
+0E0 to 0FFh	Reset the input port change interrupt flag	Input port change interrupt flag status	
+100 to 1FFh	I/O port data	I/O port data	
+200 to 201h	Command	Status	
+202 to 203h	Invalid	Interrupt status	
+204 to 205h	I/O buffer	I/O buffer	
+206 to 207h	Data sending FIFO	Data receiving FIFO	
+208 to 277h	- (Data written here is ignored)	- (Always reads 00)	
+278 to 2B7h	Device information	Device information	
+2B8 to 2BFh	Reset the I/O communication error flag	I/O communication error flag status	
+2C0 to 2DFh	Set the input port change interrupt	Input port change interrupt setting	
+2E0 to 2FFh	Reset the input port change interrupt flag	Input port change interrupt flag status	
+300 to 3FFh	I/O port data	I/O port data	PLD
+400h	Device ID	-	
+401h	-	-	
+402h	Card ID	-	
+403h	-	-	
+404h	G9001A #1 control register	G9001A #1 control register	
+405h	-	-	
+406h	G9001A #2 control register	G9001A #2 control register	
+407h	-	-	
+408h	G9001A interrupt control register	G9001A interrupt control register	
+409h	-	-	
+40Ah	General-purpose input	-	
+40Bh	-	-	
+40Ch	General-purpose output	General-purpose output	
+40D to 40Fh	-	-	
+417 to 5FFh	Image	Image	

Note: “-“ means not defined.

2) When setting the 8 byte areas in the G9001A as an IO address area.

With this selection, the address map of the 16 bytes area continues in the order of G9001A #1, G9001A #2, and PLD. The G9001A settings and general-purpose input/output signal registers are included in the PDL.

The offset values from the base address are shown below.

Offset value	Writing	Reading	Device
+000 to 001h	Command	Status	G9001A #1
+002 to 003h	Invalid	Interrupt status	
+004 to 005h	I/O buffer	I/O buffer	
+006 to 007h	Data sending FIFO	Data receiving FIFO	
+008 to 00Fh	Image	Image	
+010 to 011h	Command	Status	G9001A #2
+012 to 013h	Invalid	Interrupt status	
+014 to 015h	I/O buffer	I/O buffer	
+016 to 017h	Data sending FIFO	Data receiving FIFO	
+018 to 01Fh	Image	Image	
+020h	Device ID	-	PLD
+021h	-	-	
+022h	Card ID	-	
+023h	-	-	
+024h	G9001A #1 control register	G9001A #1 control register	
+025h	-	-	
+026h	G9001A #2 control register	G9001A #2 control register	
+027h	-	-	
+028h	G9001A interrupt control register	G9001A interrupt control register	
+029h	-	-	
+02Ah	General-purpose input	-	
+02Bh	-	-	
+02Ch	General-purpose output	General-purpose output	
+02D to 02Fh	-	-	

Note: “-“ means not defined.

11. PLD register

The details of registers allocated to the PLD are described below.

11-1. Device ID (DEV_ID_REG)

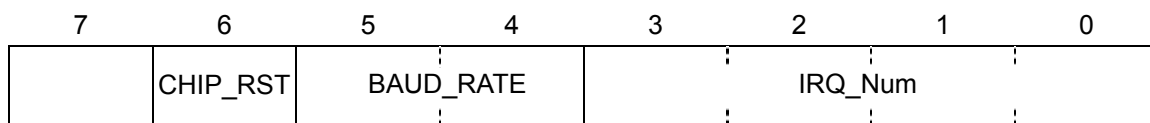
This is an ID specific to PLD devices and is always “A6h.”

11-2. Card ID (CARD_IDREG)

This is an ID for the board type and is “00h.”

11-3. G9001A #1 control register (RING0_CNT_REG)

Setting the registers in the G9001A center device.

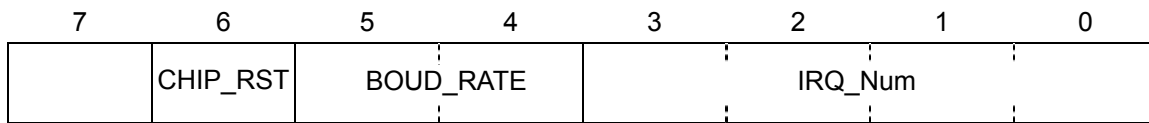


BIT	Name	Access	Default	Description
7	Not defined	-	0	Always set to 0.
6	CHIP_RST	R/W	0	Reset G9001A #1 1: Reset, 0: Normal
5-4	BAUD_RATE	R/W	00	Sets the serial communication transfer speed 11: 20 Mbps 10: 10 Mbps 01: 5 Mbps 00: 2.5 Mbps
3	IRQ_12	R/W	0	Connects an interrupt signal to IRQ12. Note 1 1: Enable, 0: Disable
2	IRQ_11	R/W	0	Connects an interrupt signal to IRQ11. Note 1 1: Enable, 0: Disable
1	IRQ_10	R/W	0	Connects an interrupt signal to IRQ10. Note 1 1: Enable, 0: Disable
0	IRQ_9	R/W	0	Connects an interrupt signal to IRQ9. Note 1 1: Enable, 0: Disable

Note 1: Effective when the interrupt control register (G9001_IRQ_REG), BIT2, Ring0_IRQ_EN is 1 (Enabled).

11-4. G9001A #2 control register (RING1 CNT REG)

Setting registers of the center device G9001A #2



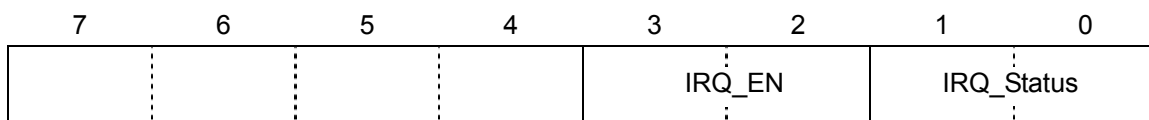
BIT	Name	Access	Default	Description
7	Not defined	-	0	Always set to 0.
6	CHIP_RST	R/W	0	Reset G9001A #2 1: Reset, 0: Normal
5-4	BOUD_RATE	R/W	00	Set the serial communication transfer speed 11: 20 Mbps 10: 10 Mbps 01: 5 Mbps 00: 2.5 Mbps
3	IRQ_12	R/W	0	Connect an interrupt signal to IRQ12. Note 1 1: Enable, 0: Disable
2	IRQ_11	R/W	0	Connect an interrupt signal to IRQ11. Note 1 1: Enable, 0: Disable
1	IRQ_10	R/W	0	Connect an interrupt signal to IRQ10. Note 1 1: Enable, 0: Disable
0	IRQ_9	R/W	0	Connect an interrupt signal to IRQ9. Note 1 1: Enable, 0: Disable

Note 1: Effective when the interrupt control register (G9001_IRQ_REG), BIT3, Ring1_IRQ_EN is 1 (Enable).

11-5. G9001A interrupt control register (G9001_IRQ_REG)

Interrupt control registers from G9001A #1 and 2 center device.

The interrupt signal status can be monitored regardless of setting enable/disable.



BIT	Name	Access	Default	Description
7-4	Not defined	-	0	Always set to 0.
3	Ring1_EN	R/W	0	Enable the G9001A #2 interrupt signal: 1=Enable, 0=Disable
2	Ring0_EN	R/W	0	Enable the G9001A #1 interrupt signal: 1: Enable, 0: Disable
1	Ring1_IRQ	R	0	Enable the G9001A #2 interrupt signal: 1: Inactive, 0: Active
0	Ring0_IRQ	R	0	Enable the G9001A #1 interrupt signal: 1: Inactive, 0: Active

11-6. General-purpose input (GPIO IN REG)

Monitor the general-purpose input status.

7	6	5	4	3	2	1	0
IN7	IN6	IN5	IN4	IN3	IN2	IN1	IN0

BIT	Name	Access	Default	Description
7	IN7	R	0	Input 8 signal status 1: Active, 0: Inactive
6	IN6	R	0	Input 7 signal status 1: Active, 0: Inactive
5	IN5	R	0	Input 6 signal status 1: Active, 0: Inactive
4	IN4	R	0	Input 5 signal status 1: Active, 0: Inactive
3	IN3	R	0	Input 4 signal status 1: Active, 0: Inactive
2	IN2	R	0	Input 3 signal status 1: Active, 0: Inactive
1	IN1	R	0	Input 2 signal status 1: Active, 0: Inactive
0	IN0	R	0	Input 1 signal status 1: Active, 0: Inactive

11-7. General-purpose output (GPIO OUT REG)

Set up the general-purpose output.

7	6	5	4	3	2	1	0
OUT7	OUT6	OUT5	OUT4	OUT3	OUT2	OUT1	OUT0

BIT	Name	Access	Default	Description
7	OUT7	R/W	0	Set up output 8. 1: Active, 0: Inactive
6	OUT6	R/W	0	Set up output 8. 1: Active, 0: Inactive
5	OUT5	R/W	0	Set up output 8. 1: Active, 0: Inactive
4	OUT4	R/W	0	Set up output 8. 1: Active, 0: Inactive
3	OUT3	R/W	0	Set up output 8. 1: Active, 0: Inactive
2	OUT2	R/W	0	Set up output 8. 1: Active, 0: Inactive
1	OUT1	R/W	0	Set up output 8. 1: Active, 0: Inactive
0	OUT0	R/W	0	Set up output 8. 1: Active, 0: Inactive

12. Serial communication cable

This system is designed to be connected with LAN cables that guarantee enhanced quality for high-speed communication and are suitable for 100BASE and 1000BASE. These are standard cables, easy to find and cheap. Therefore, we do not include these cables with our products.

To select cables you need to connect, make sure they meet the following specifications.

Wiring standard: TIA/EIA-568-B

Category 5 (CAT5)

Enhanced category 5 (CAT5e)

Category 6 (CAT6)

UTP (Unshielded Twisted Pair) cables or STP (Shielded Twisted Pair) cables that meet the specifications above.

The higher the standard the cables meet, the more the communication quality will be improved. To use the board in an area with excessive electrical noise, use shielded cables (STP).

Observe the following when connecting your system.

1) Total serial line length

This system employs a multi-drop connection method. The maximum total extension distance of the line varies, depending on the data transfer speed and the number of local boards that are connected.

- Max. 100 m (Transfer speed; 20 Mbps with 32 local boards connected)
- Max. 50 m (Transfer speed; 20 Mbps with 64 local boards connected)
- Max. 100 m (Transfer speed; 10 Mbps with connecting 64 local boards connected)

2) Minimum cable length

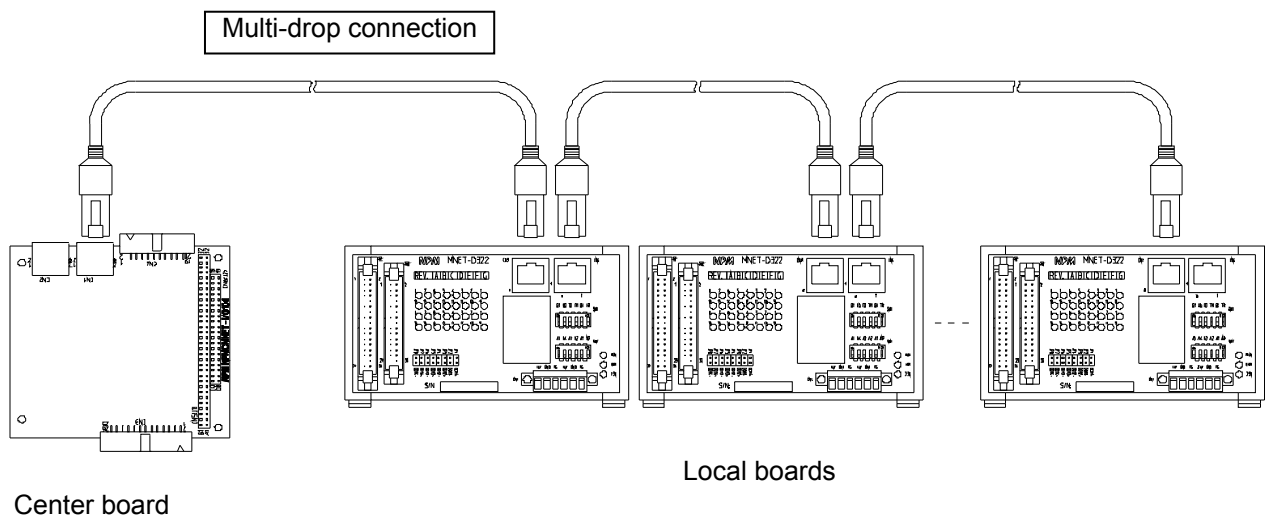
The shortest cable must be at least 60 cm long.

3) Do not mix cables of different types and model in the same serial line.

4) Keep the total serial line length as short as possible.

5) If you are using shielded cables, do not connect the shield on both ends to the FG terminals.

Connecting only one end of the shield on each cable will improve noise immunity.



13. Device driver installation (Windows version)

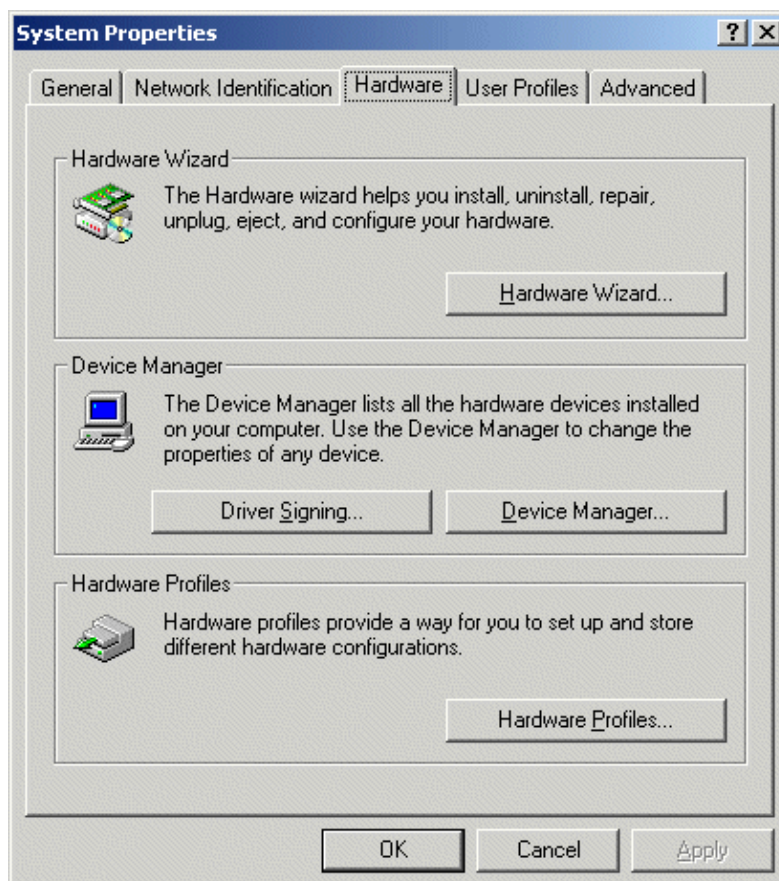
13-1. Operating environment

Compatible OS: Windows2000, WindowsXP
Map area: Memory
G9001A mapping method: 512 bytes

13-2. Installation

The device driver installation procedure is shown below.

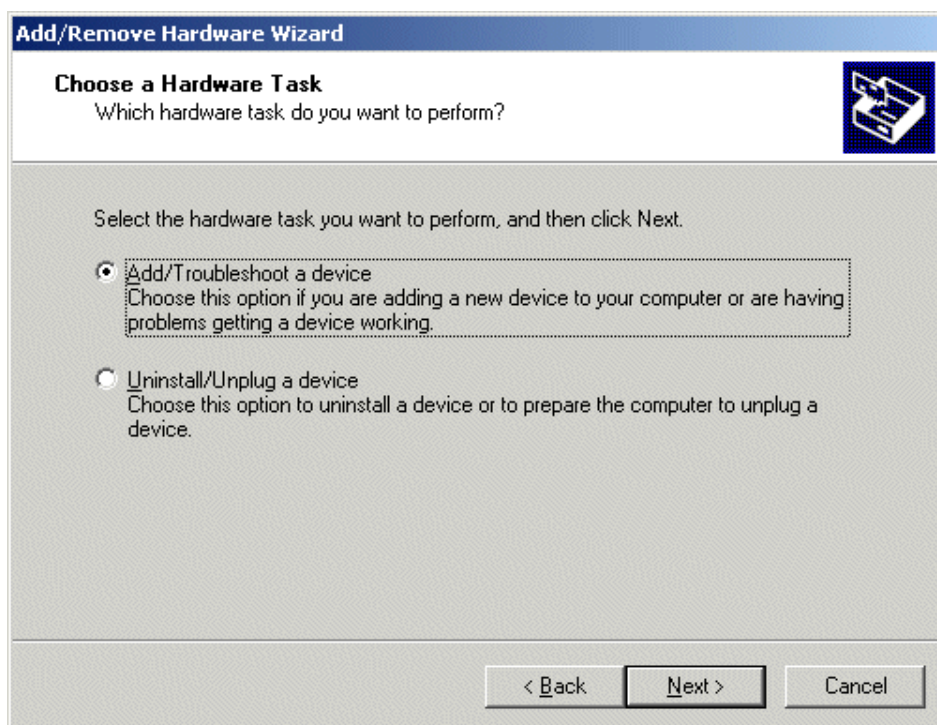
- 1) Turn OFF the power to the computer.
- 2) Set the mapping address and other details using the SW1 and SW2 switches on the NPMCMNET-I/O104 board.
(Map the space for use as memory with the 512 byte method. The default address setting in the installation file is D0000h.)
- 3) Connect the NPMCMNET-I/O104 board to your computer.
- 4) Turn the computer back on.
- 5) On the Startup menu, click [Settings] -> [Control panels] -> [System Properties], in that order. Then, click on the [Hardware wizard] button.



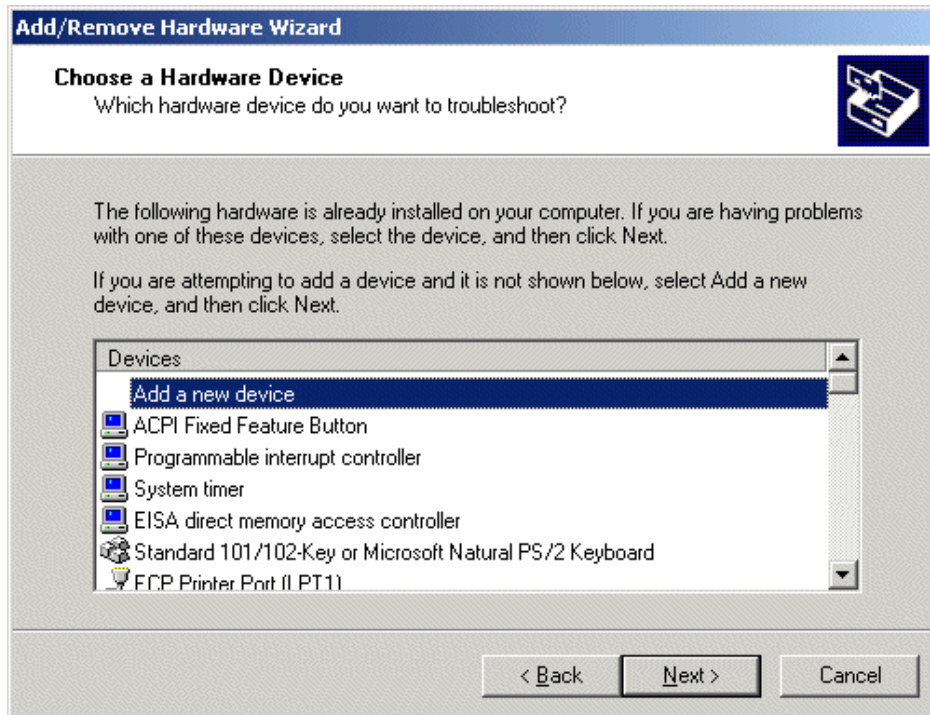
6) When the Hardware Wizard starts, click on the [Next] button



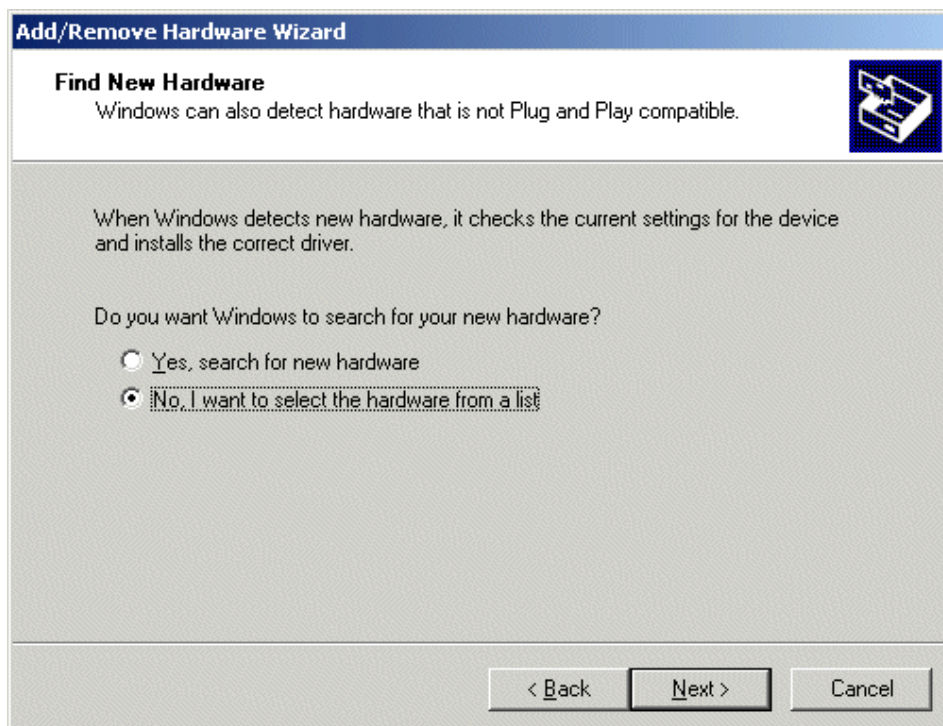
7) Click on the “Add/Troubleshoot a device” bullet and then click on the [Next] button.



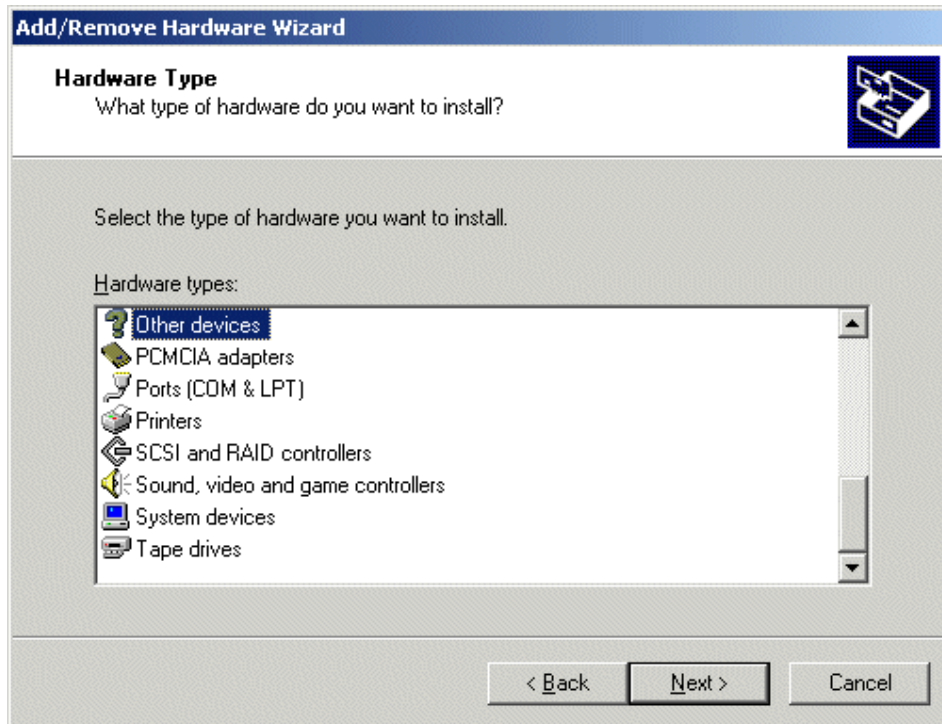
- 8) After searching for Plug and Play devices, the wizard will display the screen below. Select "Add a new device," and then click on the [Next] button.



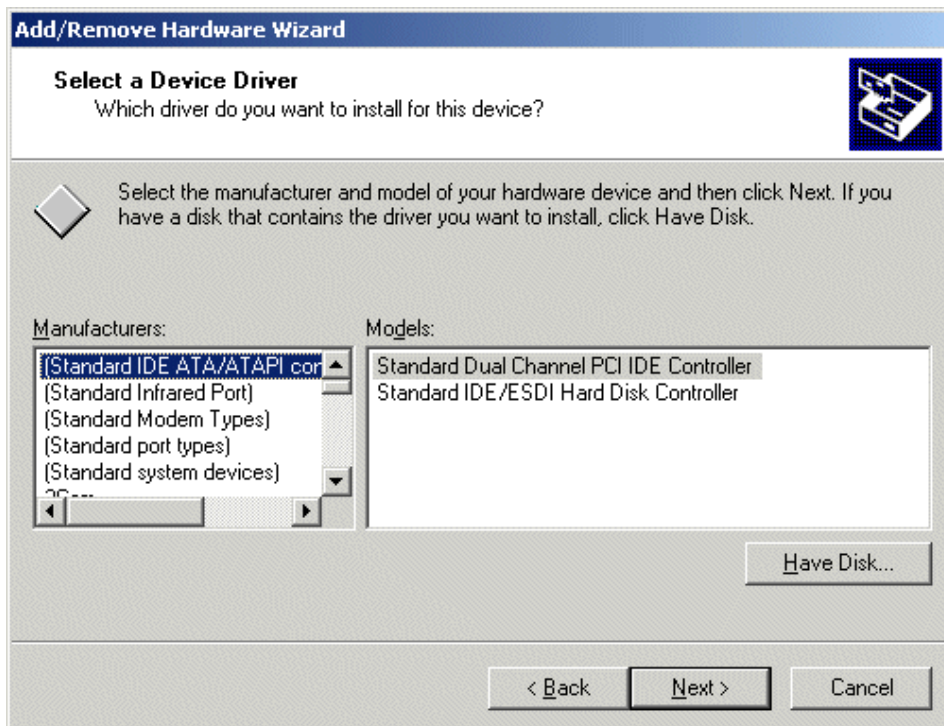
- 9) A driver installation screen will appear for new hardware that is not Plug and Play compatible. The program will ask you which search method to use. Click the "No. I want to select the hardware from a list" bullet and then click on the [Next] button.



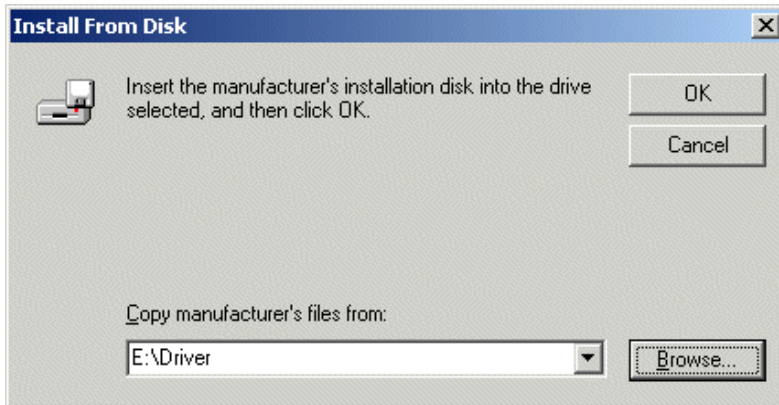
- 10) Choose a hardware type.
 Select "Other devices" and then click on the [Next] button.



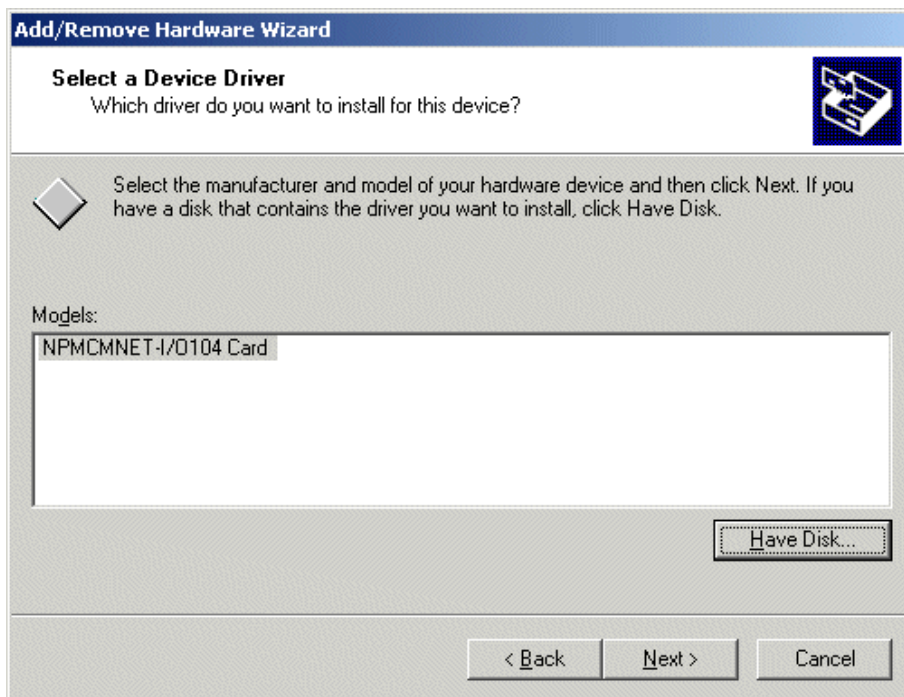
- 11) Select a device driver.
 Ignore the "Manufactures" and "Models" boxes, and click on the [Have Disk] button.



12) Insert a floppy disk or CD-R that contains the device driver and select the folder in which the device driver is included. Then click on the [OK] button.



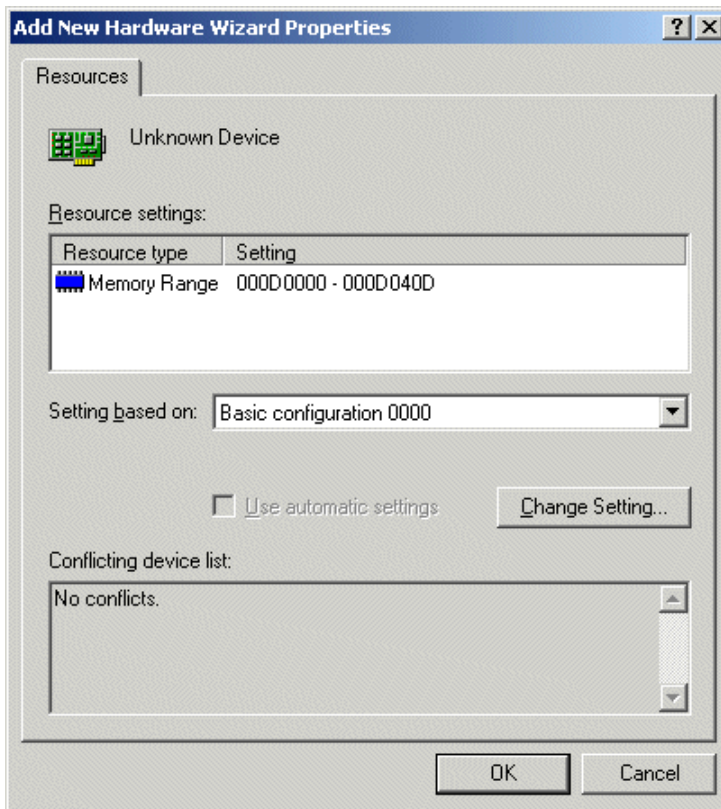
13) The PC will look for the file for the NPMCMNET-I/O104 board. Click on the [Next] button



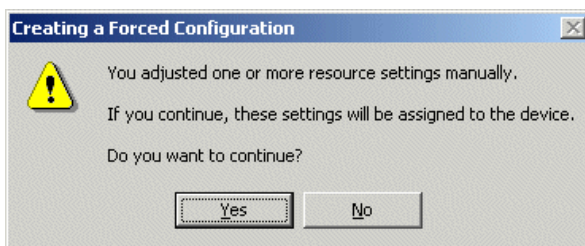
14) Next, you will see a message telling you to enter the hardware settings manually. Click on the [OK] button



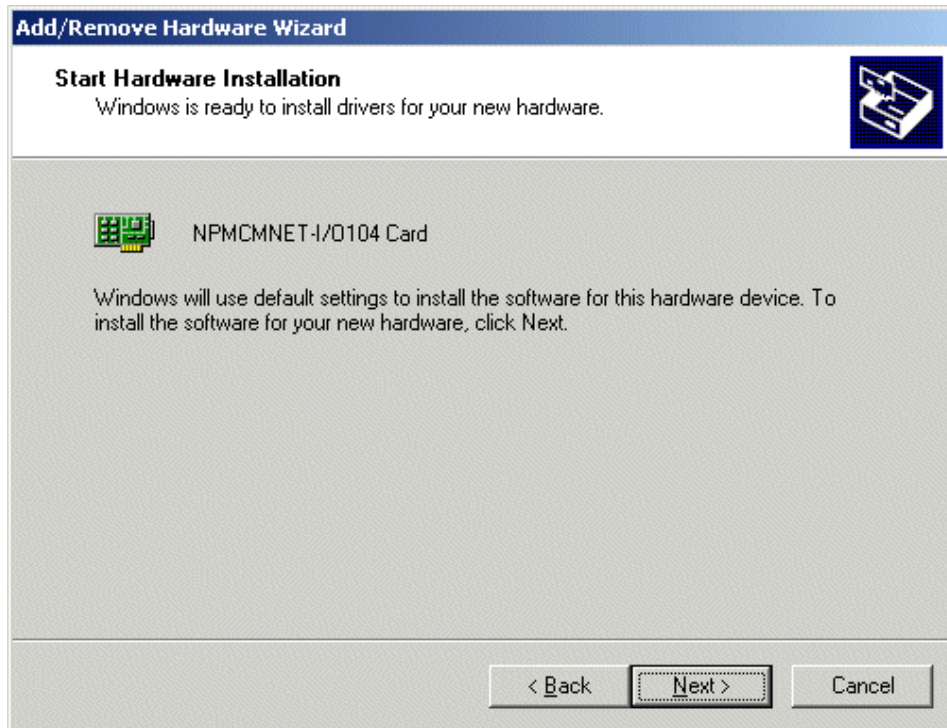
- 15) The default setting [Address D0000h -] will appear
 If there is no problem with this setting, click the [OK] button.
 If you want to change the settings, see the section “Installation to an address other than the default address (D0000h)” (described later.)



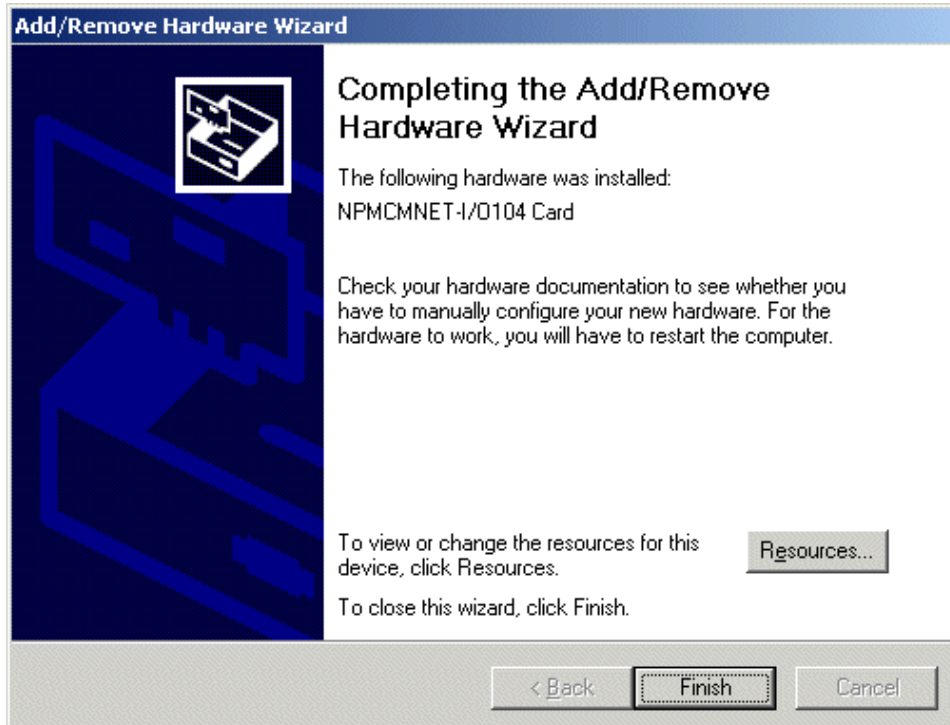
- 16) A confirmation message about making the setting manually will be displayed.
 If there are no problems, click on the [YES] button



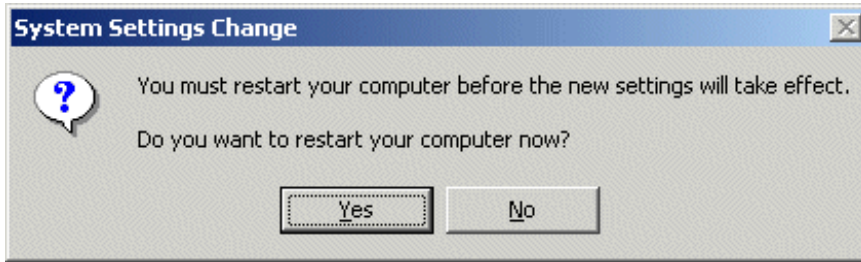
- 17) A message will be displayed indicating that the PC is now ready to install the driver. Click on the [Next] button.



- 18) A message that the driver installation is complete will be displayed. Click on the [Finish] button



- 19) A message will be displayed asking whether you want to restart the computer now. The settings will be enabled by restarting the PC.

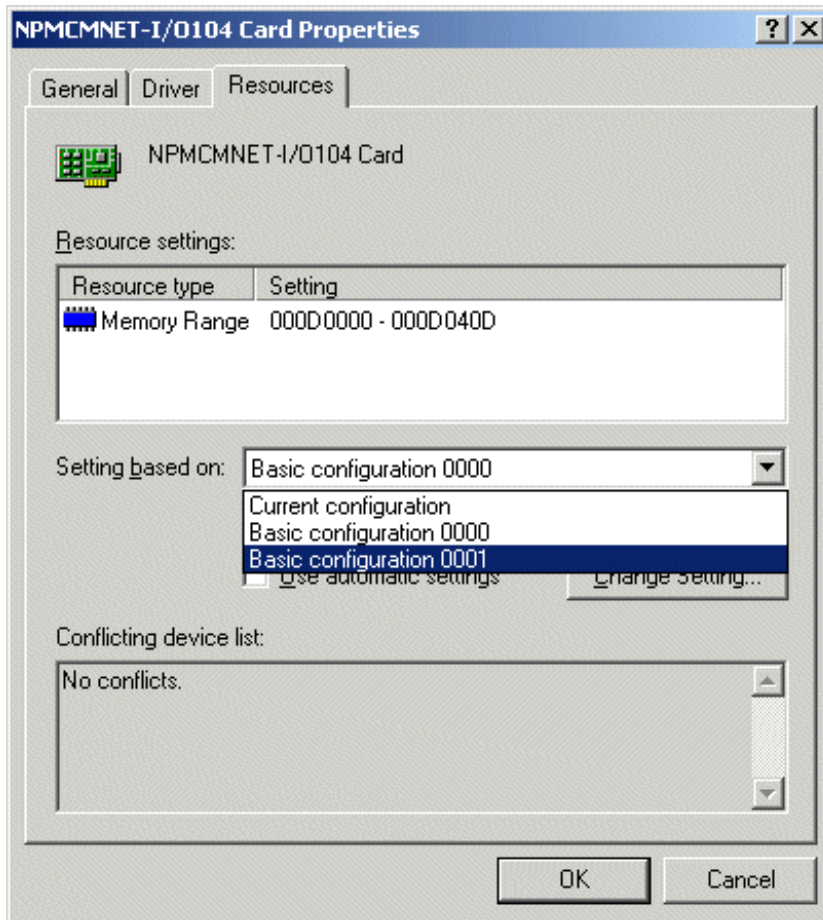


Installation to an address other than the default address (D0000h)

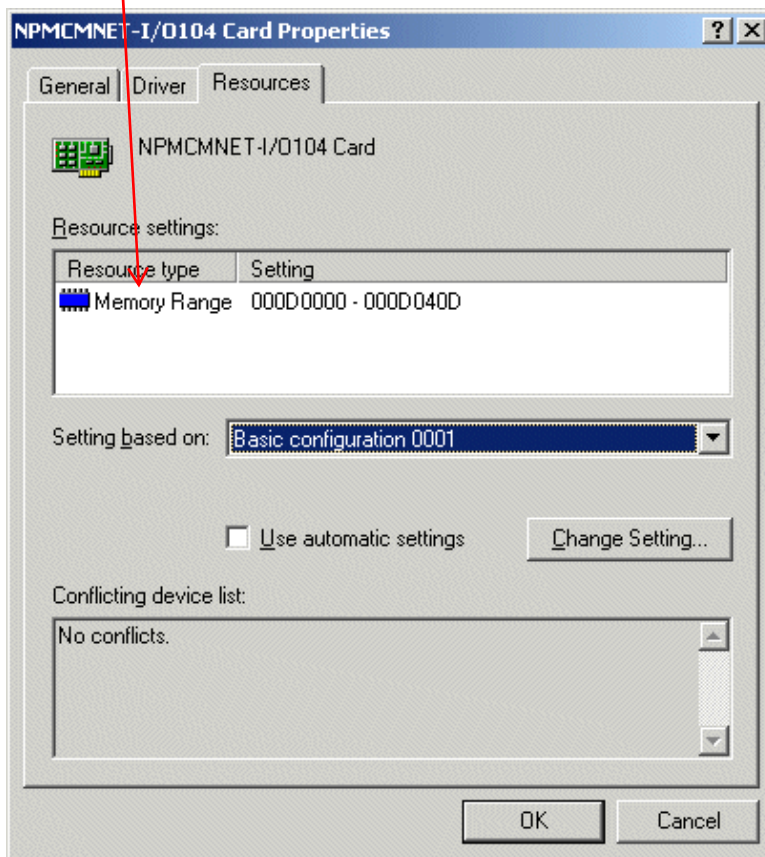
Steps 1) to 14) are the same as when using the default setting.

- i) On the next screen, select basic configuration 0001.

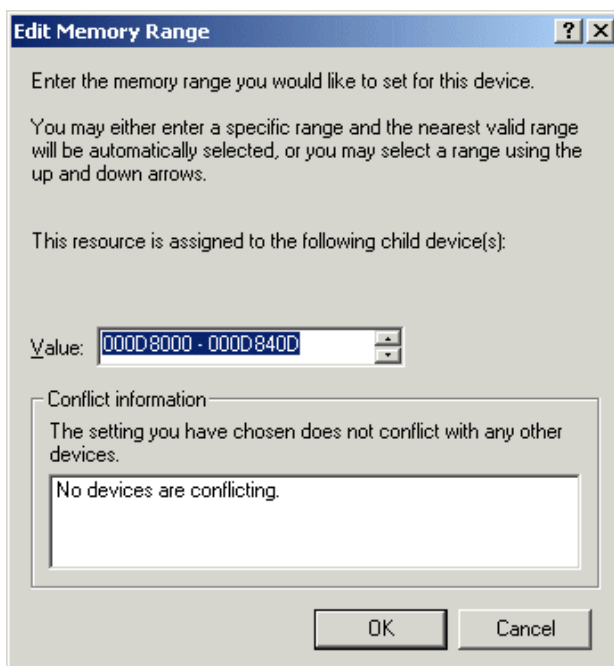
(Now, basic configuration 0000 becomes the default setting.)



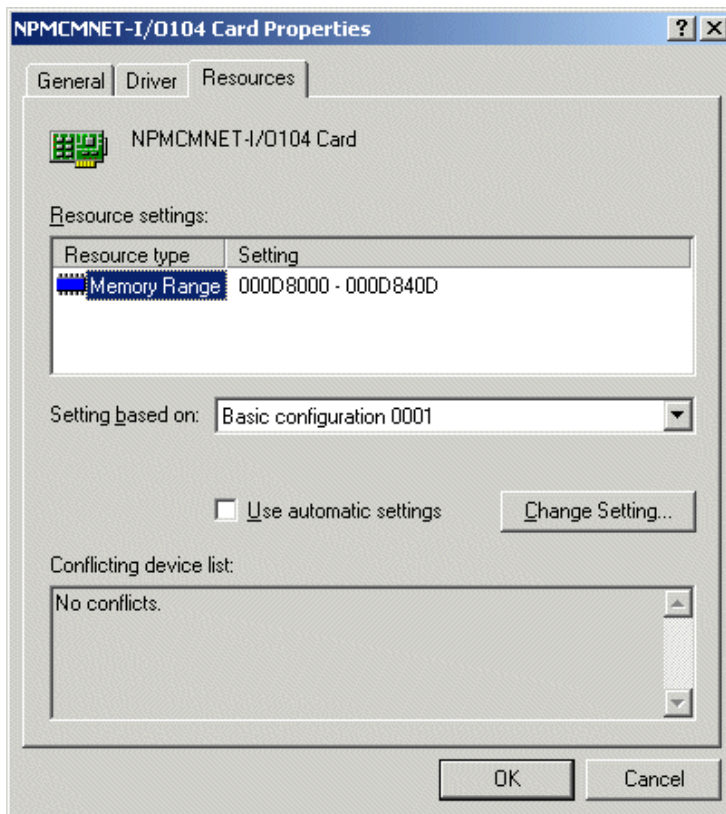
- ii) By selecting basic configuration 0001, the screen below will appear. Click on the line that says “Memory Range.”



- iii) Adjust the value to match the setting on the G9001A board. Make sure that the “No device are conflicting.” message appears, as shown in the figure below. Then click on the [OK] button.



iv) Make sure that the “No conflicts.” message appears. Then click on the [OK] button.



v) From this point on, the steps are the same as step 16) and after in the procedure for installing the device at the default address.

14. DLL

Two DLLs are available for use with this board, as shown below.

Low level DLL: A low level DLL is used to read and write data by assigning addresses.

To use this DLL, you have to be familiar with the use of the Motionnet LSIs.

DLL: This DLL contains multiple functions that execute low level access.

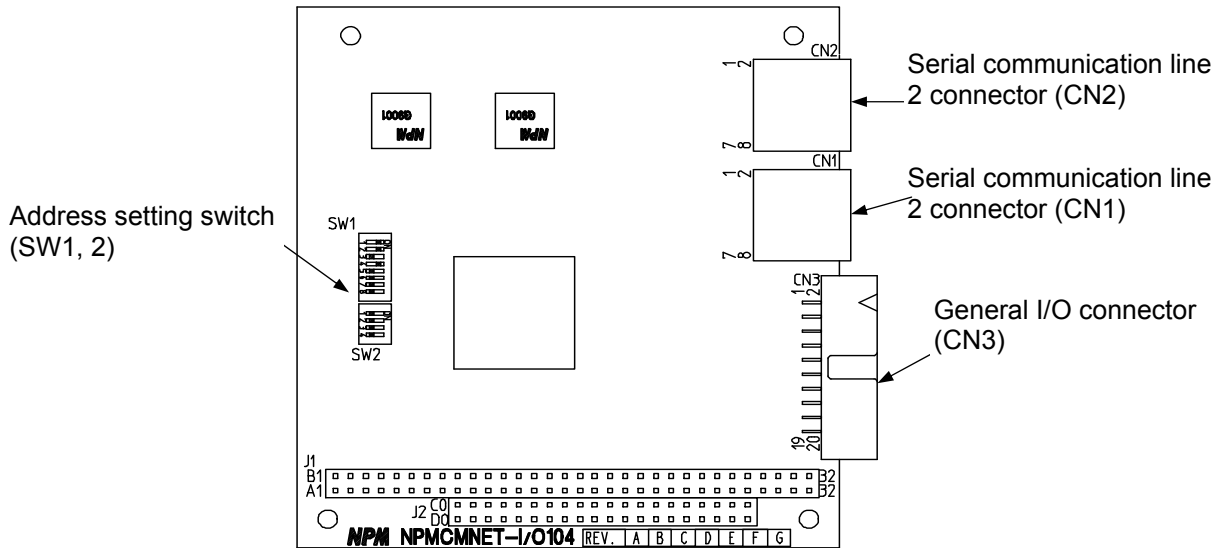
Basically, with this DLL, you do not need to be aware of the register data.

These DLLs support a maximum of 4 boards.

The files, documents, and sample programs for these DLLs are included in the attached CD-ROM.

15. Connector and switch layout

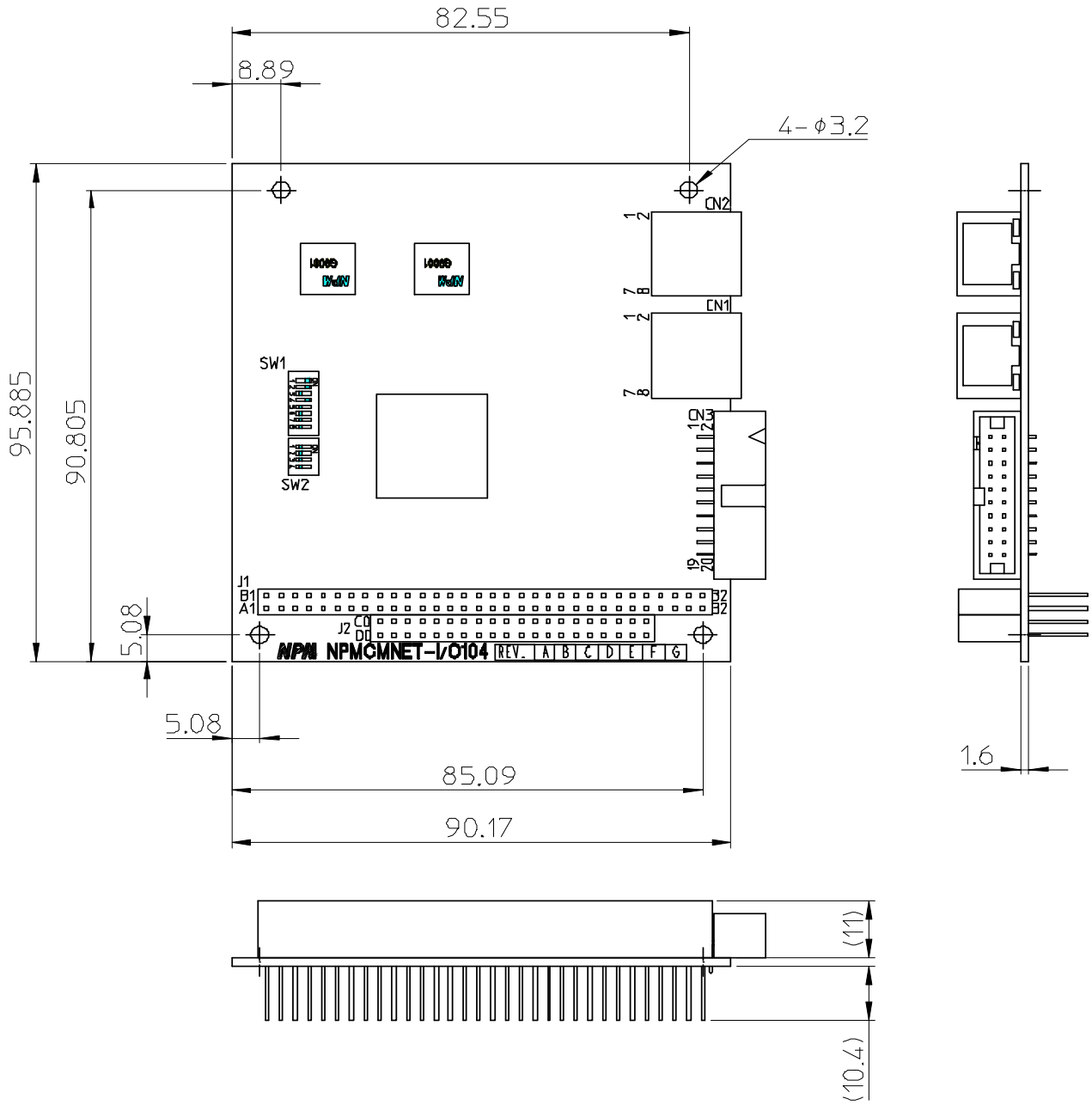
The layout of the connectors and switches is shown below.



Setting item	Setting details							
Setting address area (SW2)	Memory address/I/O address area (Default setting: Memory address area) <table border="1"> <tr> <td>SW2-4</td> <td>Address area</td> </tr> <tr> <td>OFF</td> <td>Memory address area</td> </tr> <tr> <td>ON</td> <td>I/O address area</td> </tr> </table>	SW2-4	Address area	OFF	Memory address area	ON	I/O address area	1) When the memory area is 512 byte area, (Note: When to select the IO area, set SW2-4 to on.) <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;"> SW1 <p>L L L S S S S S A A A A A A A A 1 1 1 1 1 1 1 1 9 8 7 6 5 4 3 2</p> </div> <div style="text-align: center;"> SW2 ON <p>S N 8 I A C / O 1 5 / 1 1 M 2 E M</p> </div> </div>
SW2-4	Address area							
OFF	Memory address area							
ON	I/O address area							
Setting G9001A address area (SW2)	Setting G9001A address area (Default setting: 512 bytes area) <table border="1"> <tr> <td>SW2-3</td> <td>G9001A address area</td> </tr> <tr> <td>OFF</td> <td>512 bytes</td> </tr> <tr> <td>ON</td> <td>8 bytes</td> </tr> </table> <p>Note: Setting SW2-4 as off and SW2-3 as on are prohibited.</p>	SW2-3	G9001A address area	OFF	512 bytes	ON	8 bytes	2) When selecting I/O area as 8 byte area. <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;"> SW1 <p>S S S S S S S S A A A A A A A A 1 1 1 1 1 1 9 8 5 4 3 2 1 0</p> </div> <div style="text-align: center;"> SW2 ON <p>S S 8 I A A / O 7 6 5 / 1 M 2 E M</p> </div> </div>
SW2-3	G9001A address area							
OFF	512 bytes							
ON	8 bytes							
Setting base address (SW1, 2)	Setting base address ON: "1", OFF: "0" Example of 1) is "0x0D0000" Example of 2) is "0x0C00" (Default setting: 1))							

16. External dimensions

The external dimensions of this board are shown below.



Unit: mm

CAUTION

The descriptions in this manual may be changed without prior notice to improve performance or quality.

NPM Nippon Pulse Motor Co., Ltd.

Tokyo business site: 6-1, Sakaecho, Tachikawa City, Tokyo, 190-0003, Japan

TEL: 81-42-534-7701 FAX: 81-42-534-0017

Osaka sales office: 1-2-1-2504, Benten, Minato Ward, Osaka city, 552-0007

TEL: 81-6-6576-8330 FAX: 81-6-6576-8335

E-mail: control@npm.co.jp URL: <http://www.pulsemotor.com/>

Issued in May 2006