

HITACHI

User's Manual

Option

D.NET

(LQE770-E)

S10VE

SEE-1-103 (A)

User's Manual

Option

D.NET

(LQE770-E)

S10VE

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Safety Precautions

- Before installation, operation, maintenance, and inspection of this product, you must carefully read through this manual and other related manuals. When using the product, make sure that you are familiar with all the information concerning this product, safety information, and precautions provided in those manuals.
- Keep this manual in a readily accessible place for future reference when using the product.
- Safety precautions in this manual are classified into four levels according to the severity of potential hazards: DANGER, WARNING, CAUTION, and Notice.

Definitions of the safety labels



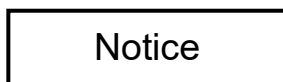
: Indicates a hazardous situation which, if not avoided, will result in death or serious injury.




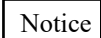
: Indicates a hazardous situation which, if not avoided, could result in death or serious injury.



: Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.



: Indicates a danger (resulting from incorrect use of the product) that can cause property damage or loss not related to personal injury if the safety precautions are not observed.

Failure to observe precautions marked with  or  could also lead to a serious consequence depending on the situation in which the product is used. Therefore, you must observe all of those precautions without fail.

The following are definitions of *serious injury*, *minor or moderate injury*, and *property damage or loss not related to personal injury* used in the safety labels.

Serious injury:

Is an injury that has aftereffects and requires hospitalization for medical treatment or long-term follow-up care.

Examples of serious injuries are as follows: vision loss, burns (caused by dry heat), low-temperature burns, electric-shock injuries, broken bones, and poisoning.

Minor or moderate injury:

Is an injury that does not require either hospitalization for medical treatment or long-term follow-up care.

Examples of minor or moderate injuries include burns and electric-shock injuries.

Property damage or loss not related to personal injury:

Is damage other than personal injury. Examples of property damage or loss not related to personal injury are as follows: damage or loss of personal property, failure or damage of the main unit of the product, and loss of data.

The safety precautions stated in this manual are based on the general rules of safety applicable to this product. These safety precautions are a necessary complement to the various safety measures included in this product. Although they have been considered carefully, the safety precautions posted on this product and in the manual do not cover every possible hazard. Common sense and caution must be used when operating this product. For safe operation and maintenance of this product, establish your own safety rules and regulations according to your specific needs. A variety of industry standards are available to aid in establishing such safety rules and regulations.


1. General Safety Guidelines

Before installing, operating, inspecting, or conducting maintenance on this unit, read the following instructions carefully:



Before starting work

- Follow all the instructions and operating procedures provided in this manual and related manuals.
- Pay particular attention to the cautionary notes in the manuals and on the equipment itself, and comply with their stipulations.
Failure to do so could cause personal injury or damage to the machine.
- Do not perform any operation or action that is not described in this manual. When in doubt, contact the relevant store or your sales staff.
- The hazard warnings on the machine and in the manual cannot cover every possible case, as it is impossible to predict and evaluate all circumstances.
You must be alert and use your common sense.
- Do not perform any installation, wiring, handling, or internal customization that is not described in this manual. Hitachi will not be responsible for any damage to Hitachi equipment or peripherals and personal injury resulting from such a practice.
- In case this product fails, configure an emergency stop circuit or interlock circuit outside the product. Failure of this product might damage the machine or cause an accident.
- Maintenance work must be done only by appropriately trained persons who have practical experience and understand the potential hazards (and how to avoid them) during operation.

 During work

- Follow the sequence of steps specific to each procedure.
- Use the relevant tools and instruments for each task as specified in the manual. If no particular tools are specified, use commercially available tools and instruments which fit the purpose.
- Make sure that all measurement instruments and powered tools have been properly calibrated or periodically inspected prior to use.
- Keep the maintenance area neat and tidy.
- Make sure that maintenance parts, materials, and removed parts are not placed in a passageway so they are not tripped on by personnel.
- Wear eye protection if there is a risk of flying debris.
- When using sharp objects or cutting tools, keep fingers and other parts of your body away from the path of the blade bit or point.
- After maintenance work is completed, before turning on power, make sure that all parts removed during maintenance have been installed back in their original positions in the machine. Also make sure that no tool or foreign material remains in the machine.



Prevention of electric shock

- Before starting work, make sure that there is no potential electrical hazard in the maintenance area.
Example: Insufficient grounding line or a wet floor
- Before starting work, check the location of the emergency power-off switches and how to operate them.
- Unless otherwise specifically instructed, isolate the machine from all power sources before starting maintenance. Turn off not only the power switches on the machine but also the switch on the distribution panel.
After turning off the switch on the power distribution panel, attach a notice saying *Do not turn on this switch* on the power distribution panel. If the power distribution panel is equipped with a lockout device, turn off the switch on the power distribution panel, lock the device, and then bring the key with you.
If you are resuming maintenance work performed by someone else, do not assume that the power is off. Make sure that the above-mentioned conditions, such as switches turned off, are satisfied. If necessary, use a measurement tool to ensure that the power is off.
- Some parts in the machine remain charged for a certain time even after the power supply to the machine is disconnected. (Follow the displayed instructions).
- When working on a machine which has a grounding terminal, make sure that the terminal is properly connected to the facility's ground.
- When working near an exposed live electric circuit, do not work alone. Work with another person who can immediately turn off the power.
- To prevent electric shock during work, do not wear any metallic items or an accessory such as a wristwatch with a metallic surface. If you wear eyeglasses with a metallic frame, take care not to let the frame touch an uninsulated surface.
- Make sure that your hands and arms are dry.
- Use only one hand when it is necessary to work near an exposed live electric circuit. This mitigates the risk of current passing through your heart if you accidentally touch the circuit.
- Do not use a dental mirror near an exposed live electric circuit. The mirror surface is conductive and can become hazardous even if the mirror is made of plastic.
- Unless otherwise specifically instructed, do not supply power to any subassembly such as a power supply unit or a motor while it is removed from the machine.



Procedure in an emergency

In the case of electric shock

- Do not panic. Do not become another victim through contact with the injured person.
- First, shut off the electric current passing through the victim by using the emergency power-off switch. If there is no emergency power-off switch, use the normal power-off switch.
If this cannot be done, push the victim away from the source of the electric current by using a nonconductive object such as a dry wooden stick.
- Call an ambulance.
- If the victim is unconscious, artificial respiration may be necessary.
A proper method for performing artificial respiration or resuscitation should be learned beforehand.
If the victim's heart is not beating, cardio-pulmonary resuscitation must be performed by a trained and qualified person.

In the case of fire

- Call the fire department, and then take action to extinguish the fire.
- Shut off power to the machine by using the emergency power-off switch. If there is no emergency power-off switch, use the normal power-off switch.

2. Notes About Warning Indications

The following summarizes the warnings contained in this manual and their locations.

2.1 WARNING

WARNING

- Always use a communication power supply that has an overvoltage and overcurrent protection function. Failure to do so might result in an accident, fire, or malfunction.
- Before supplying power to the module, make sure that all cables are connected correctly. Failure to do so might result in fire or electric shock.

(See page 3-15.)

2.2 Notice

Notice

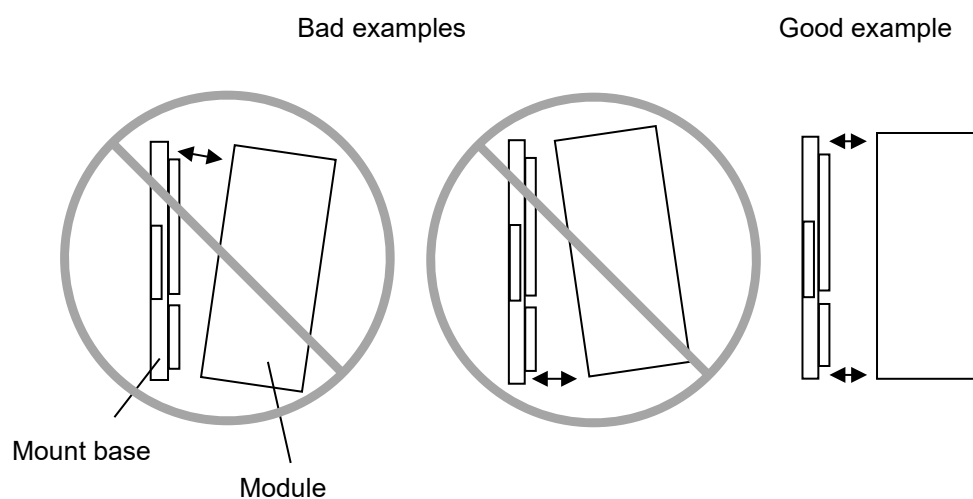
- To avoid damaging the product, protect it with cushioning, and then store it in the environment shown in Table 1-2.
- To avoid damaging the product during transit, protect it with cushioning and handle it as a precision machine.

(See page 1-1.)

- Turn off the power switch of the power supply module before setting the MODU No. setting switch. Using this switch while power is applied might cause a malfunction.
- Do not set the MODU No. setting switch to a prohibited number. Such settings cause a malfunction.
- When mounting multiple D.NET modules on a single CPU unit, you cannot specify the same MODU No. Failure to observe this rule might result in a malfunction.

(See page 2-2.)

- Poor contact might cause malfunction. Mount the module and connect cabling to the module immediately after the module is unpacked so that dust or other foreign substances do not accumulate on connectors.
- To avoid damaging a module when removing or mounting it, turn off the power switch of the power supply module beforehand.
- To avoid damaging a module, observe the following precautions when mounting or removing the module:
 - Before mounting the module on the mount base connector, check that the connector pins are properly aligned and not bent, broken, or soiled.
 - Connecting or disconnecting a module that is tilted might damage connector pins. When moving the module, hold it vertically parallel to the mount base as shown below.



(See page 3-2.)

Notice

- Make sure that you turn off the power to the S10VE and all the connected DeviceNet-compliant devices and communication power supply before connecting any cable to the D.NET module. Failure to do so might result in a malfunction.

(See page 3-4.)

- Cables of the same type (communication cables) must not be intermingled with cables of other types (power cables and motor lead cables). Particularly, communication cables must be placed at least 300 mm away from motor lead cables for devices such as inverters, motors, and power regulators. Do not put communication cables and motor lead cables together in the same pipe or conduit. Failure to observe this rule might result in a malfunction.
- Always use dedicated 5-wire communication cables conforming to the DeviceNet standard. Do not use any other cables for communication. Failure to do so might result in a malfunction.
- Provide sufficient slack in connected communication cables so as to allow devices to be removed for any reason (such as for troubleshooting and relocation).
- Cables might be damaged if pressure or tension is applied to them. When you tie several communication cables in a bundle, clamp or tie them loosely so that you can easily move them later if necessary.
- Do not pull communication cables with excessive force. Doing so might disconnect or break a cable.
- Do not place a heavy object on a communication cable. Doing so might break the cable or cause a communication failure.

(See page 3-8.)

- Always use ferrules to connect the communication cable to the plug-in screw connector. Failure to do so might result in a disconnected or broken cable.
- Provide enough slack in connected communication cables so as not to subject open-type connectors to excessive force. Failure to do so might result in disconnected cables or connectors.
- Connection of a node other than the D.NET module does not always require an open-type connector. For nodes manufactured by other companies, connect them with communication cables according to the manual for each node.
- Connect the signal wires, power wires and drain wire correctly to the connector. Failure to do so might result in module damage or a malfunction. Note that the power wires of a thick cable require different ferrules than the other wires of the same cable.

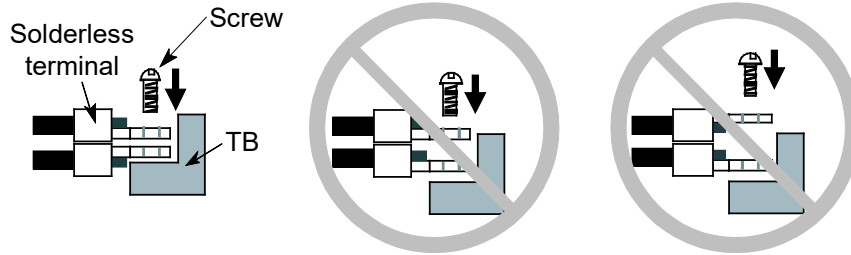
(See page 3-9.)

- Use screws in the fixing screw holes of a T-branch tap to secure the branch tap firmly. Failure to do so might result in a malfunction.

(See page 3-10.)

Notice

- When connecting two crimped (solderless) connectors to a single terminal, make sure that they are back to back. If they are not, a communication failure might occur due to incomplete connection.



(See page 3-11.)

- When you connect a terminating resistor to a TB, always connect it between the terminals corresponding to the signal wires (CAN-H and CAN-L). If you do not, a malfunction might occur.

(See page 3-12.)

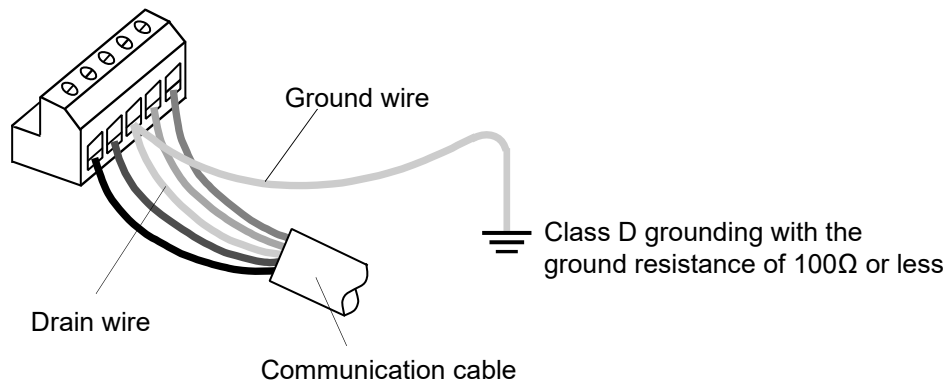
- Insert a line filter into the primary side of the communication power supply. Failure to do so might cause induced noise and subsequent malfunction.

(See page 3-15.)

- If the network is not grounded, a malfunction or failure might occur due to electrostatic discharge or external power supply noise. Ground DeviceNet at only a single point. Additionally, ground the network near the center of the network.

(See page 3-16.)

- Secure the two cables to the drain terminal of the open-type connector and apply class D grounding with the ground resistance of 100Ω or less to the ground wire as shown in the following figure. Failure to do so might result in a failure or malfunction.



- Do not ground the communication cable and motor lead cables to the same grounding point. Doing so might cause induced noise and result in malfunction.

(See page 3-17.)

Notice

- If power feeding is changed to use multiple communication power supplies by dividing the power system in consideration of the location of a communication power supply, you must verify the operation of each communication power supply. Specifically, you need to verify that power can be fed in accordance with *3.4.5 Communication power supply location considerations*.

(See page 3-28.)

- To install or uninstall D.NET SYSTEM/S10VE, use the administrator account. Using the standard account might result in incorrect installation or uninstallation.
- Before installing D.NET SYSTEM/S10VE, terminate all Windows® programs, including resident programs in the memory (such as virus monitoring software). Installing D.NET SYSTEM/S10VE while any of these programs are running might cause an error. If an error occurs, uninstall the tool being installed, terminate all Windows® programs, and then reinstall the tool. For details about the uninstallation procedure, see *4.1.3 Uninstallation*.
- Do not specify, as the D.NET SYSTEM/S10VE installation folder, any of the following folders protected by User Account Control:
 - Program file folder (for example, C:\Program Files)
 - System root folder (for example, C:\Windows)
 - System drive root folder (for example, C:\)
 - Program data folder (for example, C:\ProgramData)

(See page 4-2.)

- D.NET SYSTEM/S10VE might not be installed properly in any of the following cases: 1) Administrator permissions are acquired by using User Account Control# from a standard user account, 2) The administrator account was created from a standard user account by using User Account Control. In this case, log on with the administrator account that was first created on your computer, and then reinstall D.NET SYSTEM/S10VE.

If you log on with a user account other than that used for installing D.NET SYSTEM/S10VE, the installed program might not appear in the program menu. In this case, log off and log on again with the administrator account that was first created on your computer, uninstall the installed program, and then install the program again.

When you want to create a new account, log on with an administrator account without using User Account Control.

#: User Account Control is a Microsoft Windows feature that temporarily grants administrative rights to standard user accounts.

(See page 4-5.)

Notice

- Set a refresh time so that the following conditions are met:

The number of transmission frames per 10 ms must be within 16 frames (transfer speed = 500/250 kbps).

The number of transmission frames per 10 ms must be within 8 frames (transfer speed = 125 kbps).

The number of transmission frames (8 output bytes or less) = 1 frame,

(9 output bytes or more) = output byte count ÷ 7 (round up a fraction)

- The D.NET communication capability might be exceeded, resulting in a transmission cycle delay. Do not set a master/slave refresh time and peer refresh time shorter than the communication time calculated in section 5.4.

(See page 4-23.)

- Do not use the bit reversal mode when connecting with a slave device (such as AI/AO) that handles analog data or other numeric data. Doing so might cause input/output data to become undefined.
- Do not use the bit reversal mode when connecting with a slave device that handles both digital data and analog data. Doing so might cause input/output data to become undefined.

(See page 4-32.)

- Bit reversal processing cannot be applied for any data area specified as the input/output area described under 4.2.6 *D.Station data format conversion setting*, even when the **Bit reversal mode** check box is selected. (This is because bit reversal is not performed for analog modules, including pulse counters, even if bit swap is specified on the D.Station module side.)

- When you establish a connection with the D.Station module, ensure that the bit reversal mode and byte reversal mode settings are consistent with the data swap setting made with the rotary switches on the D.Station module side.

For example, if you make a bit/byte swap setting on the D.Station module side, select both the bit reversal mode check box and the byte reversal mode check box on the D.NET module side.

(See page 4-33.)

- This setting item is available only when the communication destination is a D.Station module. If you select this item for any communication destination other than a D.Station module, an error occurs and connection is not established. This state can be verified by checking for the slave state value 0x2F (I/O status information acquisition failure) described in 4.2.10 *Slave error information*.

- D.Station status information collection is performed only at the establishment of a connection with a D.Station module. Accordingly, even if the status of the D.Station module changes after the establishment of a connection, this status change is not reflected in the D.NET module. If you want to monitor its status constantly, use the I/O error/mounting information adding function of the D.Station module, which adds status information to the input/output data. For details about the I/O error/mounting information adding function, see *HSC-1000 User's Manual D.Station* (manual number PAE-1-003).

(See page 4-36.)

Notice

- You must specify the input and output byte counts in bytes. If you do not use the input and output byte counts, set them to 0.
- Even when either the input or output byte count is set to 1, a 1-word area is used in the CPU memory area defined by a specified input/output address pair.
- If you set the output byte count to a value greater than 8, the D.NET module performs fragment transmission (split transfer). If you set the input byte count to a value greater than 8, the D.NET module performs fragment reception.
- If the D.NET module is used in slave mode, it does not check the data size. You must check the size of data to be exchanged with the master in advance.

(See page 4-40.)

- Do not use the bit reversal mode when connecting with a master device that inputs and outputs analog data or other numeric data. Doing so might cause input/output data to become undefined.

(See page 4-41.)

- The timeout information is 1 or 2 words long, depending on the number of remote I/O station modules registered in the RI/O Timeout information collection station registration window.

(See page 4-45.)

- This function can be used only for transmission (output) in slave mode. (It is not applicable in master-peer mode.)
- The output area in which timeout information is stored cannot be used as an input area for remote I/O communication.
- If you select the **Bit reversal mode** check box, each word of timeout information is also bit-reversed (the MSB and LSB of each data are reversed).

(See page 4-47.)

- You can register a maximum of 32 cases of format conversion, 8 cases per D.Station module. If the registration limit is exceeded, the tool displays an error message indicating too many cases for registration, and does not write the specified parameters to the PCs. In this case, you have to correct the parameters and retry writing.

- If a specified module mode is AI or AO (with or without a sign extension) and a specified input/output byte count is an odd number, then the count is rounded up to the nearest even number.

Examples: If a byte count of 1 is specified, it is rounded up to 2.

If a byte count of 3 is specified, it is rounded up to 4.

(See page 4-53.)

Notice

- Until the PCs are reset, the parameters written to the CPU modules do not take effect. If you do not reset the PCs, or if reset of the PCs fails, manually reset the PCs, or perform a power-on reset.

(See page 4-58.)

- Set the PCs number of the S10VE you want to configure. If the S10VE does not match the PCs number, configuration information that is edited offline cannot be sent by the data transmission/reception function of BASE SYSTEM/S10VE. Setting 9999 as the PCs number enables transmission regardless of the PCs number of the S10VE. However, note that it becomes impossible to check transmission to unintended PCs.

(See page 4-59.)

- Data is transferred word by word between the I/O area of the CPU module and the I/O buffer of the D.NET module. Therefore, the unit of data transfer that can assure the simultaneity of data is one word. However, to assure simultaneity of data in the whole configuration, including DeviceNet devices, the DeviceNet devices themselves must also ensure simultaneity of data.

(See page 5-2.)

- Each slave timeout flag is set (= 1) when no data is received from the slave device for a certain period. However, this is not the case when data cannot be transmitted normally as a result of a CAN transmission timeout or bus-off condition. The reason for this is that reception monitoring always starts upon completion of a normal transmission. You can check the occurrence of a CAN transmission timeout or bus-off condition by accessing the S-register described in 5.3 *S-register*.

(See page 5-5.)

- The bus-off and CAN transmission timeout error bits are set to 0 (OFF) when the corresponding error conditions are cleared. Therefore, if a communication cable is damaged or the communication connector is connected incompletely, these bits might be set and reset repeatedly. Keep this in mind when referencing this register in a ladder program.

(See page 5-6.)

- The bit reversal mode can only be enabled for individual slaves.
- Do not use the bit reversal mode when connecting with a slave device (such as AI/AO) that handles analog data or other numeric data. Doing so might cause input/output data to become undefined.
- Do not use the bit reversal mode when connecting with a slave device that handles both digital data and analog data. Doing so might cause input/output data to become undefined.

(See page 5-12.)

Notice

- Data swapping is required only when the data is made up of bytes or long or longer words. In this case, you need to swap data regardless of the number of data bytes to be input or output. For example, if data is transferred to and from a 4-channel AI slave (1 word/channel), the number of input bytes is 8, but no data swapping is required because the data is transferred in words.

(See page 5-14.)

- The bit reversal and byte reversal modes need to be enabled or disabled, depending on the data handling of application programs and the specifications of connected devices.
- Any area set for the D.Station data format conversion function is invalid in bit conversion mode, where no bit conversion is performed.

(See page 5-16.)

- Check for loose connector fixing screws periodically (every 3 to 6 months), and tighten any loose screws (by using a tightening torque of 0.2 to 0.3 N·m).

(See page 6-1)

Application Conditions

- When using the product explained in this manual (called *this product* hereafter), we ask you to provide a backup or fail-safe system outside the product so that any failure or problem in this product will not cause serious consequences.
- This product is a general-purpose product designed for general industrial applications. This product shall not be used in applications that require a high level of safety or responsibility or special quality assurance. Hitachi assumes no responsibility for any loss or damage arising from the use of this product in such applications. Examples of such applications are as follows:

Applications where a high level of safety is required

Example: Power station control system (nuclear power, thermal power, or hydro power), combustion facility, aviation or space facility, railway facility, lift facility, facility for recreation and amusement, medical facility, safety equipment, on-vehicle equipment, ship facility, traffic light system, and other facilities where death or bodily harm might result in the event of an emergency

Applications where a high level of responsibility is required

Example: Systems that supply gas, water, or electricity, systems requiring round-the-clock operation, system responsible for legal settlement or other purpose of handling rights and properties

Applications under severe conditions or environment

Example: Outdoor facility environment that meets any of the following conditions:
Environment that is chemically contaminated, subject to electromagnetic interference, or subject to constant vibration or shock

However, use of this produce in any of the applications described above can be approved by the decision of Hitachi if the purpose is specifically limited, the customer has responsibility for providing redundancy, or no special quality is required. For details, contact a Hitachi sales representative.

Warranty and Servicing

1. Warranty period and scope

Warranty period

The warranty period of this product shall be one year after the product has been delivered to the specified site. The warranty period of repaired products shall be six months from the date of repair. The warranty period for repaired products takes precedence over the warranty period prior to repair.

Scope

If the product malfunctions during the warranty period described above while using this product as instructed by this manual, the product shall be repaired free of charge.

Repair service

Return repair is supported, and requires the customer to send the malfunctioning product to a designated repair service.

- Fill in the required items in the *Hitachi Programmable Controller S10VE Repair Request Sheet* in *Appendix A* in the *S10VE User's Manual General Description* (manual number SEE-1-001), and then enclose it in the package with the product to be returned for repair.
- The customer must cover the costs for sending the product for repair to Hitachi.
- Hitachi will pay the transport cost for returning the repaired product to the customer.
- Repair is limited to replacement of malfunctioning parts.
- Work other than replacement of malfunctioning parts, such as investigation into the cause of failure, shall be charged even during the warranty period.

2. Exception of warranty obligation

Regardless of the warranty period, Hitachi bears no responsibility in any of the following cases.

The warranty mentioned here means the warranty for the individual product that is delivered. Therefore, we cannot be held responsible for any losses or lost profits that result from operation of this product or from malfunctions of this product. This warranty is valid only in Japan and is not transferable.

- The malfunction was caused by handling or use of the product in a manner not specified in the product specifications.
- The malfunction was caused by a unit other than that which was delivered.
- The malfunction was caused by modifications or repairs made by a vendor other than the vendor that delivered the unit.
- The malfunction was caused by a relay or other consumable which has passed the end of its service life.
- The malfunction was caused by a disaster, natural or otherwise, for which the vendor is not responsible.
- The malfunction was caused by reasons that could not be anticipated, based on conventional technological understanding, at the time of shipment from Hitachi.

3. Range of services

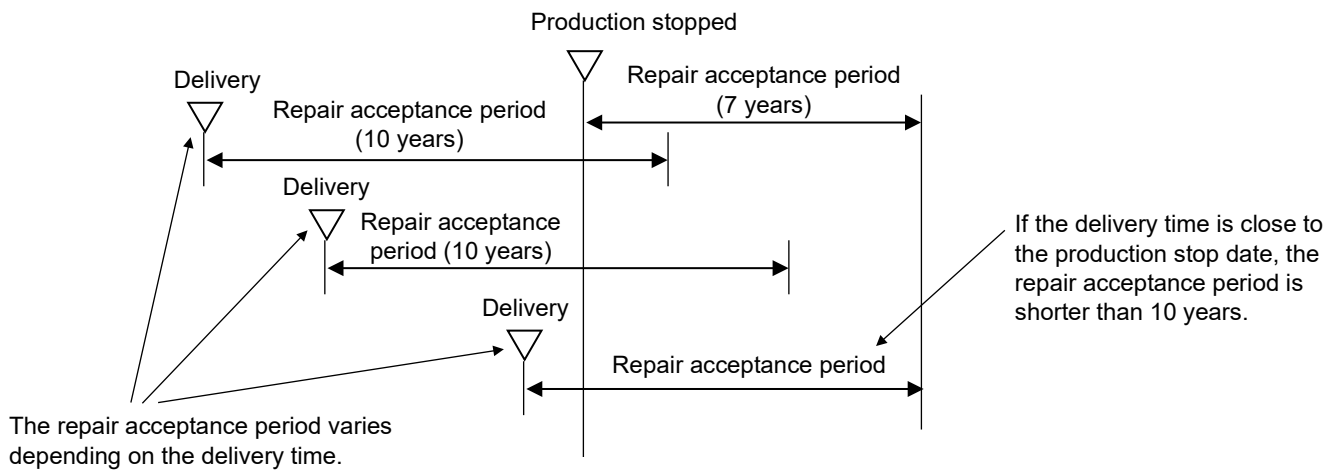
The price of the delivered product does not include on-site servicing fees by engineers. Extra fees will be charged for the following:

- Instruction for installation and adjustments, and witnessing trial operations
- Inspections, maintenance and adjustments
- Technical instruction, technical training and training facilities
- Examinations and repairs after the warranty period expires
- Examination of malfunctions caused by reasons outside the scope of the preceding warranty

4. Repair acceptance period

The repair acceptance period of S10VE products is 10 years after the product is delivered to the specified site or 7 years after production of the product is stopped, whichever comes earlier. The standard service life of S10VE is 10 years. We cannot accept repair of products whose designated repair acceptance periods (as described here) have been exceeded.

Payment for any repair after expiration of the warranty is the responsibility of the customer.



5. Service after production of the product is stopped

Products (including spare parts) cannot be supplied after production of those products is stopped.

6. Specification changes

Specifications described in this manual are subject to change without prior notice.

Revision History

Revision No.	History (revision details)	Issue date	Remarks
A	New edition	Oct. 2019	

Preface

Thank you for purchasing the D.NET module, which is an option for use with the S10VE.

This manual *S10VE User's Manual Option D.NET* describes how to use the D.NET module. For proper use of the D.NET module, thoroughly read this manual.

Trademarks

- Microsoft® and Windows® are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.
- DeviceNet® is a registered trademark of Open DeviceNet Vendor Association, Inc.

Note about storage capacity calculations

- Memory capacities and requirements, file sizes and storage requirements must be calculated according to the formula 2^n . The following examples show the results of such calculations by 2^n (to the right of the equal signs).
 - 1 KB (kilobyte) = 1,024 bytes
 - 1 MB (megabyte) = 1,048,576 bytes
 - 1 GB (gigabyte) = 1,073,741,824 bytes
 - 1 TB (terabyte) = 1,099,511,627,776 bytes
- As for disk capacities, they must be calculated using the formula 10^n . Listed below are the results of calculating the above example capacities using 10^n in place of 2^n .
 - 1 KB (kilobyte) = 1,000 bytes
 - 1 MB (megabyte) = 1,000² bytes
 - 1 GB (gigabyte) = 1,000³ bytes
 - 1 TB (terabyte) = 1,000⁴ bytes

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1. Specifications

1.1 Application

The D.NET module (model: LQE770-E) conforms to the DeviceNet standard and performs data communications with various types of DeviceNET-compliant devices connected to the network as master modules, peer modules, or slave modules, each determined in its type by setting.

1.2 Specifications

1.2.1 D.NET module specifications

Table 1-1 D.NET module specifications

Item	Specifications
Model	LQE770-E
Number of networks	2 networks per module
Maximum mountable number of modules	4 modules per CPU unit
Weight	330 g or less
Current consumption	700 mA or less
Hot swapping	Not supported

1.2.2 Environmental specifications

Table 1-2 Environmental specifications

Item	Specifications
Operating ambient temperature	0 to 55°C
Storage ambient temperature	-20 to 75°C
Relative humidity	10 to 90% RH (operating and non-operating) (no condensation)
Vibration resistance	Frequency: 10 to 150 Hz, acceleration: 10 m/s ² Applied direction of vibration: directions X, Y, and Z, Sweep time: 8 minutes, number of sweep cycles: 20
Shock resistance	Peak acceleration: 147 m/s ² , half-sine shock time: 11 ms, applied direction of shock: directions X, Y, and Z, three times for each case
Ambient air	Dust: 0.1mg/m ³ or less
Corrosive gas	JEITA IT-1004A Class B (no corrosive gas must exist)

Notice

- To avoid damaging the product, protect it with cushioning, and then store it in the environment shown in Table 1-2.
- To avoid damaging the product during transit, protect it with cushioning and handle it as a precision machine.

1. Specifications

1.2.3 Communication specifications

Table 1-3 Communication specifications

Item		Specifications	
Model		LQE770-E	
MAC layer	Transmission line access	CSMA/NBA (Carrier Sense Multiple Access with Non-destructive Bitwise Arbitration)	
	Protocol	CAN (Control Area Network) protocol Master/slave communication and peer-to-peer communication is supported [#] .	
Physical layer	Maximum number of connectable nodes	64 nodes per network	
	Transfer speed	Variable (selectable from 125, 250, and 500 kbps)	
	Transfer size	Master/slave communication (poll) and peer-to-peer communication: Up to 256 bytes per transfer (poll = polling)	
		Master/slave communication (Bit Strobe): Up to 8 bytes per transfer	
	Coding system	NRZ (Non Return to Zero)	
	Insulation	Photocoupler, 500 V	
	Communication power	24 V DC (see <i>Table 3-3 Specifications of communication power supply.</i>)	
	Communication power supply	Self-feeding	
	Transmission medium	Connector	Open plug connector
		TAP	Open-type TAP and shield-type TAP
		Cable	Trunk line: 5-conductor thick cable Total line length (variable according to the transfer rate): 500 m or less at 125 kbps 250 m or less at 250 kbps 100 m or less at 500 kbps
Drop line: Up to 6 m per branch cable, 5-conductor thin cable Total branch cable length: 156 m or less at 125 kbps 78 m or less at 250 kbps 39 m or less at 500 kbps			
Power line: Up to 3 m			
Terminator (terminating resistor)	Connector incorporating a terminating resistor, or 121Ω ± 1% (1/4 W or more) metal film resistor		

[#]: List of supported functions

DeviceNet FEATURES			
Device Type	Communications Adapter	Master/Scanner	Supported
Explicit Peer to Peer Messaging	Supported	I/O Slave Messaging	
I/O Peer to Peer Messaging	Supported	- Bit Strobe	Supported
Configuration Consistency Value	Not supported	- Polling	Supported
Faulted Node Recovery	Not supported	- Cyclic	Not supported
Baud Rates 125k, 250k, 500k	Supported	- Change of State (COS)	Not supported

1.2.4 Types of communication

(1) Communications in master mode

(a) Polling communication (Poll)

Polling communication is a type of communication in which the master sequentially sends a communication request to a slave which then sends a response back to the master.

The master sends a polling request to each slave at regular intervals to exchange control data with the slave. The slave is not allowed to send data until the slave receives a polling request from the master. By using a polling request, the master sends control data to the slave. Similarly, by using a polling response, the slave sends control data back to the master.

The polling communication is automatically performed at regular intervals according to the master/slave refresh time set in D.NET SYSTEM/S10VE (see *Chapter 4. Operation*). Therefore, you do not need to let your application program start polling communication.

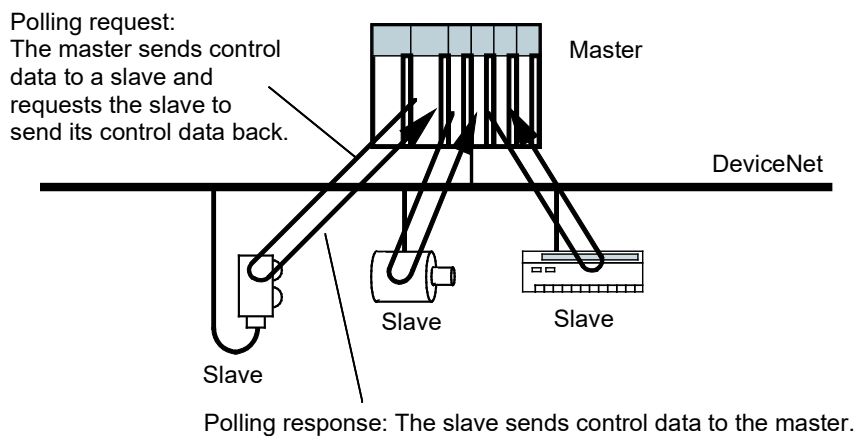


Figure 1-1 Polling communication in master mode

1. Specifications

(b) Bit strobe communication (Bit Strobe)

Bit strobe communication is a type of communication in which the master sends a broadcast message to multiple slaves (bit strobe request), and then the slaves that receive this message send input data back (bit strobe response) to the master.

The master sends a single bit strobe request to slaves at regular intervals. A slave is not allowed to send data until it receives a bit strobe request from the master. By using a bit strobe request, the master sends control data to the slave. Similarly, by using a bit strobe response, the slave sends control data back to the master.

Bit strobe communication is automatically performed at regular intervals according to the master/slave refresh time set in D.NET SYSTEM/S10VE (see *Chapter 4. Operation*). Therefore, a user application program is not necessary to start bit strobe communication.

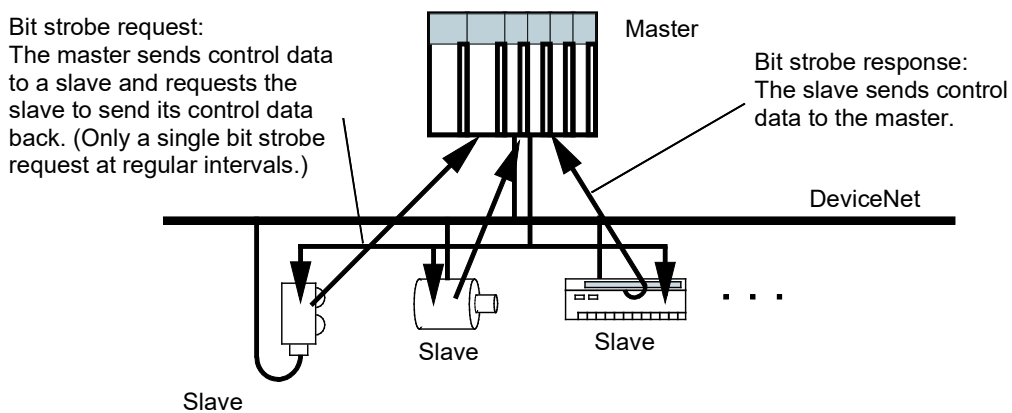


Figure 1-2 Bit strobe communication in master mode

- (2) Communications in slave mode
 - (a) Polling communication (Poll)

In polling communication, the D.NET module operates as a slave, and can send and receive control data to and from a master D.NET module or non-Hitachi master module.

The slave D.NET module automatically sends a polling response back to the master when receiving a polling request from the master. Therefore, a user application program is not necessary to start sending of a polling response.

The slave D.NET module supports only polling communication.

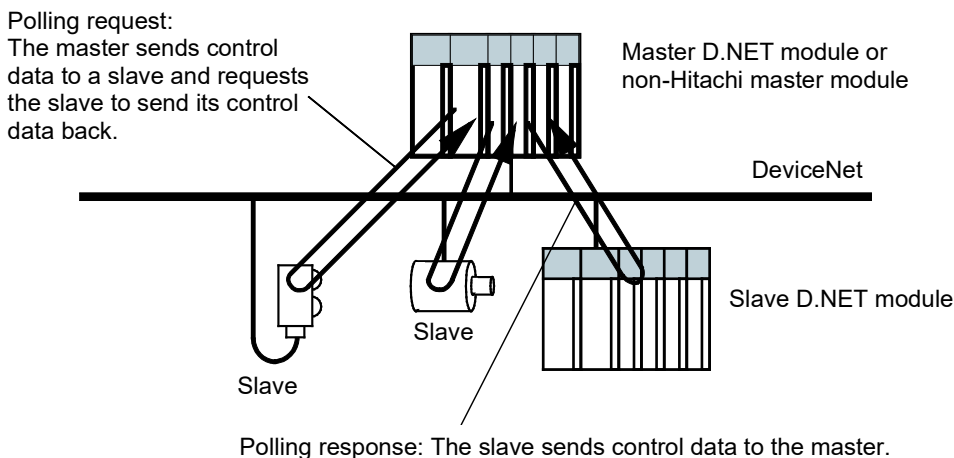


Figure 1-3 Polling communication in slave mode

- (3) Communications in peer mode

In peer mode, a sending peer assigns a message ID to control data to be sent and broadcasts the control data at regular intervals. A receiving peer receives the data selectively, based on the message ID and the sender MAC ID. Only the nodes that support peer-to-peer communication can receive transmitted data. Peer communication is automatically performed at regular intervals according to the peer refresh time set in D.NET SYSTEM/S10VE (see *Chapter 4. Operation*). Therefore, a user application program is not necessary to start peer communication.

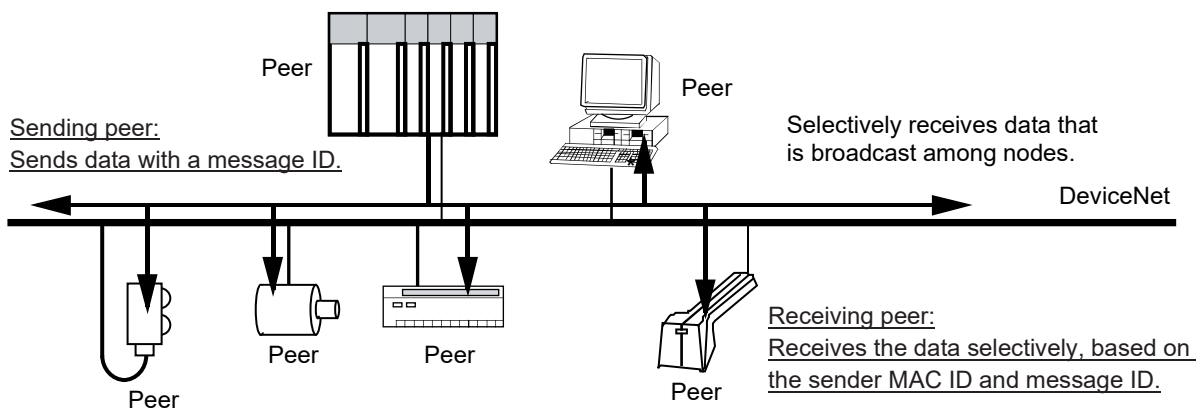


Figure 1-4 Peer-to-peer communication in peer mode

1. Specifications

(4) Allowable combinations of communication modes for a single D.NET module

The combinations of communication modes you can set with a single D.NET module (channel 0 and channel 1) are restricted as follows.

If one channel is set to master mode, you can set the other channel only to master mode or peer mode except when setting no mode (you cannot set it to slave mode).

If one channel is set in slave mode, you can set the other channel only to slave mode except when setting no mode (you cannot set it to master mode or peer mode).

If one channel is set to peer mode, you can set the other channel only to master mode or peer mode except when setting no mode (you cannot set it to slave mode).

For details, see Table 1-4.

Table 1-4 Allowable combinations of communication modes for a single D.NET module

No.	Channel 0 (or Channel 1)	Channel 1 (or Channel 0)	Allowed or not
1	Master	Not set	Allowed
2		Master	Allowed
3		Slave	Not allowed
4		Peer	Allowed
5	Slave	Not set	Allowed
6		Master	Not allowed
7		Slave	Allowed
8		Peer	Not allowed
9	Peer	Not set	Allowed
10		Master	Allowed
11		Slave	Not allowed
12		Peer	Allowed
13	Not set	Master	Allowed
14		Slave	Allowed
15		Peer	Allowed

1.3 System software specifications

1.3.1 System software overview

To use the D.NET module, you need to register the hardware switch settings and various kinds of software information in the module. The system software (tools) shown in Table 1-5 allows you to register module information in a similar manner to the way you would do so by using a typical Windows® based application.

Table 1-5 System software (tools)

Package name	Model
D.NET SYSTEM/S10VE	S-7898-31

1.3.2 Required hardware and software

To use the system software of the D.NET module, you need the following hardware and software:

- Personal computer (PC) with a CPU of 1 GHz or faster
- Display with a resolution of 1366 x 768 dots or higher (FWXGA)
- 2 GB (or more) RAM
- Free hard disk capacity of 200 MB or more
- Cable (UTP crossed twisted-pair cable of Category 5e or higher) connected between PC and CPU module
- Microsoft® Windows® 7 (64-bit) operating system, Microsoft® Windows® 10 (64-bit) operating system
- Microsoft .NET Framework 4
- Microsoft Visual C++ 2010 redistributable package (x64)

Users of this product must have a basic knowledge of the Windows® environment and user interfaces. This system complies with the Windows® standard. This manual is intended for users who have mastered a basic knowledge of how to use Windows®.

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2. Names and Functions of Parts

2.1 Names and functions of parts

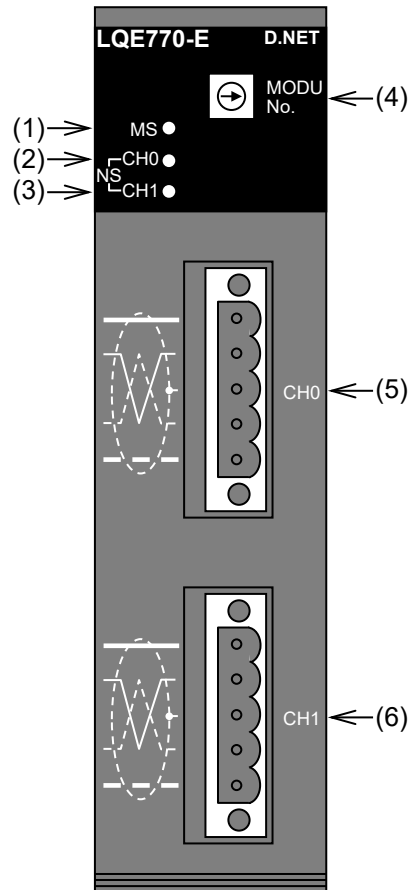


Table 2-1 Names and functions of parts

No.	Name	Function
(1)	MS (Module Status) indicator LED	Indicates the state of the module and network by a combination of LEDs. (For meanings of the LED status indications, see Table 2-3.)
(2)	Channel-0 NS (Network Status) indicator LED	
(3)	Channel-1 NS (Network Status) indicator LED	
(4)	MODU No. setting switch	The switch for setting a module number (For the set values, see Table 2-2.)
(5)	Channel-0 DeviceNet Interface connector	The connector for connecting the DeviceNet communication cable
(6)	Channel-1 DeviceNet Interface connector	

2. Names and Functions of Parts

Set the MODU No. setting switch according to Table 2-2.

Table 2-2 MODU No. setting switch values

Set value	Meaning
0	Module 0
1	Module 1
2	Module 2
3	Module 3
4 to 7	Setting prohibited
8 to B	Setting prohibited (setting in test and maintenance)
C to F	Setting prohibited

Notice

- Turn off the power switch of the power supply module before setting the MODU No. setting switch. Using this switch while power is applied might cause a malfunction.
- Do not set the MODU No. setting switch to a prohibited number. Such settings cause a malfunction.
- When mounting multiple D.NET modules on a single CPU unit, you cannot specify the same MODU No. Failure to observe this rule might result in a malfunction.

Table 2-3 explains the various states as indicated by the MS and NS LEDs.

The MS LED indicates the state of the module, and the NS LED indicates the state of each channel.

When communication is established normally on channel 0 and a connection timeout occurs on channel 1, the NS LED of channel 0 lights up in green and the NS LED of channel 1 flashes in red.

Table 2-3 States indicated by the MS and NS LEDs

MS	NS	State	Remarks
Y: ON B: Blinking	N: OFF		
N	N	The D.NET module is powered off.	--
Y (green)	N	- Object initialization is in progress. - A check is in progress to see if the specified MAC ID already exists.	This condition arises when the D.NET module has started but cannot communicate over the network. For details about how to troubleshoot this problem, see <i>Table 13-23 Reason why the D.NET module cannot perform communication</i> in the <i>S10VE User's Manual General Description</i> (manual number SEE-1-001).
Y (green)	B (green)	- Configuration information reception is in progress. - Object construction is in progress.	When a bus-off condition and recovery from it are being repeated indefinitely, the green MS/NS LEDs might seem to be blinking. This condition might arise when no communication destination is registered yet.
Y (green)	B (red)	A connection timeout occurs.	This condition arises when an error occurs in communication with a slave.
Y (green)	Y (green)	Communication is in progress. (including when a minor failure is detected)	This condition arises when, in master mode, the communication destination (slave) is not connected or has a power failure. This condition also arises when, in slave mode, there is no communication (as is the case when the slave is powered on before the master and waiting for data to come from that master).
Y (green)	B (red)	A bus-off condition occurred.	The MS/NS LEDs blink at regular intervals of 0.5 seconds, so its blinking due to a bus-off condition might be unrecognizable when recovery from that condition is made without taking time.
	Y (red)	A bus-off condition is not cleared within 10 or more seconds (for only one channel).	
Y (red)	Y (red)	A bus-off condition is not cleared within 10 or more seconds (for both channels).	
Y (green)	Y (red)	The specified MAC ID already exists.	For details about how to check MAC ID duplication and major failure, see <i>Chapter 13. Troubleshooting</i> in the <i>S10VE User's Manual General Description</i> (manual number SEE-1-001).
Y (red)	N	A major failure occurred.	

[Supplement] Immediately after power-on, if no error occurs, the MS and NS LED indicators operate as follows:

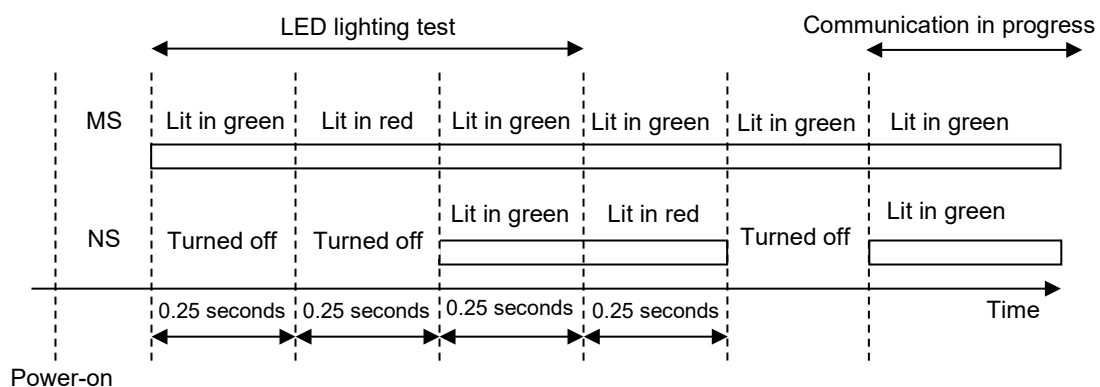


Figure 2-1 MS/NS LEDs immediately after power-on

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3. Mounting and Wiring

3.1 Mount base

The D.NET module can be mounted in the mount base shown in Table 3-1.

Table 3-1 Mount base applicable to the D.NET module

Name	Model	Specification
7-slot mount base	HSC-1770	Power supply + RI/O-IF + CPU + I/O 7 slots

3.2 Mounting the modules

Mount the option module in an I/O slot (slot No. 1 to 7) on the mount base (see Figure 3-1).

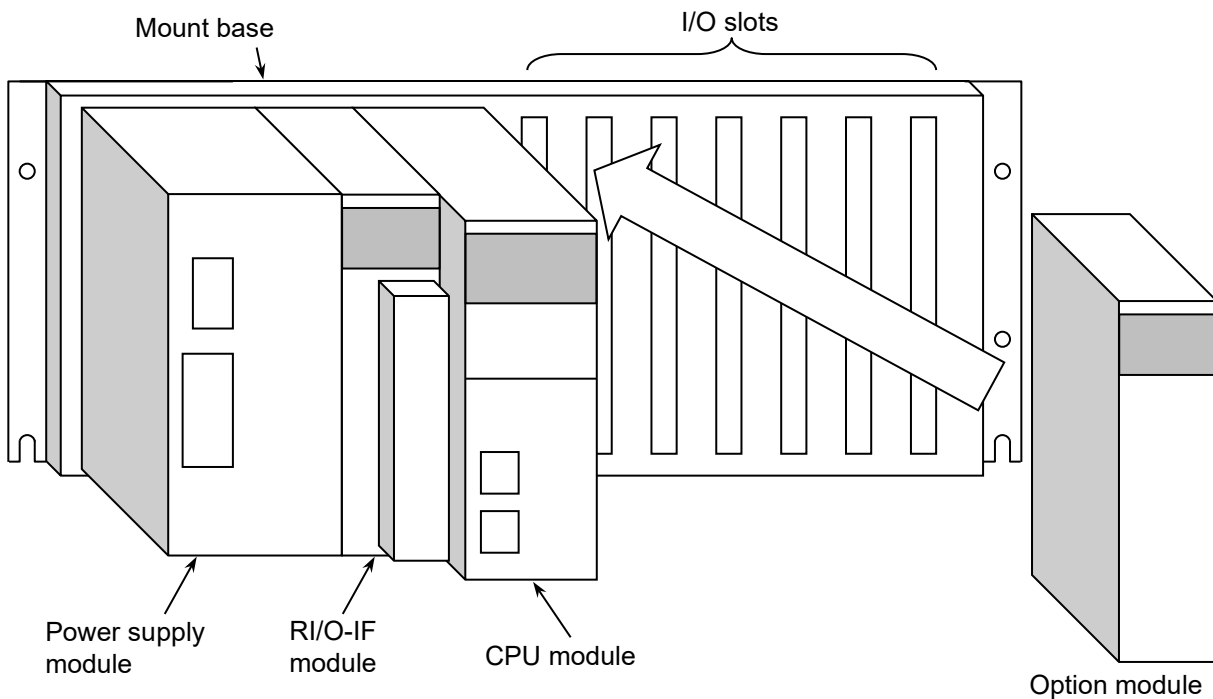
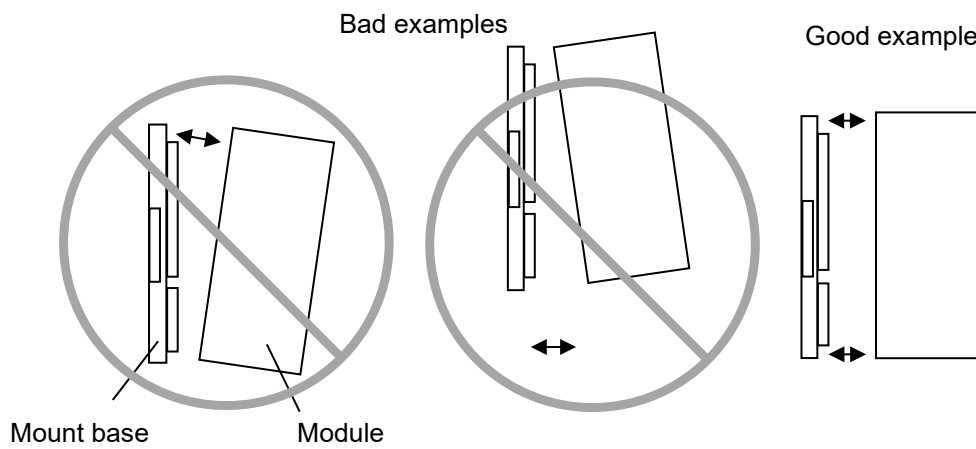


Figure 3-1 Mounting the option module

Notice

- Poor contact might cause malfunction. Mount the module and connect cabling to the module immediately after the module is unpacked so that dust or other foreign substances do not accumulate on connectors.
- To avoid damaging a module when removing or mounting it, turn off the power switch of the power supply module beforehand.
- To avoid damaging a module, observe the following precautions when mounting or removing the module:
 - Before mounting the module on the mount base connector, check that the connector pins are properly aligned and not bent, broken, or soiled.
 - Connecting or disconnecting a module that is tilted might damage connector pins. When moving the module, hold it vertically parallel to the mount base as shown below.



3.3 External dimensions of the D.NET module

Figure 3-2 shows the external dimensions of the D.NET module.

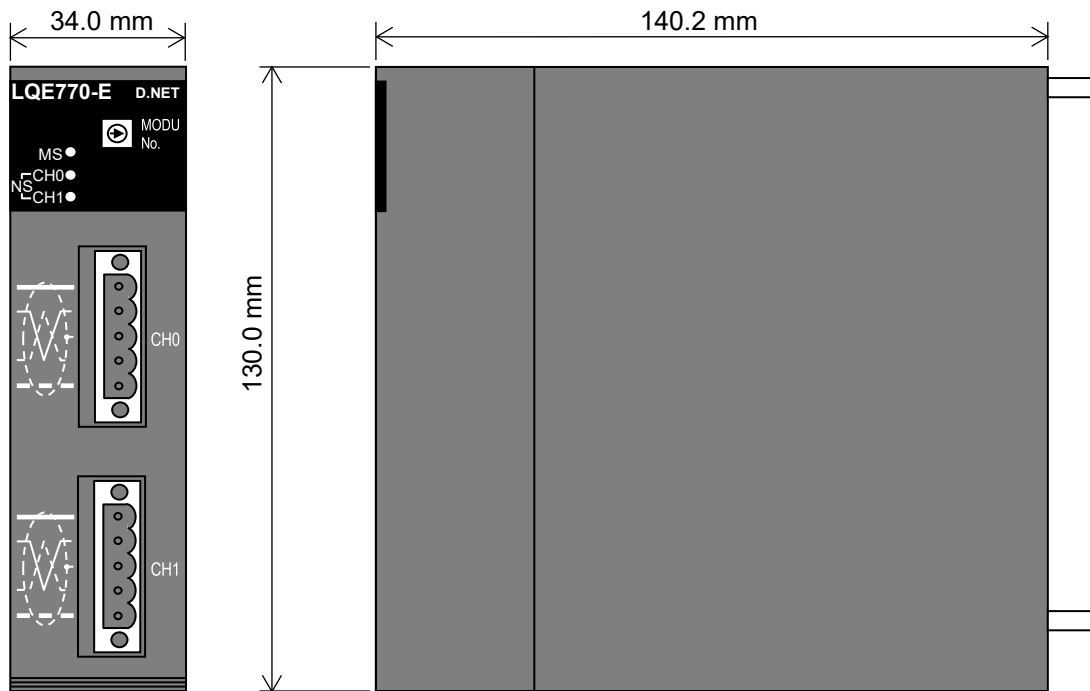


Figure 3-2 External dimensions of the D.NET module

3.4 Wiring

3.4.1 Interface signals and wiring method

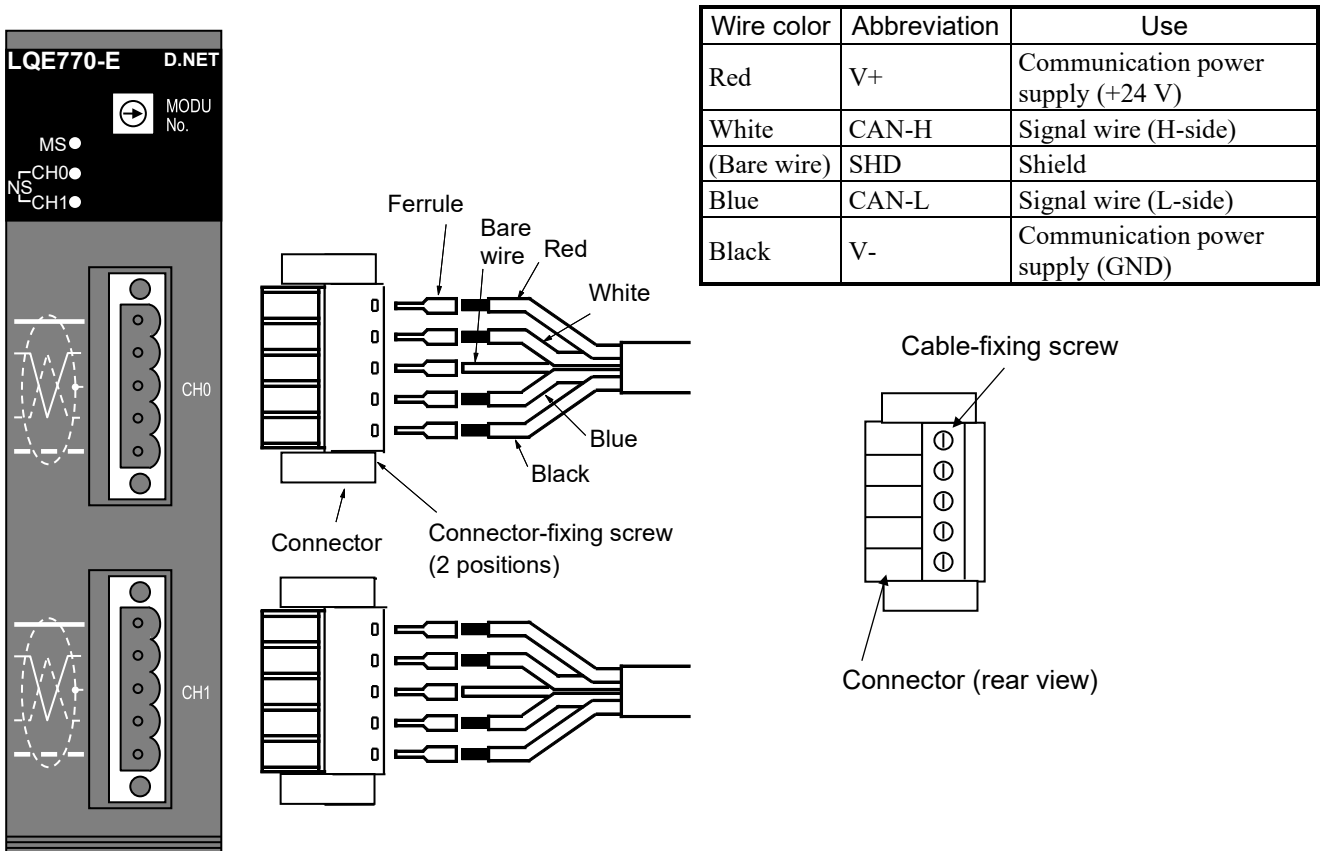


Figure 3-3 Interface signals and wiring of LQE770-E

First, crimp a ferrule over the end of each wire, as shown in Figure 3-3. Then, while paying attention to the orientation of the connector, insert the power wire, signal wire and shield wire (bare wire) into each corresponding hole of the connector. Finally, firmly tighten the Cable-fixing screw (tightening torque of 0.5 to 0.6 N·m) for each cable.

Connector caps are attached on the D.NET module upon shipment. Remove the connector cap from the connector of the channel you want to use. Store the removed connector cap. Do not remove connector caps for unused channels.

After connecting the cables to the connector, orient and insert the connector correctly and firmly according to the connector position of the D.NET module. Then, tighten the connector-fixing screws to secure the connector to the D.NET module (tightening torque of 0.2 to 0.3 N·m).

The LQE770-E is a self-feeding communication power supply (V+, V-) and requires no external power supply. The communication power supply for the connector is independent of the internal power supply of the module. Therefore, connecting the power cable to the connector does not cause a problem.

Notice

- Make sure that you turn off the power to the S10VE and all the connected DeviceNet-compliant devices and communication power supply before connecting any cable to the D.NET module. Failure to do so might result in a malfunction.

3.4.2 Hardware configuration

Figure 3-4 shows an example of the DeviceNet hardware configuration. In any DeviceNet network, a control device connected to the network is called a *node*, and the D.NET module is also one of the nodes. There are two kinds of node: slave and master. A slave inputs and outputs information, and a master collectively controls and manages slaves in the network.

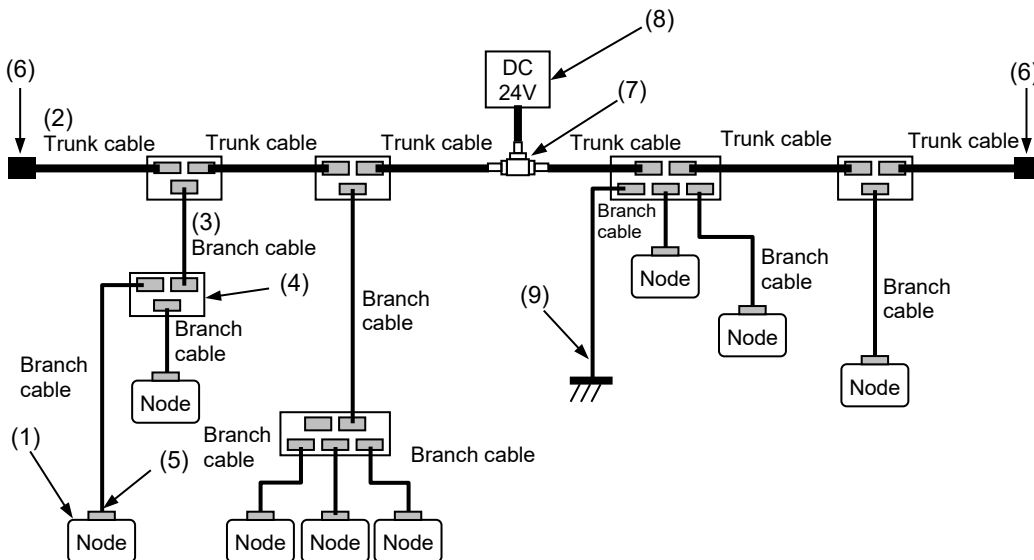


Figure 3-4 Example of the DeviceNet hardware configuration

The components of DeviceNet network are as follows:

(1) Node

Nodes that are connected to DeviceNet are classified into two types: slave and master. A slave inputs and outputs information, and a master, such as the D.NET module, collectively controls and manages the slaves. DeviceNet network imposes no restriction on where you place master and slaves.

(2) (3) Trunk cable and branch cable

Communication cables connected to a DeviceNet network are classified into two types: trunk cable and branch cable. A trunk cable is a bundle of cables, each of which has a terminating resistor at both ends. A cable branching from a trunk cable is called a branch cable, and any cables branching from that branch cable are also called branch cables. Nodes are connected to branch cables. Dedicated 5-wire communication cables (thick or thin type) are used as communication cables.

(4) T-branch tap

DeviceNet networks use T-branch taps to branch a cable from a trunk cable and to branch a cable from a branch cable. You can also use a T-branch tap to branch a cable from a branch cable and connect nodes. Not only T-branch taps but also connector blocks can be used for branching.

(5) Connector

Connectors that connect communication cables to a node and to a T-branch tap are classified into two types: open and closed. The open-type connector is preferably used to connect a communication cable to a D.NET module and to a T-branch tap.

3. Mounting and Wiring

(6) Terminating resistor

In any DeviceNet network, you must install a terminating resistor ($121\Omega \pm 1\%$) on each end of the trunk cable. We recommend that you use TBs and terminating resistors for connecting TBs.

(7) (8) Power tap and communication power supply

Communication over DeviceNet networks requires that a communication power supply be connected to the network through a power tap, and that power be supplied to each node of the network through a communication cable. Communication power supplies can also be connected to the network through T-branch taps and TBs. The communication power supply voltage used in DeviceNet is 24 V DC $\pm 4\%$. The D.NET module does not need to be connected to any communication power supply on the network because it self-feeds power for communication.

(9) Network grounding

To avoid ground loops, the shield of the communication cable must be grounded at only one point near the center of the network. For this, more than one method is available, for example, by grounding at a D.NET module, by grounding from a tap, and by grounding from a TB. In the preceding configuration example, the shield is grounded from a T-branch tap.

Table 3-2 lists other recommended components of the DeviceNet control mechanism (than the nodes). No. in the table corresponds to that of each component in Figure 3-4.

To use a TB, screws for the TB and solderless terminals for the communication cables are required in addition to the components listed in Table 3-2.

Table 3-2 Recommended component parts

No.	Part name	Specifications	Recommended product	
			Model	Manufacturer
(2)	Thick cable	5-wire communication cable	TDN18U [#]	SWCC SHOWA HOLDINGS CO., LTD.
(3)	Thin cable	5-wire communication cable	TDN24U [#]	
(4)	T-branch tap	Open-type T-branch tap	DCN1-1C	OMRON Corporation
		Open-type 3-branch tap	DCN1-3C	
(5)	Connector	Open type	MSTB2.5/5-STF-5.08-AU	Phoenix Contact GmbH & Co.
	Ferrule	Used to connect a thick cable (signal and shield) to a connector	A1-6	
		Used to connect a thick cable (power) to a connector	A2.5-7	
		Used to connect a thin cable to a connector	VPC-0.5-F8	J.S.T Mfg. Co., Ltd.
(6)	Terminating resistor	For installing a TB	MFBEC1200C	KOA Corporation
(7)	Power tap	Equipped with a reverse current stopper and a grounding terminal.	1485T-P2T5-T5	Rockwell Automation Japan Co.,Ltd.
(8)	Communication power supply	24 V DC $\pm 4\%$	S8FS-G05024C	OMRON Corporation

[#]: The cable length is specified separately.

3.4.3 Components

(1) Communication cables

Figure 3-5 shows the physical structure of a dedicated 5-wire communication cable conforming to the DeviceNet standard. There are two types of communication cables: thick and thin. The physical structures of these thick and thin cables are identical.

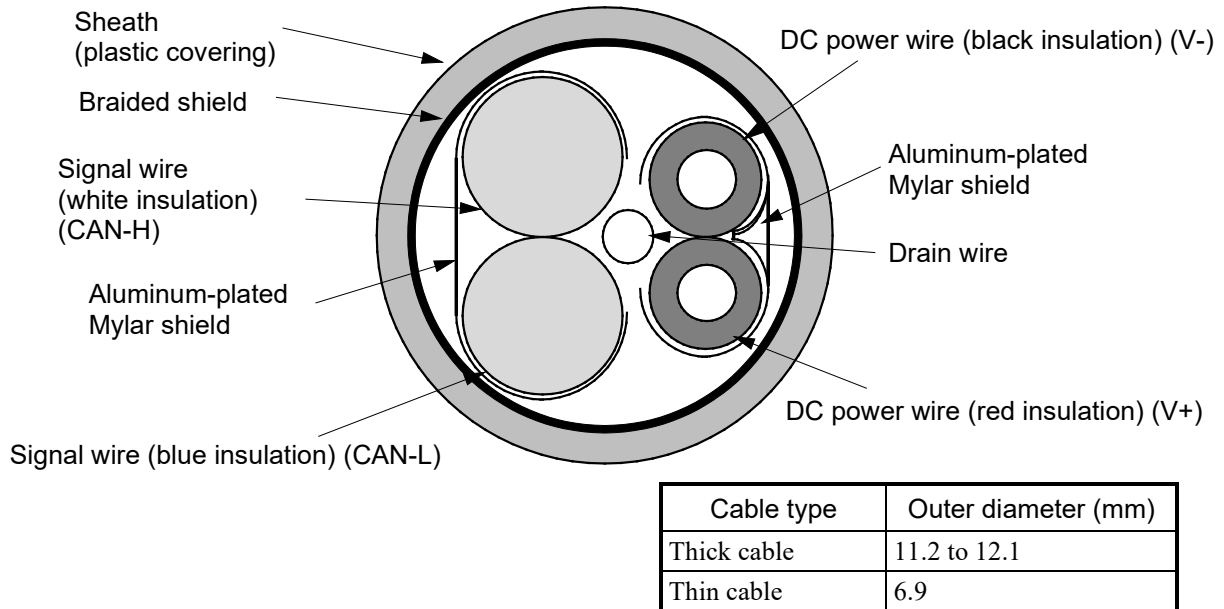


Figure 3-5 Communication cable

A thick cable is hard and resistant to bending, and has less signal attenuation. So, a thick cable is suitable for communication over a relatively long distance. Usually, a thick cable is used as a trunk cable that must be long.

In contrast, a thin cable is flexible and easy to bend but it has significant signal attenuation. So, a thin cable is not suitable for long-distance communication. Usually, thin cables are used as branch cables.

When constructing a small network, you can also use thin cables as short-distance trunk cables.

As shown in Figure 3-6, you must secure a straight length of about 5 cm or more on the connection end of the communication cable connected to the D.NET module. The bending radius of the cable must be at least 25 cm (for a thick cable) or 15 cm (for a thin cable).

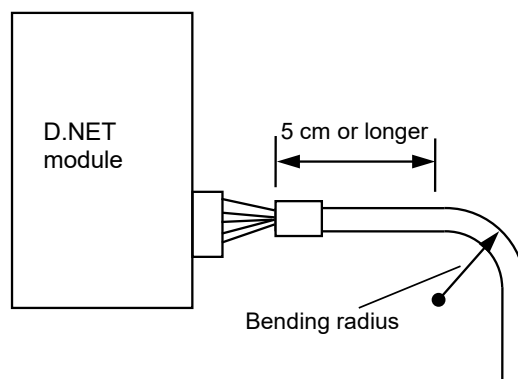


Figure 3-6 Bending radius of the cable

Notice

- Cables of the same type (communication cables) must not be intermingled with cables of other types (power cables and motor lead cables). Particularly, communication cables must be placed at least 300 mm away from motor lead cables for devices such as inverters, motors, and power regulators. Do not put communication cables and motor lead cables together in the same pipe or conduit. Failure to observe this rule might result in a malfunction.
- Always use dedicated 5-wire communication cables conforming to the DeviceNet standard. Do not use any other cables for communication. Failure to do so might result in a malfunction.
- Provide sufficient slack in connected communication cables so as to allow devices to be removed for any reason (such as for troubleshooting and relocation).
- Cables might be damaged if pressure or tension is applied to them. When you tie several communication cables in a bundle, clamp or tie them loosely so that you can easily move them later if necessary.
- Do not pull communication cables with excessive force. Doing so might disconnect or break a cable.
- Do not place a heavy object on a communication cable. Doing so might break the cable or cause a communication failure.

(2) Connector

Use removable connectors to connect communication cables to nodes and to branch taps. The DeviceNet system allows the use of two types of connector: open and closed. However, the open-type connectors, particularly plug-in screw connectors, are recommended to connect cables to D.NET modules and T-branch taps.

If the communication cable is connected by using a plug-in screw connector, you do not need to disconnect the network when removing nodes.

Figure 3-7 shows the appearance, cable color, and the pin assignment of an open-type connector.

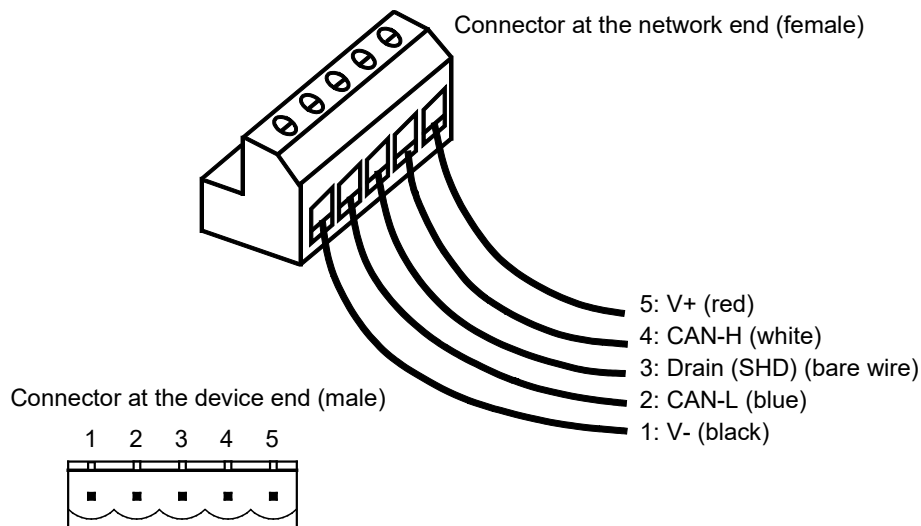


Figure 3-7 Connector

Notice

- Always use ferrules to connect the communication cable to the plug-in screw connector. Failure to do so might result in a disconnected or broken cable.
- Provide enough slack in connected communication cables so as not to subject open-type connectors to excessive force. Failure to do so might result in disconnected cables or connectors.
- Connection of a node other than the D.NET module does not always require an open-type connector. For nodes manufactured by other companies, connect them with communication cables according to the manual for each node.
- Connect the signal wires, power wires and drain wire correctly to the connector. Failure to do so might result in module damage or a malfunction. Note that the power wires of a thick cable require different ferrules than the other wires of the same cable.

3. Mounting and Wiring

(3) T-branch tap

Use T-branch taps to branch a branch cable from the trunk cable of the communication cable, and to branch a branch cable from a branch cable. Two types of T-branch taps are available for use in the DeviceNet network: open and closed. We recommend the open-type tap. T-branch taps are further classified into two types: 1-branch and 3-branch. The connecting methods of these two types are identical.

Figure 3-8 shows open-type T-branch taps.

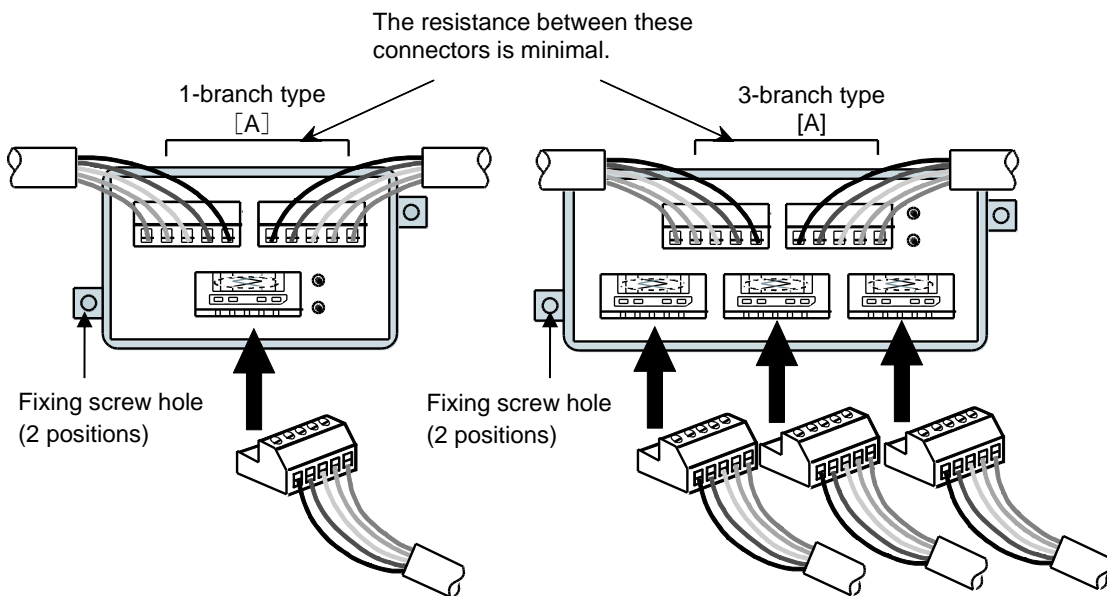


Figure 3-8 T-branch taps

There is resistance between T-branch tap connectors. The resistance between the connectors shown by [A] is minimal. Therefore, we recommend that you connect the longest branch cable to these connectors when using a T-branch tap for branching a branch cable.

Notice

- Use screws in the fixing screw holes of a T-branch tap to secure the branch tap firmly. Failure to do so might result in a malfunction.

You can use not only T-branch taps but also TBs to branch the communication cable. Install a TB-compatible solderless terminal on each wire of the cable, and then connect the wires to the TB.

Figure 3-9 shows an example of a TB connection.

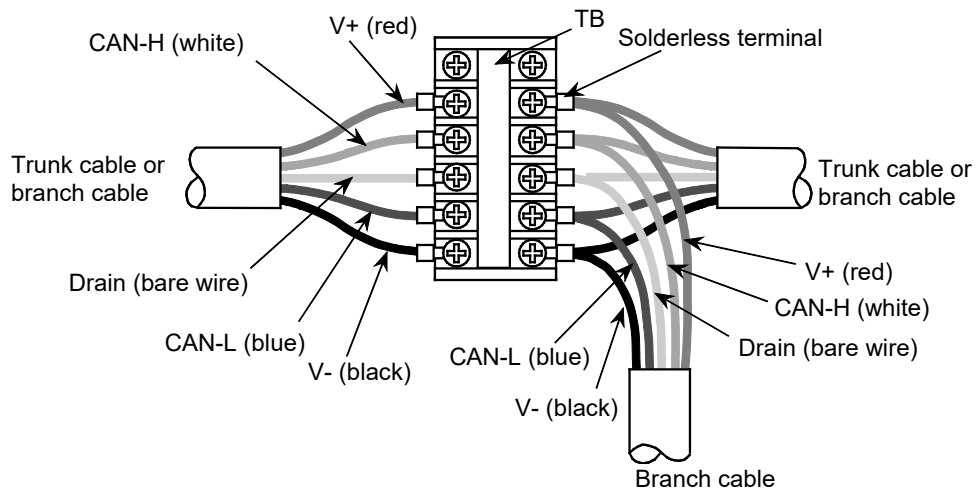
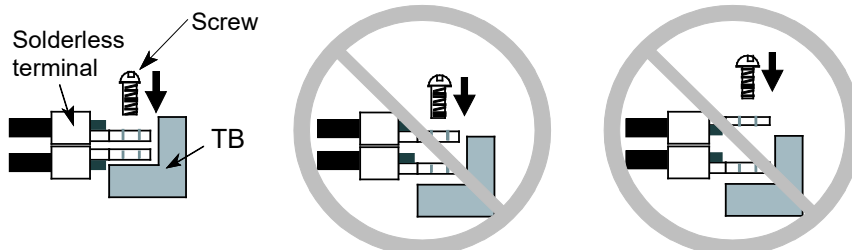


Figure 3-9 Terminal block (TB)

Notice

- When connecting two crimped (solderless) connectors to a single terminal, make sure that they are back to back. If they are not, a communication failure might occur due to incomplete connection.



3. Mounting and Wiring

(4) Terminating resistor

Each end of the trunk cable of the DeviceNet network must always be terminated with a terminating resistor. The specifications of a terminating resistor are as follows.

<Specifications of a terminating resistor>

Resistance: 121Ω

Tolerance: $\pm 1\%$

Permissible loss: $1/4\text{ W}$

Type: Metal film

We recommend that you use TBs to connect terminating resistors to the trunk cable. Attach a TB-compatible solderless terminal to each lead of the terminating resistor, then cover the lead with a piece of Teflon tube, and finally connect the solderless terminal to the TB. The terminating resistor can be connected in any orientation but it must always be connected between the terminals corresponding to the signal wires (CAN-H and CAN-L).

Figure 3-10 shows an example of connection of a terminating resistor.

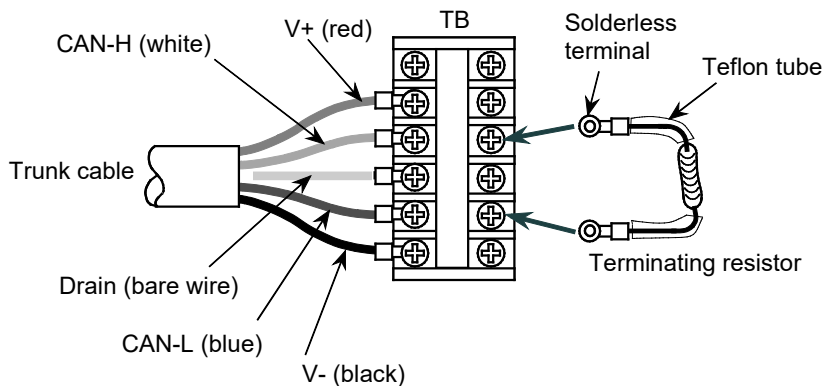


Figure 3-10 Terminating resistor

Notice

- When you connect a terminating resistor to a TB, always connect it between the terminals corresponding to the signal wires (CAN-H and CAN-L). If you do not, a malfunction might occur.

(5) Power tap and communication power supply

The DeviceNet communication cable contains power lines to directly supply power from the network to the nodes. No additional power supply is required for each individual node. Therefore, a communication power supply rated at 24 V DC must be connected to the trunk cable of the communication cable.

There are two common ways of connecting a communication power supply to the trunk cable: by using a dedicated power tap and by connecting a TB. You can also use a T-branch tap to connect a communication power supply if the current consumption is 3 A or less.

Basically, DeviceNet uses one single communication power supply per network. However, if two or more communication power supplies are required (as a result of consideration as described in 3.4.5 *Communication power supply location considerations*), their power lines must be separated from each other. Specifically, this can be accomplished by disconnecting the power wire V+ by using a power tap or a TB.

Figures 3-11 to 3-13 show the method of connecting the power wire by a power tap or TB and the method of separating the power lines.

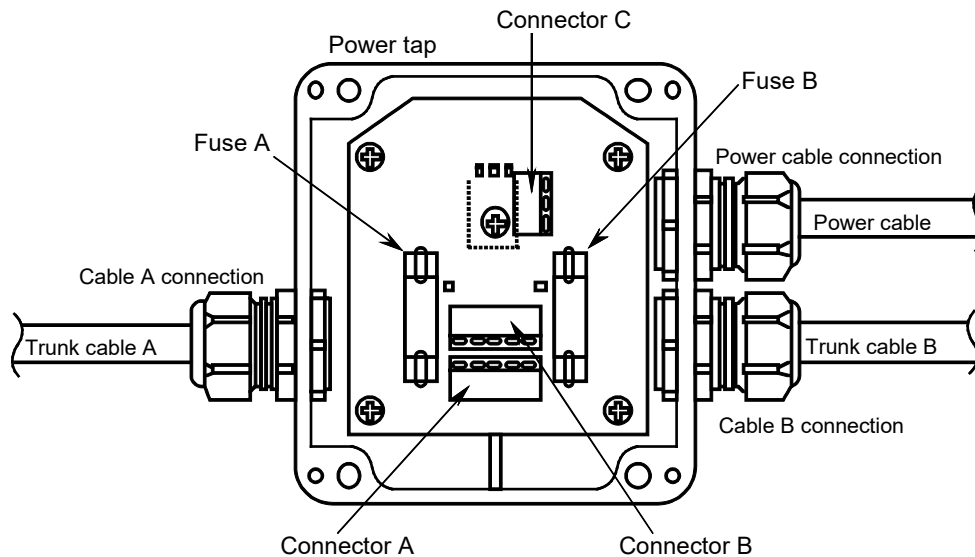


Figure 3-11 Connecting the power cable by a power tap

3. Mounting and Wiring

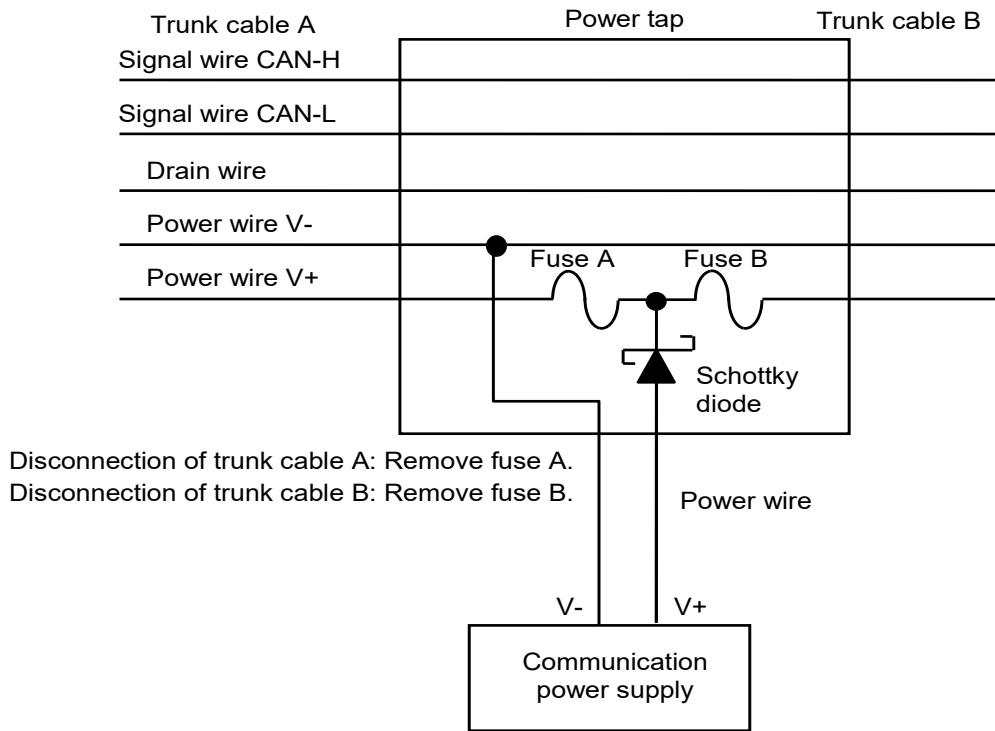


Figure 3-12 Separating a power wire by a power tap

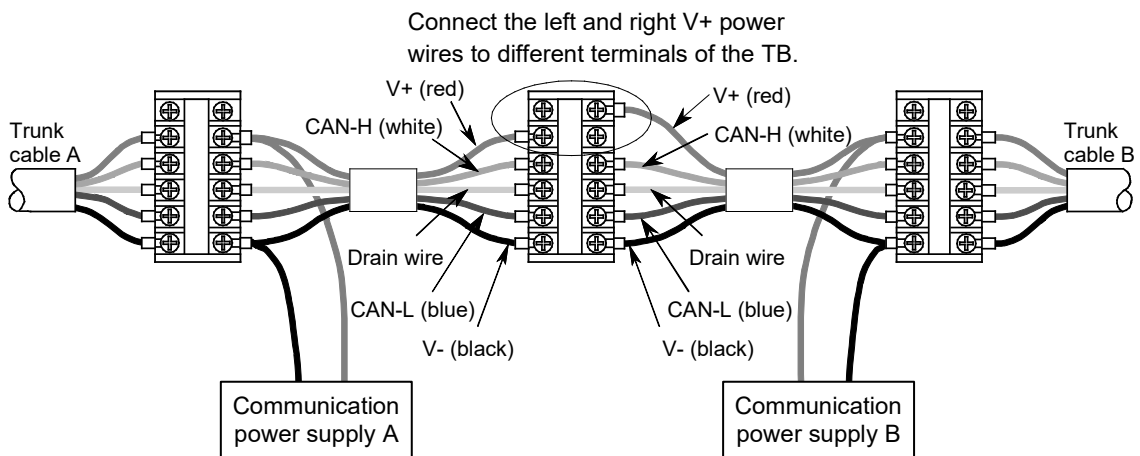


Figure 3-13 Connecting and disconnecting power wires by using a TB

Table 3-3 lists the specifications of the communication power supply conforming to the DeviceNet standard.

Table 3-3 Specifications of the communication power supply

Item	Specifications
Initial setting of the power supply	24 V DC $\pm 1\%$ (23.76 to 24.24 V)
Maximum rating	Output current of 16 A or less
Voltage fluctuation	0.3% maximum
Load fluctuation	0.3% maximum
Influence by ambient temperature	0.03% per °C maximum
Input voltage range	120 V $\pm 10\%$ 230 V $\pm 10\%$ (if necessary) or automatically selected in the range of 95 V to 250 V
Input frequency range	48 to 62 Hz
Output ripple	250 mVp-p
Electrostatic capacitance of load	7,000 μ F maximum
Ambient temperature	Operating: 0 to 60°C Non-operating: -40 to 85°C
Restriction on inrush output current	Less than 65 A
Protection against overvoltage	Provided (no specified value)
Protection against overcurrent	Provided (maximum current: 125%)
Time required for power-up	250 ms to reach 5% of the final output voltage
Overshoot at startup	0.2% maximum
Insulation	Provided between output and AC power supply and between output and frame ground
Standards	Required: UL Recommended: FCC Class B, CSA, TUV, VDE
Ambient relative humidity	5 to 95% (no condensation)
Surge current withstand	Reserve capacity of 10%

 **WARNING**

- Always use a communication power supply that has an overvoltage and overcurrent protection function. Failure to do so might result in an accident, fire, or malfunction.
- Before supplying power to the module, make sure that all cables are connected correctly. Failure to do so might result in fire or electric shock.

Notice

- Insert a line filter into the primary side of the communication power supply. Failure to do so might cause induced noise and subsequent malfunction.

3. Mounting and Wiring

(6) Network grounding

Lead out the drain wire connected to the shield of the trunk cable with a single wire, stranded cable or braided copper cable by using a T-branch tap or a TB, and then apply class D grounding with the ground resistance of 100Ω or less. Figure 3-14 shows how the ground wire is led out from a T-branch tap or TB.

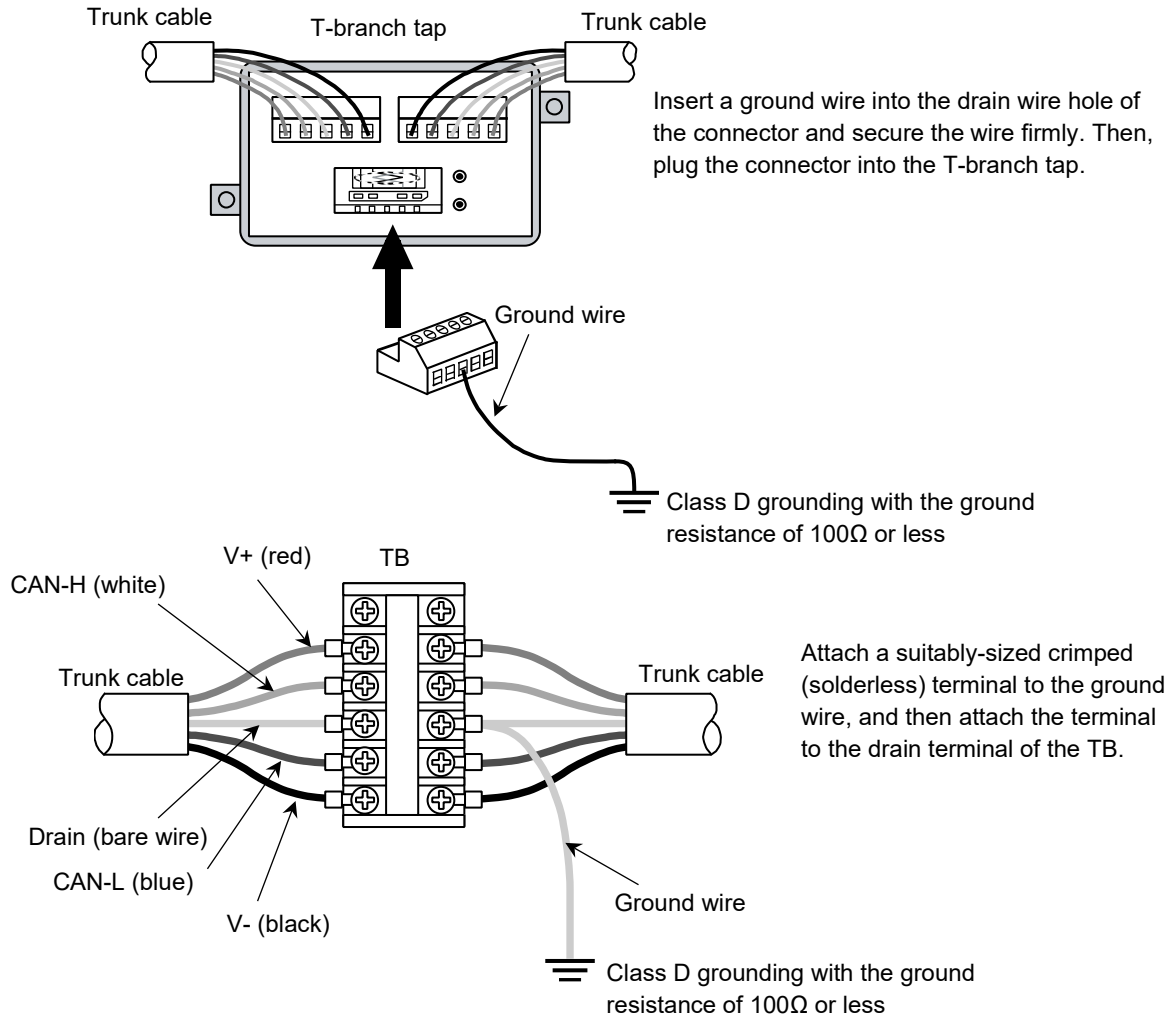


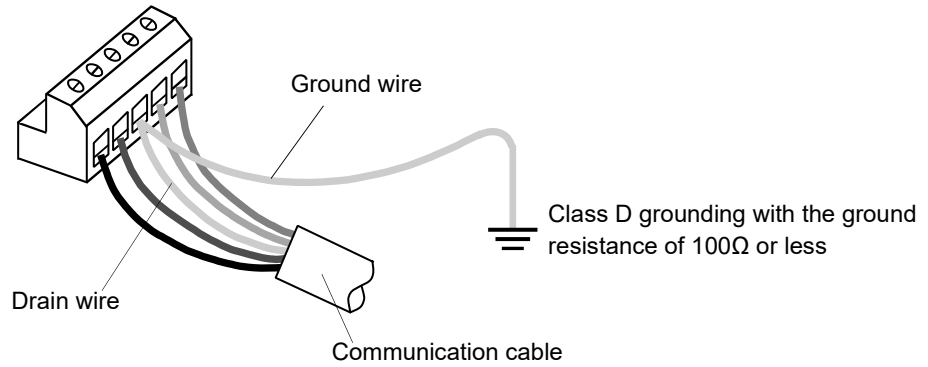
Figure 3-14 Leading out the ground wire

Notice

- If the network is not grounded, a malfunction or failure might occur due to electrostatic discharge or external power supply noise. Ground DeviceNet at only a single point. Additionally, ground the network near the center of the network.

Notice

- Secure the two cables to the drain terminal of the open-type connector and apply class D grounding with the ground resistance of 100Ω or less to the ground wire as shown in the following figure. Failure to do so might result in a failure or malfunction.



- Do not ground the communication cable and motor lead cables to the same grounding point. Doing so might cause induced noise and result in malfunction.

3.4.4 Restriction on the cable length

This subsection describes restriction on the length of cables in DeviceNet. Make sure that you observe the following restrictions when constructing a network.

(1) Maximum network length

The maximum network length is the distance between the two nodes located farthest from each other or the distance between two installed terminating resistors, whichever is longer. The maximum network length depends on the type of the trunk cable and the transfer rate used in the network, as shown in the following figure and table.

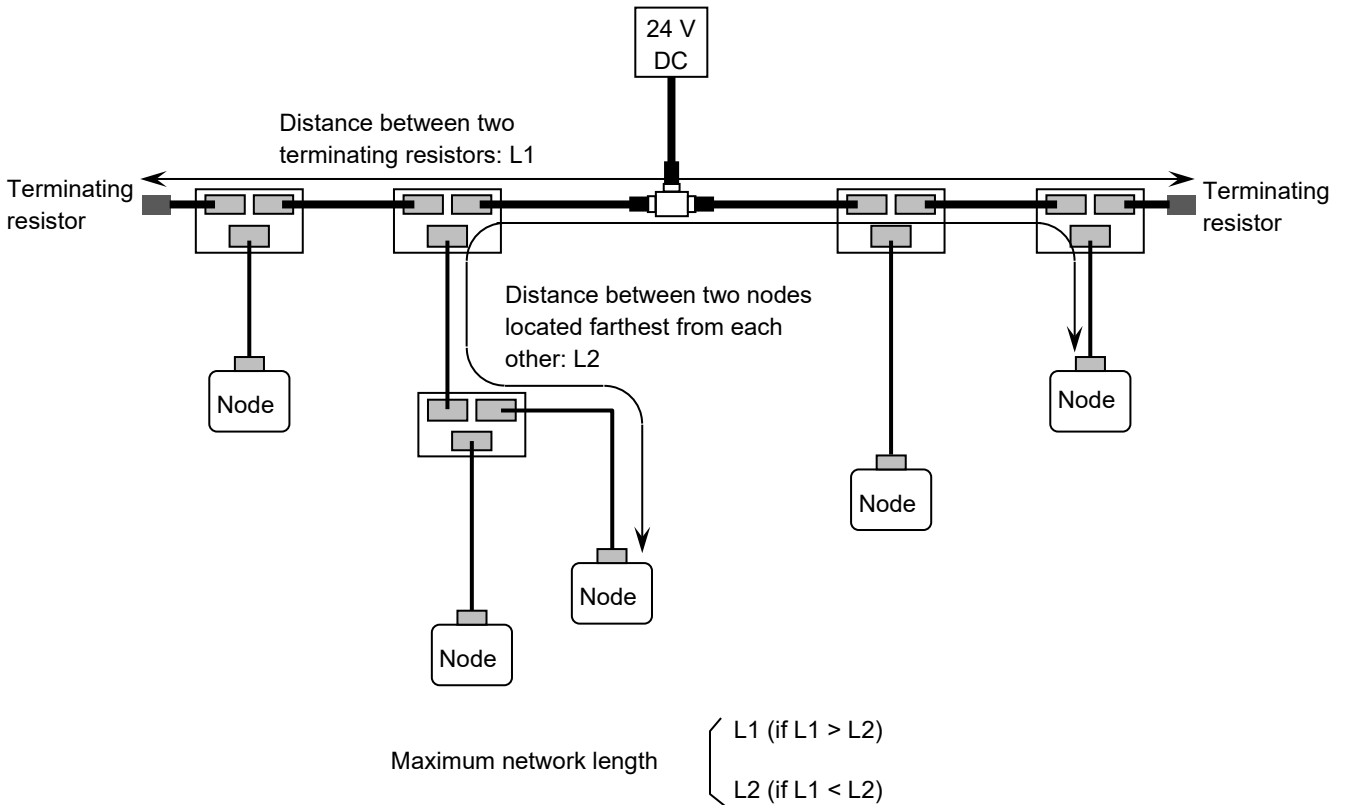


Figure 3-15 Maximum network length

Table 3-4 Cable types and network transfer rates

Transfer rate	Trunk cable types		
	Thick cable only	Thin cable only	Thick and thin cables
500 kbps	100 m or shorter	100 m or shorter	$L_{THICK} + L_{THIN} \leq 100 \text{ m}$
250 kbps	250 m or shorter		$L_{THICK} + 2.5 \times L_{THIN} \leq 250 \text{ m}$
125 kbps	500 m or shorter		$L_{THICK} + 5 \times L_{THIN} \leq 500 \text{ m}$

Note: LTHICK represents a thick cable length and LTHIN represents a thin cable length.

(2) Branch cable length

The branch cable length is the distance between a point at which a communication cable branches from the trunk cable and a point (node) at which the branch ends. The maximum branch cable length is 6 meters, regardless of the transfer rate.

The maximum length of distance from the trunk cable to the communication power supply is 3 meters.

Figure 3-16 shows the concept of the branch cable length.

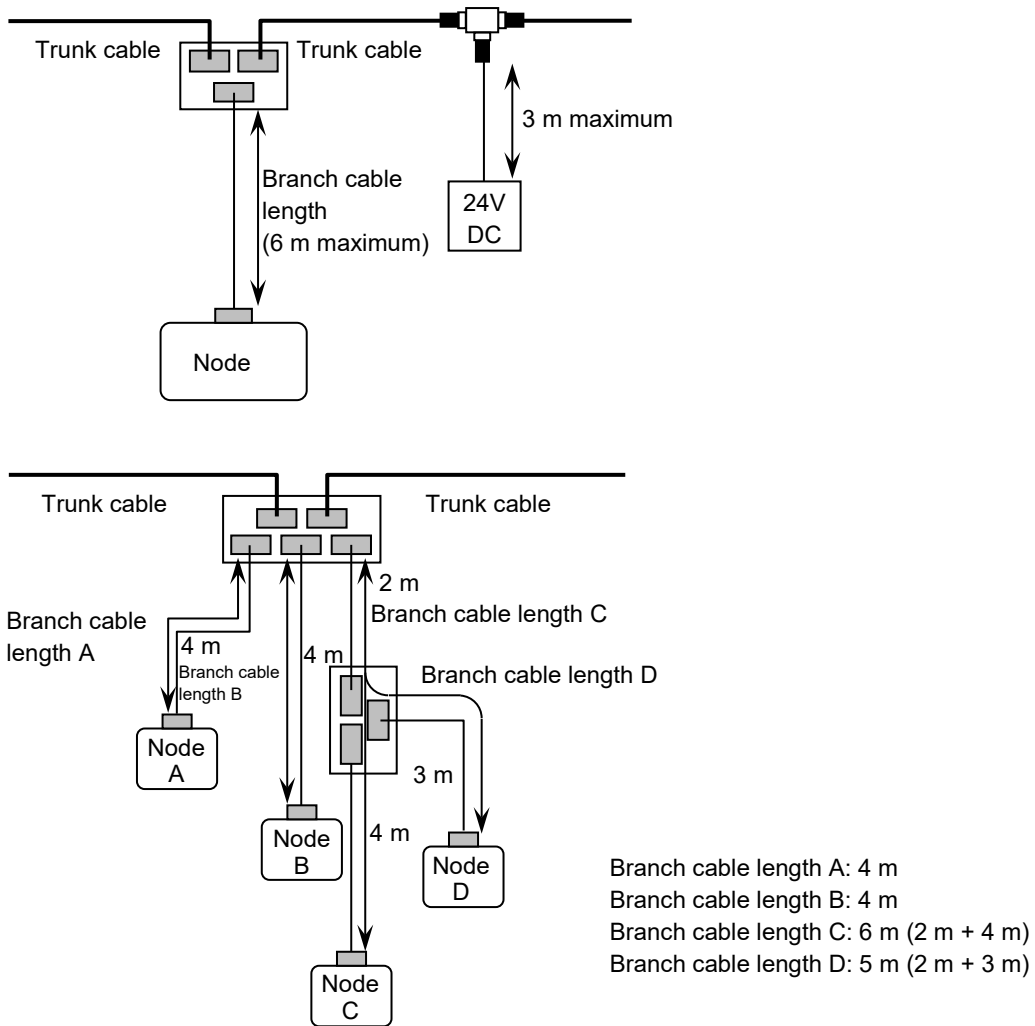


Figure 3-16 Branch cable length

3. Mounting and Wiring

(3) Total branch cable length

The total branch cable length is the sum total of the lengths of all branch cables (cable lengths) in the network. This is not the total of all the branch cable lengths (lengths from the branch tap of the trunk cable to each node). The allowable total branch cable length depends on the transfer rate used in the network. Figure 3-17 shows an example of the configuration of the total branch cable length. In this configuration, the total branch cable length is 40 meters and the transfer rate that can be used is either 125 kbps or 250 kbps.

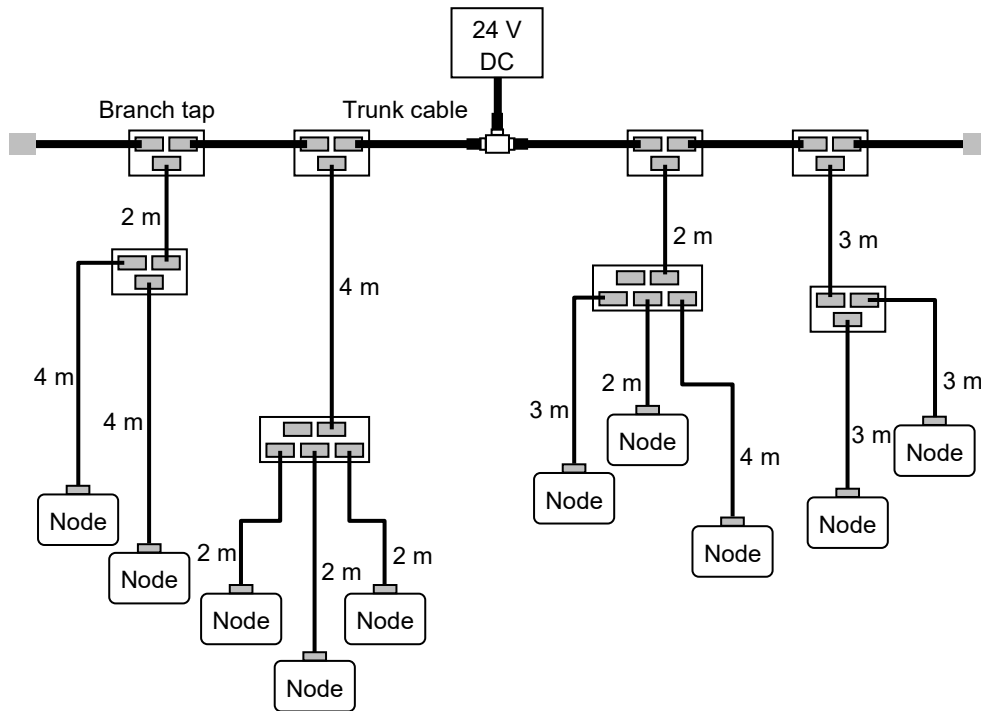


Figure 3-17 Total branch cable length

Table 3-5 Transfer rates and total branch cable lengths

Transfer rate	Total branch cable length
500 kbps	39 m or shorter
250 kbps	78 m or shorter
125 kbps	156 m or shorter

<Reference> Specifications of the communication cable

Table 3-6 Specifications of the communication cable

Item		Trunk cable (Thick cable)	Branch cable (Thin cable)
Signal wire	Cross section of conductor	AWG18	AWG14
	Outer diameter of insulator	3.81 mm	1.96 mm
	Color	Blue and white	Blue and white
	Impedance	120Ω ±10%	120Ω ±10%
	Propagation delay	4.46 ns per m	4.46 ns per m
	Attenuation factor	500 kHz: 0.820 dB per 100 m 125 kHz: 0.426 dB per 100 m	500 kHz: 1.640 dB per 100 m 125 kHz: 0.951 dB per 100 m
	Conductor resistance	22.6Ω per 1,000 m	91.9Ω per 1,000 m
Power wire	Cross section of conductor	AWG15	AWG22
	Outer diameter of insulator	2.49 mm	1.40 mm
	Color	Red and black	Red and black
	Conductor resistance	8.9Ω per 1,000 m	57.4Ω per 1,000 m
	Maximum current	8 A	3 A
Outer diameter of cable product		10.41 to 12.45 mm	6.10 to 7.11 mm

Table 3-7 Recommended cable models

Trunk cable (Thick cable)	Branch cable (Thin cable)	Length	Color	Manufacturer
TDN18U-100G	TDN24U-100G	100 m	Light gray	SWCC SHOWA HOLDINGS CO., LTD.
TDN18U-300G	TDN24U-300G	300 m		
TDN18U-500G	TDN24U-500G	500 m		
TDN18U-100B	TDN24U-100B	100 m	Light blue	
TDN18U-300B	TDN24U-300B	300 m		
TDN18U-500B	TDN24U-500B	500 m		

3.4.5 Communication power supply location considerations

In the DeviceNet network, each node is supplied power through a 5-wire communication cable via a communication connector. Therefore, when constructing a network, you must consider whether each node can be supplied power from the communication power supply in respect of current consumption at each node and the cable length restriction shown in 3.4.4.

Before you consider this, obtain the following information:

- Current consumption at each node (The D.NET module (LQE770-E) has its own power supply, so its power consumption need not be included in the calculation of current consumption.)
- Type (thick or thin) and length of each communication cable (as determined by the method described in 3.4.4)

First, make sure that the total current consumption of all nodes is within the current capacity of the communication power supply. If it exceeds the current capacity of the communication power supply, replace the communication power supply with one of a larger current capacity, or supply power to the nodes by using multiple power supplies.

Next, consider the maximum current capacity of each cable. The maximum current capacity of the trunk cable shown in Table 3-6 is 8 A (for a thick cable) or 3 A (for a thin cable). Therefore, as shown in Figure 3-18, you can feed a maximum current of 16 A (through a thick trunk cable) or 6 A (through a thin trunk cable) from a single power supply.

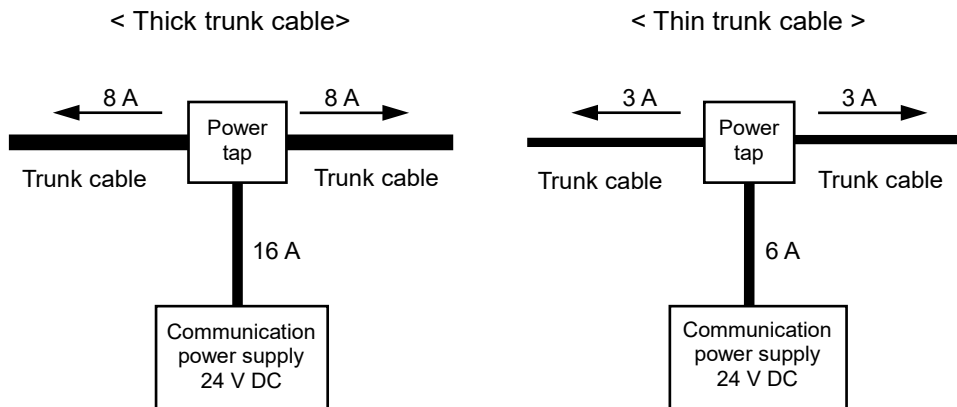


Figure 3-18 Allowable power supply capacity

However, if the total current consumption of the nodes connected to a thin trunk cable exceeds the allowable power supply capacity of 6 A, the requirement cannot be met even if the communication power supply is connected to anywhere. So, in this case, consider replacement of the thin cable with a thick cable.

Further, the maximum current capacity of a branch cable varies with its length. The longer the cable, the smaller the maximum current capacity. This relationship is true for both thick and thin cables. The maximum current capacity (I) of a branch cable (the total current consumption through the branch cable) is calculated from the branch cable length (L) by the following expression:

$$I = 4.57/L \text{ (The result must be less than 8 A for thick cable or less than 3 A for thin cable.)}$$

I: Current capacity of a branch cable (A)

L: Branch cable length (m)

If the maximum current capacity of a branch cable is less than the total current consumption of the nodes connected to the branch cable, take the following measures:

- Shorten the branch cable.
- If multiple nodes are connected to the branch cable, remove one or more of the nodes from the cable and attach the removed nodes to a new branch cable.

After you confirm that the maximum current capacity of the branch cable is not exceeded, determine where to locate the power supply in consideration of voltage drop in the trunk cable. There are the following two ways to determine where to place the power supply:

- Method 1: Using simple calculation by a graph
- Method 2: Calculating a voltage drop from the resistance of the communication cable and the current consumption by using equations

If Method 1 produces a result meeting the given condition (the total current consumption must be less than the maximum current capacity), the power supply can be placed at your planned location. This method assumes the worst configuration in terms of power supply. Therefore, even when the result does not meet the given condition, Method 2 might produce a result meeting the condition. In this case, the power supply can be placed at your planned location.

(1) Method 1: Using simple calculation by a graph

This method is a fast and easy method for determining where to place the power supply. Note that the graph to be used varies according to the type of the trunk cable being used (thick or thin).

First, see Table 3-8 and Table 3-9 to find the maximum current capacity corresponding to the type and the total length of the trunk cable.

Then, if the total current consumption of all the nodes is less than the maximum current capacity found from the tables, the power supply can be placed at your desired location.

However, if it exceeds the maximum current capacity found from the tables, take the following measures. If none of these measures can reduce the total current consumption below the maximum current capacity, calculate voltage drops by using the expression of (2), which takes the actual node arrangement into consideration.

- If a thin cable is used, replace it with a thick cable and determine the maximum current capacity corresponding to the thick cable.
- Move the power supply toward the center of the trunk cable so that the nodes are divided into two groups, one on the left side of the power supply and one on its right side. Then, determine the maximum current capacity of the left trunk cable (the left side of the power supply) and that of the right trunk cable, and compare the total current consumption of the left-side nodes with that of the right-side nodes.
- Assume that nodes are already arranged on both sides of the communication power supply. If the total current consumption of the nodes on one side is greater than the maximum current capacity, move the power supply toward the farthest end of that side and perform a review.

3. Mounting and Wiring

<Thick trunk cable lengths and maximum currents>

Table 3-8 Thick trunk cable lengths and maximum currents

Trunk cable length (m)	0	25	50	100	150	200	250	300	350	400	450	500
Maximum current (A)	8.00	8.00	5.42	2.93	2.01	1.53	1.23	1.03	0.89	0.78	0.69	0.63

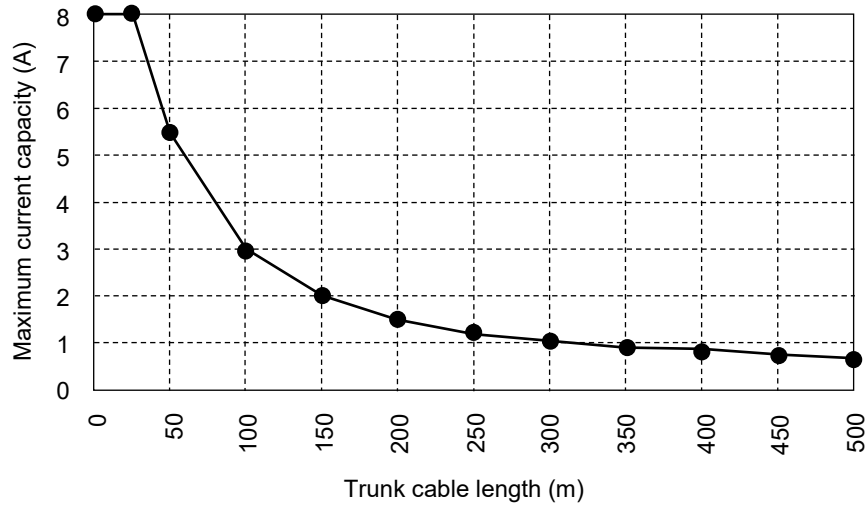


Figure 3-19 Thick trunk cable length vs. maximum current

<Thin trunk cable lengths and maximum currents>

Table 3-9 Thin trunk cable lengths and maximum currents

Trunk cable length (m)	0	10	20	30	40	50	60	70	80	90	100
Maximum current (A)	3.00	3.00	3.00	2.06	1.57	1.26	1.06	0.91	0.80	0.71	0.64

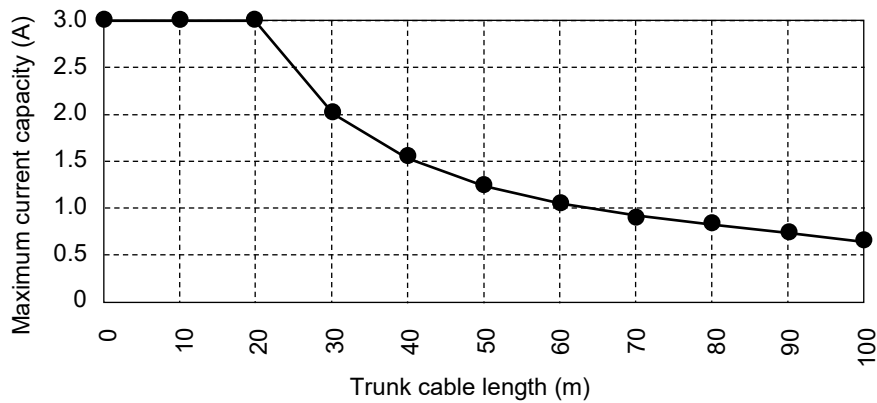


Figure 3-20 Thin trunk cable length vs. maximum current

<Example of using Method 1>

In the following example, the network is supplied power by connecting a single power supply to one end of a trunk cable of 300 m length. The nodes on the trunk cable have the current consumptions shown in Figure 3-21.

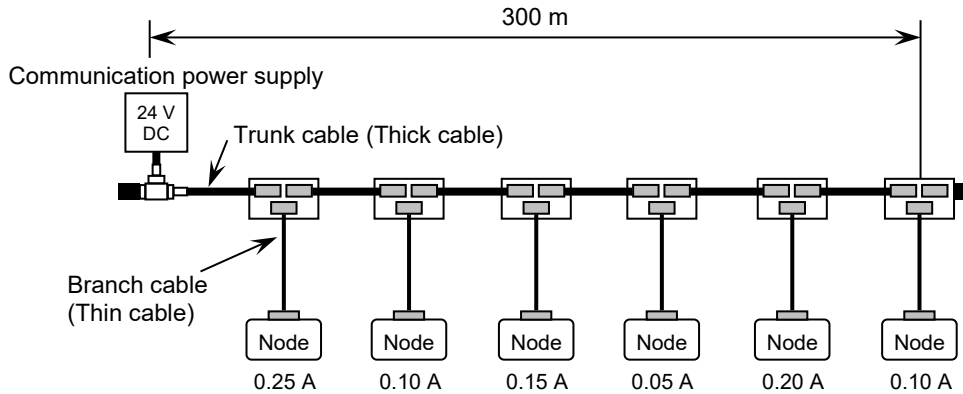


Figure 3-21 Example of a power supply and nodes connection for Method 1

Total current consumption required in the nodes: $0.25 + 0.10 + 0.15 + 0.05 + 0.20 + 0.10 = 0.85$ A

Total length of power cables: 300 meters

Maximum current of the thick cable (300 m): 1.03 A (found on the graph in Table 3-8)

In this example, it is apparent that the power supply can feed power to all of the nodes because the total current consumption of the nodes does not exceed the maximum current capacity found on the graph.

- (2) Method 2: Calculating a voltage drop from the resistance of the communication cable and the current consumption by using equations

This method can be used when the result obtained using Method 1 does not meet the given condition.

This method calculates voltage drops based on the actual node arrangement and power supply location, and verifies your plan.

Verification using equations

The DeviceNet standard prescribes that the maximum allowable voltage drop in each of the paired power wires (V_+ and V_-) be 5 V, which is a drop from the specified voltage (24 V DC) of the communication power supply and from the specified input voltage (11 to 25 V DC) of the power to communications devices. Figure 3-22 is a graphical representation of these voltage drops.

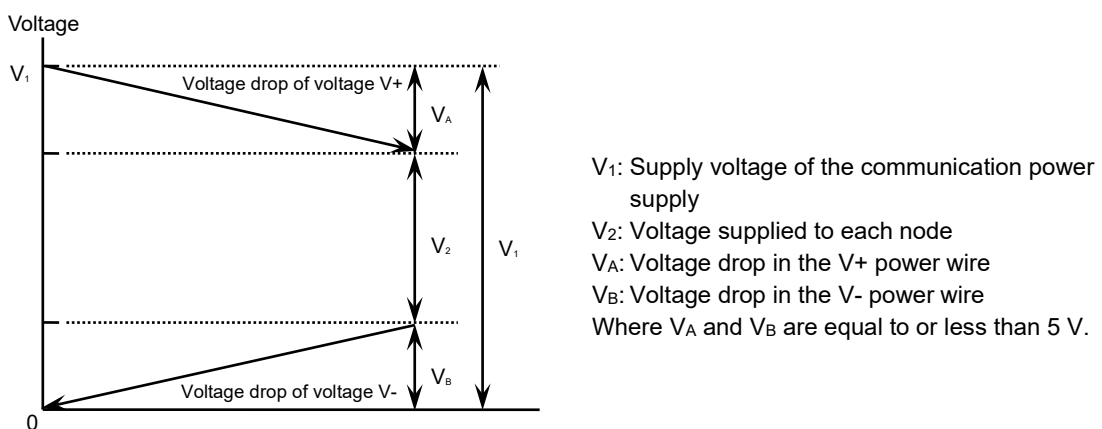


Figure 3-22 Voltage drops

3. Mounting and Wiring

The DeviceNet standard also prescribes a communication power supply that has an output of 24 V DC and a tolerance of 4.0%. Therefore, the voltage V_1 used in actual applications is 23 V, which allows for the tolerance. Further, the voltage drops in power wires V+ and V- are prescribed to be 5 V or less.

Therefore, the voltage V_2 supplied to each node is made equal to or greater than 13 V. This voltage has an adequate margin compared with the minimum supply voltage (11 V) supplied to each node.

The permissible voltage drop (5 V) in each of V+ and V- consists of a permissible voltage drop in the trunk cable and that in the branch cables, which are calculated as follows:

- Calculation of a permissible voltage drop in the branch cables

The current, I, flowing through the branch cables is calculated from the maximum current capacity and the maximum allowable branch cable length of 6 m, as follows:

$$I = 4.57/6 = 0.761 \text{ (A)}$$

The resistance, R, of the maximum allowable branch cable length is calculated from the maximum resistance for a thin cable of 0.069Ω per m, as follows:

$$R = 0.069 \times 6 = 0.414 \text{ (\Omega)}$$

Therefore, the permissible voltage drop in the maximum allowable branch cable length is:

$$IR = 0.761 \times 0.414 = 0.315 \text{ (V)}$$

The final voltage drop in the branch cables is 0.33 V, allowing for a margin.

- Calculation of a permissible voltage drop in the trunk cable

The permissible voltage drop in each of the power wires (V+ and V-) in any DeviceNet system is prescribed to be 5 V, so the permissible voltage drop in the trunk cable is calculated by:

$$5.0 - 0.33 = 4.67 \text{ (V)}$$

Based on the preceding calculated values of the permissible voltage drop in the trunk cable (4.67 V) and permissible voltage drop in the branch cables (0.33 V), you can perform verification as follows.

- Verification expression of a voltage drop in the trunk cable

$$\Sigma(L(n) \times R(c) + N(t) \times 0.005) \times I(n) \leq 4.67$$

where:

L(n): Distance between the power supply and a given node
(excluding the branch cable length)

R(c): Maximum cable resistance
(0.015Ω per m for thick cable or 0.069Ω per m for thin cable)

N(t): Number of branch taps between the node and the communication power supply

I(n): Current consumption required in the communications section of the node

0.005Ω : Contact resistance of branch tap

If the preceding verification expression is applicable, the power supply at your planned location can supply power to every node on the trunk cable. Note that the total current consumption of the nodes does not exceed the maximum current capacity of the trunk cable (8 A for thick cable or 3 A for thin cable).

If the preceding verification expression is not applicable, take the following measures:

- Replace the thin cable (if used) with a thick cable and evaluate the verification expression again.
- Move the communication power supply toward the center of the trunk cable so that the nodes are divided into two groups on the left and right sides of the power supply. Then, evaluate the verification expression for each of the left and right trunk cables again.
- Assume that the nodes are already arranged on both sides of the communication power supply, and the verification expression is not applicable for the nodes on one side. In this case, move the communication power supply toward the farthest end of the trunk cable on that side, and evaluate the verification expression for each of the left and right trunk cables again.
- Reposition nodes that consume a relatively large amount of current close to the communication power supply, and evaluate the verification expression again.

If the verification expression is still not applicable after all of the preceding measures are taken, divide the power supply system into two or more subsystems and provide a power supply for each of the subsystems.

<Example of using Method 2>

In the following example, the network is supplied power by connecting a single power supply to the center of a trunk cable of 240 m length (120 m on each side). The current consumption of each node on the trunk cable is shown in Figure 3-23.

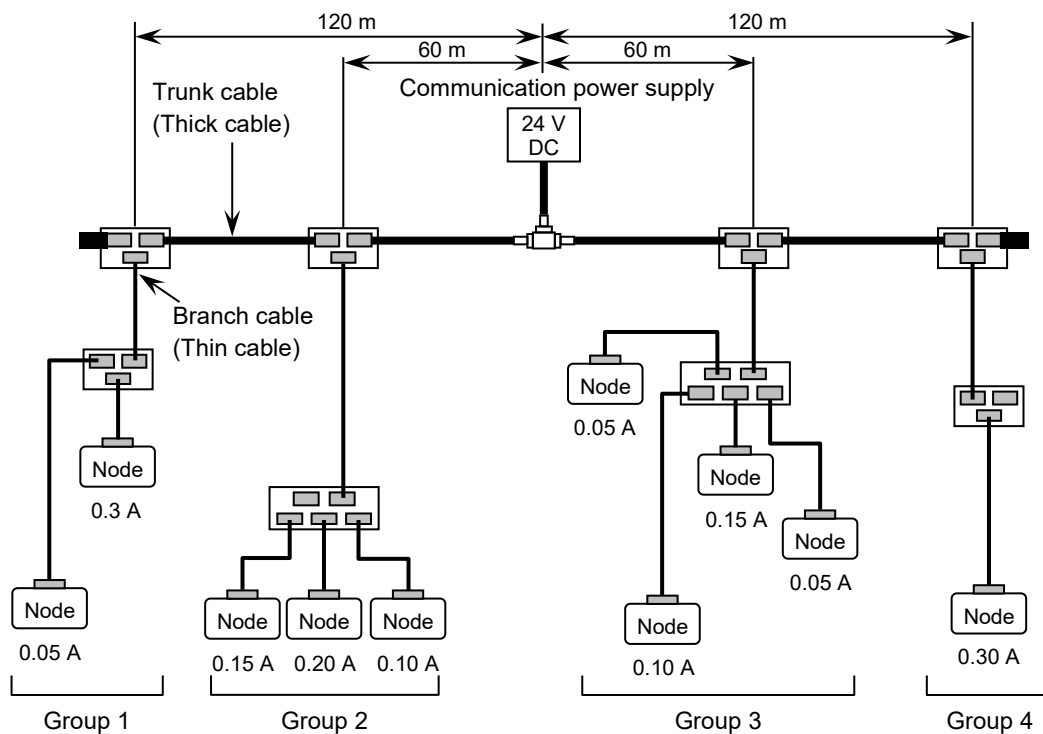


Figure 3-23 Example of a power supply and nodes connection for Method 2

3. Mounting and Wiring

To calculate the left side of the verification expression, a voltage drop in each group must be calculated:

Left side of the trunk cable:

Voltage drop in group 1: $(120 \times 0.015 + 2 \times 0.005) \times 0.35 = 0.634 \text{ V}$

Voltage drop in group 2: $(60 \times 0.015 + 1 \times 0.005) \times 0.45 = 0.407 \text{ V}$

Total voltage drop in the left trunk cable = $0.634 + 0.407 = 1.041 \text{ V}$

Right side of the trunk cable:

Voltage drop in group 3: $(60 \times 0.015 + 1 \times 0.005) \times 0.35 = 0.317 \text{ V}$

Voltage drop in group 4: $(120 \times 0.015 + 2 \times 0.005) \times 0.30 = 0.543 \text{ V}$

Total voltage drop in the right trunk cable = $0.317 + 0.543 = 0.860 \text{ V}$

The preceding information shows that the verification expression is applicable for both sides, meaning that the power supply can supply power to all the nodes in the network.

Notice

- If power feeding is changed to use multiple communication power supplies by dividing the power system in consideration of the location of a communication power supply, you must verify the operation of each communication power supply. Specifically, you need to verify that power can be fed in accordance with *3.4.5 Communication power supply location considerations*.

3.4.6 Grounding specification

The grounding of transmission lines must be done at a single point. To meet this condition, you have to insulate electrically the communication section of each node connected to the transmission line and ground the individual nodes at one point, as shown in the following figure. If multiple communication power supplies need to be used in the network, select one of the power supplies and ground the shield wire and the V- power wire of the transmission line via the selected power supply. Figure 3-24 shows an example of the grounding specification.

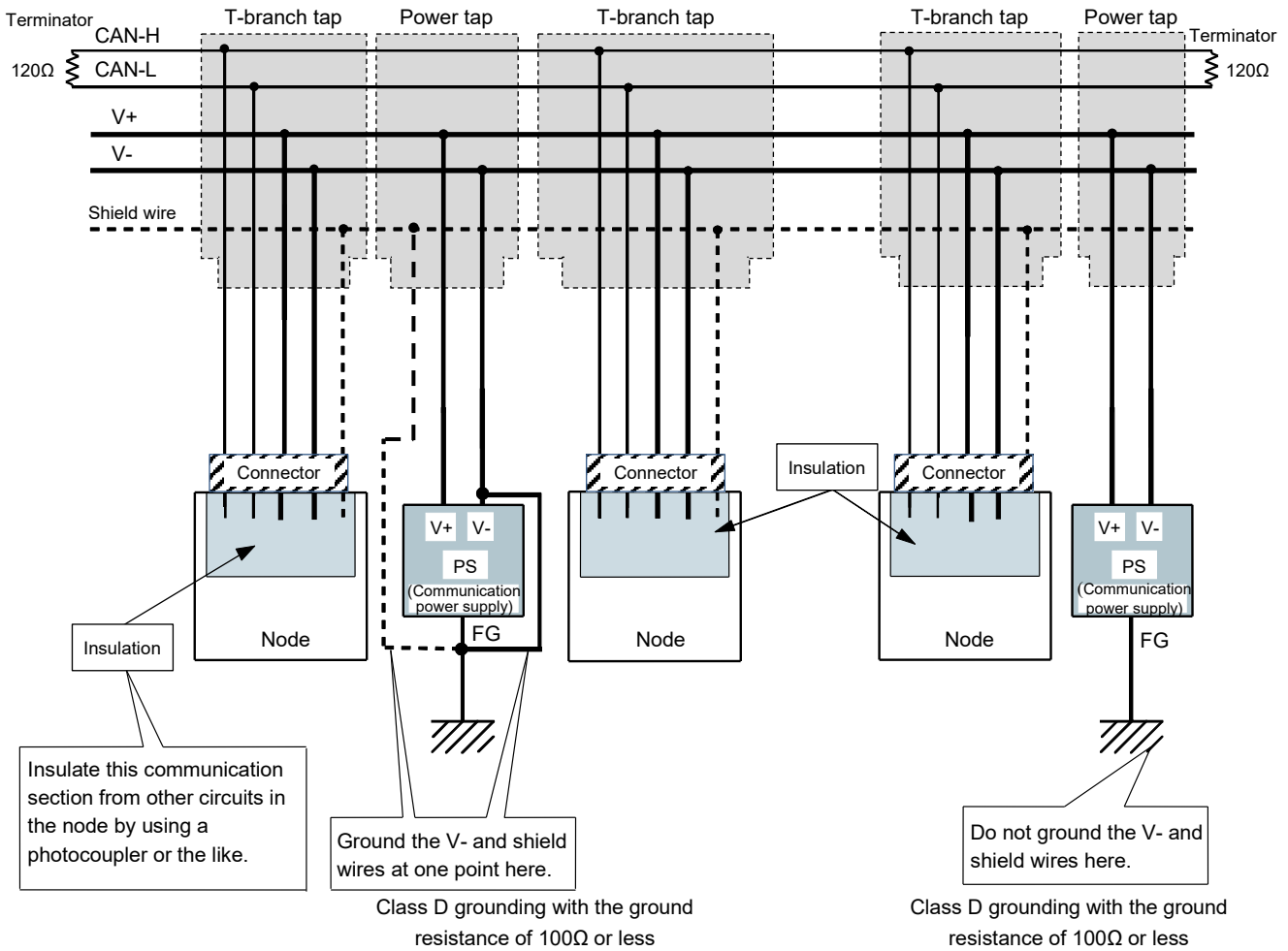


Figure 3-24 Example of grounding specification

3. Mounting and Wiring

3.4.7 Precautions for use in an environment subject to electromagnetic noise

When using the D.NET module in places where the electromagnetic noise level is high, we recommend that you take the following measures.

- (1) If the D.NET module needs to be connected to noise-inducing equipment, such as an inverter
 - Ground the shield wire (SHD) of the DeviceNet cable at the noise source. The protective grounding terminal (\oplus) of the S10VE must be grounded at a point away from the grounding point of the noise source.

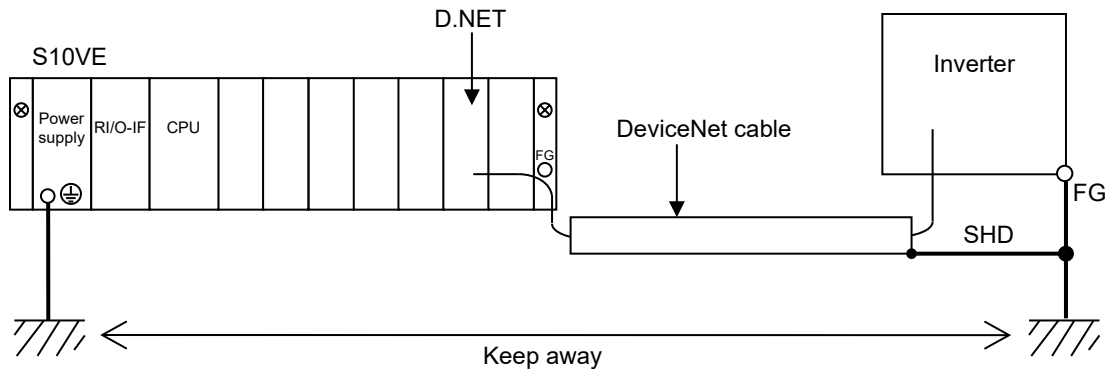


Figure 3-25 Separating grounding location

- Attaching a ferrite core to the DeviceNet cable might improve the noise tolerance of the D.NET module. The ferrite core must meet the following conditions:
 - It must attenuate the frequencies of noise generated by the noise source.
 - It must not attenuate the frequency band of transmission signals transmitted over the DeviceNet communication line (at 125 kbps to 500 kbps).

However, depending on their properties, some ferrite cores might attenuate such transmission signals significantly, resulting in a communication error. Therefore, care must be taken when attaching a ferrite core to the cable.

- (2) If the DeviceNet cable is laid near AC power cables
 - The DeviceNet cable duct or conduit must be kept away from AC power cable ducts and conduits. Additionally, these cables must be separated from each other as much as possible and grounded separately.

4. Operation

4.1 Installing and starting up the system

4.1.1 Notes on installation

D.NET SYSTEM/S10VE supports the Microsoft® Windows® 7 (64-bit) operating system and Microsoft® Windows® 10 (64-bit) operating system.

D.NET SYSTEM/S10VE must be installed from the CD of BASE SET/S10VE. The Microsoft Visual C++ 2010 redistributable package (x64) is a prerequisite program for operating BASE SET/S10VE. If you double-click `SETUP.exe` (in BASE SET/S10VE) with this program not installed, the following message appears and installation fails: *The program can't start because MSVCR110.dll is missing from your computer. Try reinstalling the program to fix this problem.* Install the Microsoft Visual C++ 2010 redistributable package (x64) in advance from the Microsoft download center. Before you attempt to install D.NET SYSTEM/S10VE, make sure that BASE SYSTEM/S10VE (software product model: S-7898-38) has been installed. If BASE SYSTEM/S10VE has not been installed, install it. D.NET SYSTEM/S10VE cannot be installed if BASE SYSTEM/S10VE has not been installed.

If you attempt to start BASE SET/S10VE with the Microsoft Visual C++ 2010 redistributable package (x64) not installed, the following error message appears during startup: *The program can't start because MSVCR110.dll is missing from your computer. Try reinstalling the program to fix this problem.* Then, BASE SET/S10VE terminates abnormally.

Notice

- To install or uninstall D.NET SYSTEM/S10VE, use the administrator account. Using the standard account might result in incorrect installation or uninstallation.
- Before installing D.NET SYSTEM/S10VE, terminate all Windows® programs, including resident programs in the memory (such as virus monitoring software). Installing D.NET SYSTEM/S10VE while any of these programs are running might cause an error. If an error occurs, uninstall the tool being installed, terminate all Windows® programs, and then reinstall the tool. For details about the uninstallation procedure, see *4.1.3 Uninstallation*.
- Do not specify, as the D.NET SYSTEM/S10VE installation folder, any of the following folders protected by User Account Control:
 - Program file folder (for example, C:\Program Files)
 - System root folder (for example, C:\Windows)
 - System drive root folder (for example, C:\)
 - Program data folder (for example, C:\ProgramData)

4.1.2 Installation

This subsection describes how to install D.NET SYSTEM/S10VE.

Before starting installation, log on to the system with an administrator account.

- (1) To install D.NET SYSTEM/S10VE, double-click `setup.exe` stored in the CD (BASE SET/S10VE).
- (2) After double-clicking `SETUP.exe`, the following message (Figure 4-1) might be displayed. Click the **Yes** button to start setup.

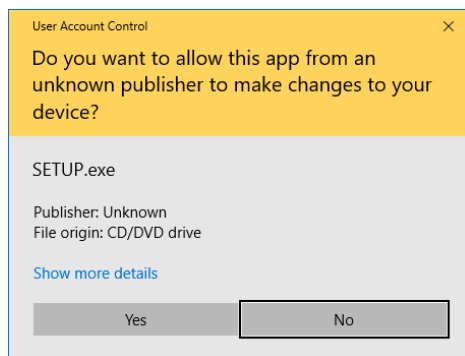


Figure 4-1 User Account Control message

- (3) In the SETUP window that appears (Figure 4-2), select D . NET SYSTEM/S10VE and then click the **Install** button.

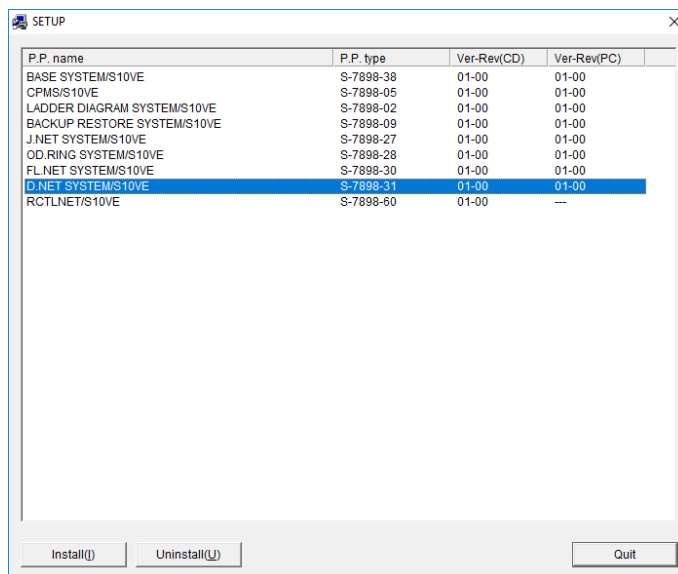


Figure 4-2 SETUP window

4. Operation

- (4) The D.NET SYSTEM/S10VE InstallShield Wizard window (Figure 4-3) appears. Click the **Next** button.

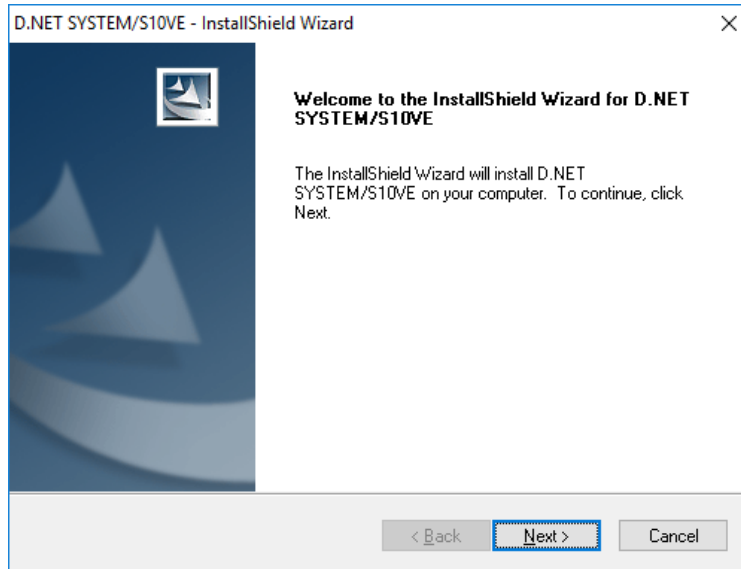


Figure 4-3 D.NET SYSTEM/S10VE InstallShield Wizard window

If you click the **Cancel** button, a message appears, asking whether you want to cancel setup. Click the **Yes** or **No** button.

Yes: Cancels installation of D.NET SYSTEM/S10VE.

In the InstallShield Wizard Completed window, click the **Complete** button.

No: Restarts installation of D.NET SYSTEM/S10VE.

- (5) The Choose Destination Location window appears. If necessary, change the installation folder, and then click the **Next** button.
- (6) The Setup Status window appears.
- (7) When the installation is complete, the InstallShield Wizard Completed window appears. Click the **Complete** button.

Notice

- D.NET SYSTEM/S10VE cannot be installed on a per-user basis. To install D.NET SYSTEM/S10VE successfully, you must first log on to the system with an administrator account.

D.NET SYSTEM/S10VE might not be installed properly in any of the following cases: 1)

Administrator permissions are acquired by using User Account Control[#] from a standard user account,

2) The administrator account was created from a standard user account by using User Account Control.

In this case, log on with the administrator account that was first created on your computer, and then reinstall D.NET SYSTEM/S10VE.

If you log on with a user account other than that used for installing D.NET SYSTEM/S10VE, the installed program might not appear in the program menu. In this case, log off and log on again with the administrator account that was first created on your computer, uninstall the installed program, and then install the program again.

When you want to create a new account, log on with an administrator account without using User Account Control.

[#]: User Account Control is a Microsoft Windows feature that temporarily grants administrative rights to standard user accounts.

4. Operation

4.1.3 Uninstallation

This subsection describes how to uninstall D.NET SYSTEM/S10VE.

Before starting uninstallation, log on to the system with the administrator account.

- (1) Click the **Start** button, and then open **Control Panel**. Click **Uninstall a program**, and then double-click D.NET SYSTEM/S10VE.

A confirmation message for uninstallation of D.NET SYSTEM/S10VE (Figure 4-4) appears. Click the **Yes** or **No** button.

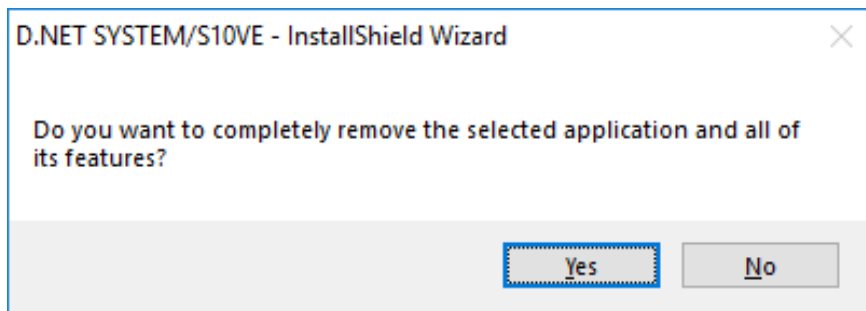


Figure 4-4 Confirmation message for uninstallation of D.NET SYSTEM/S10VE

Yes: Starts uninstallation.

No: Cancels uninstallation.

- (2) When the uninstallation is complete, a message indicating completion of uninstallation appears. Click the **Complete** button.

4.1.4 Reinstallation

To reinstall D.NET SYSTEM/S10VE, you must uninstall it, and then install it again. For details about the uninstallation procedure, see *4.1.3 Uninstallation*. For details about the installation procedure, see *4.1.2 Installation*.

4.1.5 Starting up the system

This subsection describes how to start up D.NET SYSTEM/S10VE.

(1) Starting up BASE SYSTEM/S10VE

Start up BASE SYSTEM/S10VE, and then create or select the target project. For details about how to start up BASE SYSTEM/S10VE and create or select a project, see the *S10VE User's Manual General Description* (manual number SEE-1-001).

(2) Selecting the command

From the **Program** menu of BASE SYSTEM/S10VE, click **Setting Tool**. The Setting Tool window (Figure 4-5) appears.

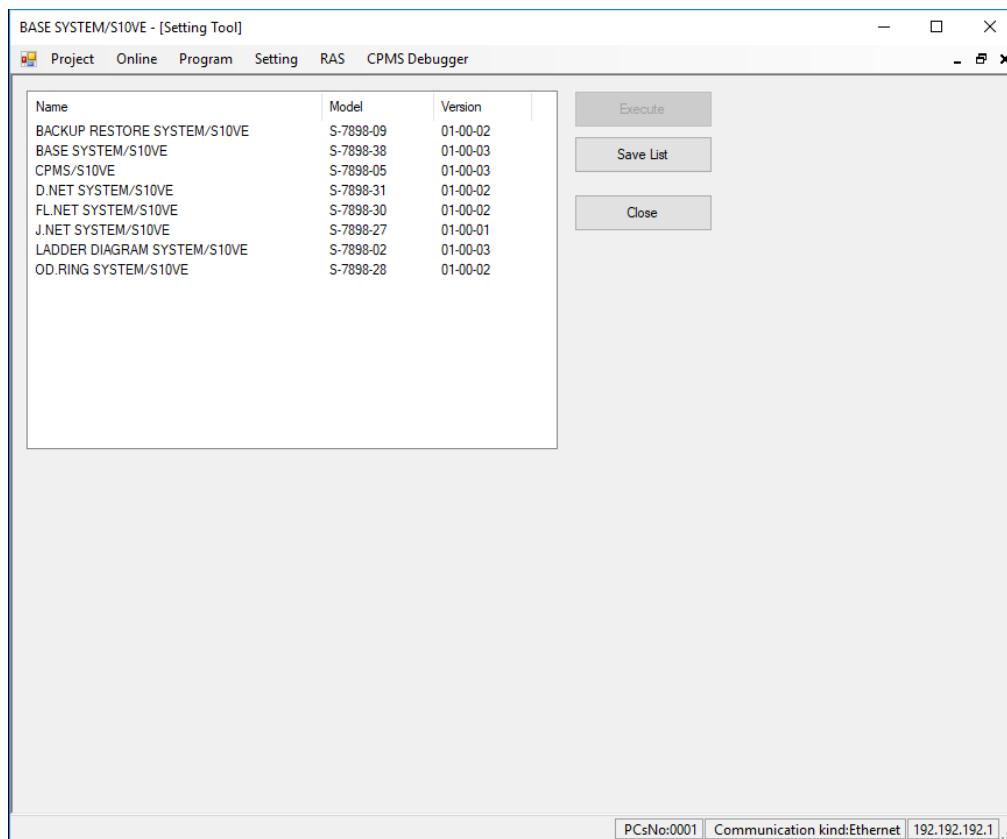


Figure 4-5 Setting Tool window of BASE SYSTEM/S10VE

4. Operation

(3) Starting up D.NET SYSTEM/S10VE

In the Setting Tool window (Figure 4-5), from the list box, select D.NET SYSTEM/S10VE, and then click the **Execute** button. The main window (Figure 4-6) appears.

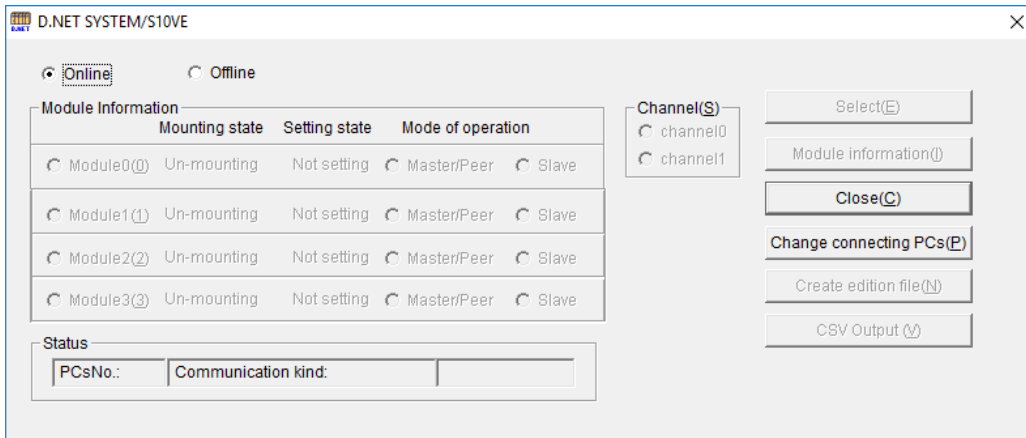


Figure 4-6 Main window (initial display)

In this state, PCs are not connected yet. To connect to PCs and then reference D.NET module settings or RAS information, see (4) *Startup in online mode*. To create or edit a D.NET module configuration information file without connecting to PCs, see (5) *Startup in offline mode*.

(4) Startup in online mode

(a) In the main window (Figure 4-6), select the **Online** radio button, and then click the **Change connecting PCs** button. The Communication type window (Figure 4-7) appears. Specify the IP address of the connection destination, and then click the **OK** button. (For details about how to select the communication type, see 4.1.6 *Changing connections*.)

The default communication type is the one last set by using the **Change connecting PCs** option of BASE SYSTEM/S10VE.

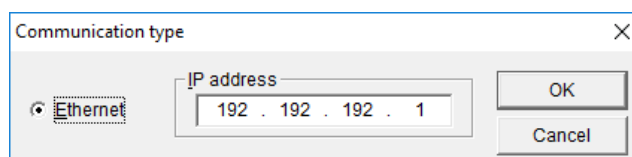


Figure 4-7 Communication type window

- (b) The display returns to the main window (Figure 4-8) in which module selection is possible. The current mounting and configuration information (mounting state, setting state, and operating mode) of the D.NET modules appears. If D.NET modules have been mounted or CPU module parameters have been set, module numbers (0 to 3) are displayed in gray or black. Information about the selected D.NET module is displayed in black. For unselected modules, information is displayed in gray. Modules that are neither mounted nor set are dimmed and cannot be selected.

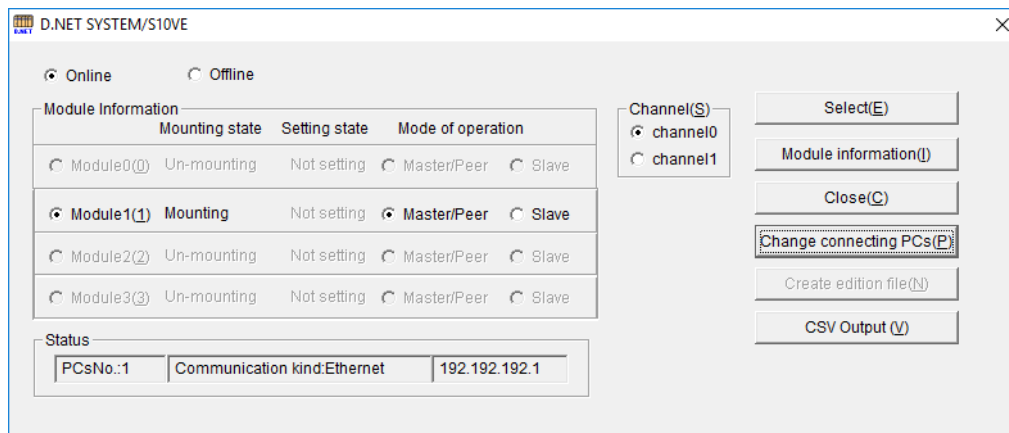


Figure 4-8 Main window (online mode)

Select a valid module number and channels, and then click one of the following buttons:

Select:

Use this button to read, edit, and reconfigure parameters set to the CPU module or D.NET module. For details, see *4.2.3 Channel numbers and operation mode selection*.

Module information:

Use this button to acquire the current mounting state of each D.NET module and update the display content of the main window. For details about the mounting state, see *4.2.2 D.NET system main window*.

CSV Output:

Use this button to output (to a file in a CSV format) the parameters set in the CPU or each D.NET module. For details, see *4.2.13 CSV output*.

4. Operation

(5) Startup in offline mode

In offline mode, you can edit an existing configuration information file of a D.NET module or create a new one even if there is no actual machine. Use such a configuration information file to send configuration information through the data transmission/reception function of BASE SYSTEM/S10VE.

(a) In the main window (Figure 4-8), select the **Offline** radio button.

The **Change connecting PCs** button changes to the **Edition file select** button.

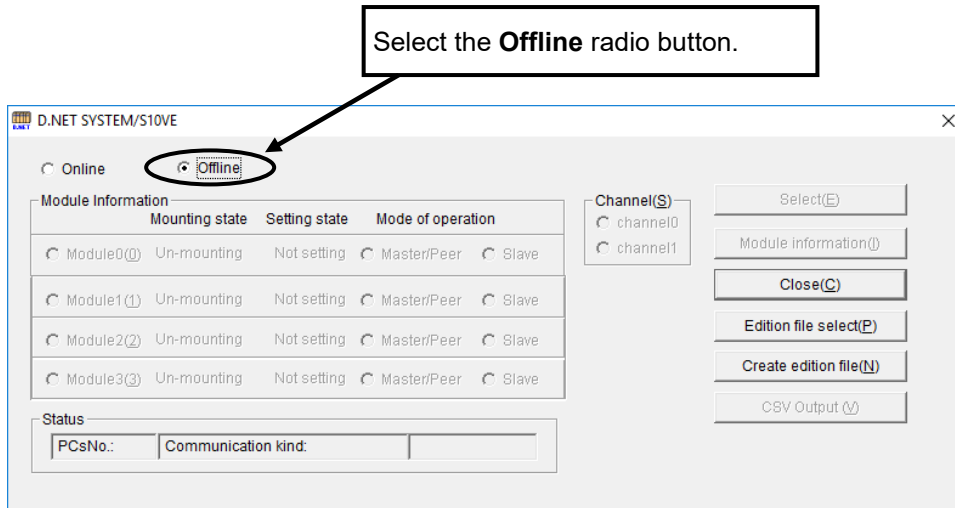


Figure 4-9 Main window ([Offline] radio button selected)

Click one of the following buttons:

Edition file select:

Use this button to edit an existing configuration information file.

For details, see *4.1.7 Selecting an edition file.*

Create edition file:

Use this button to create a new configuration information file.

For details, see *4.1.8 Creating an edition file.*

4.1.6 Changing connections

Function: Sets the PCs-to-personal computer communication type.

Operation: The following describes the operation procedure.

- (1) In the main window (Figure 4-6), click the **Change connecting PCs** button.
- (2) The Communication type window (Figure 4-10) appears.

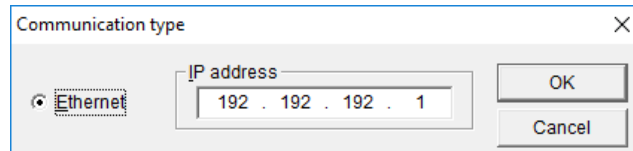


Figure 4-10 Communication type window (initial display)

- (3) Enter the IP address of the connection destination.
- (4) Click the **OK** button. The module information (mounting state, setting state, and operating state) read from the PCs based on the IP address entered in step (3) is applied to the main window.
If you click the **Cancel** button, the module information read from the PCs based on the IP address prior to step (3) is applied to the main window.

4. Operation

4.1.7 Selecting an edition file

Function: Selects an existing D.NET configuration information file to be edited. This function works in the offline mode.

Operation: The following describes the operation procedure.

- (1) In the main window (Figure 4-8), select the **Offline** radio button.
- (2) Click the **Edition file select** button to select a file to edit.

The Open window (Figure 4-11) appears.

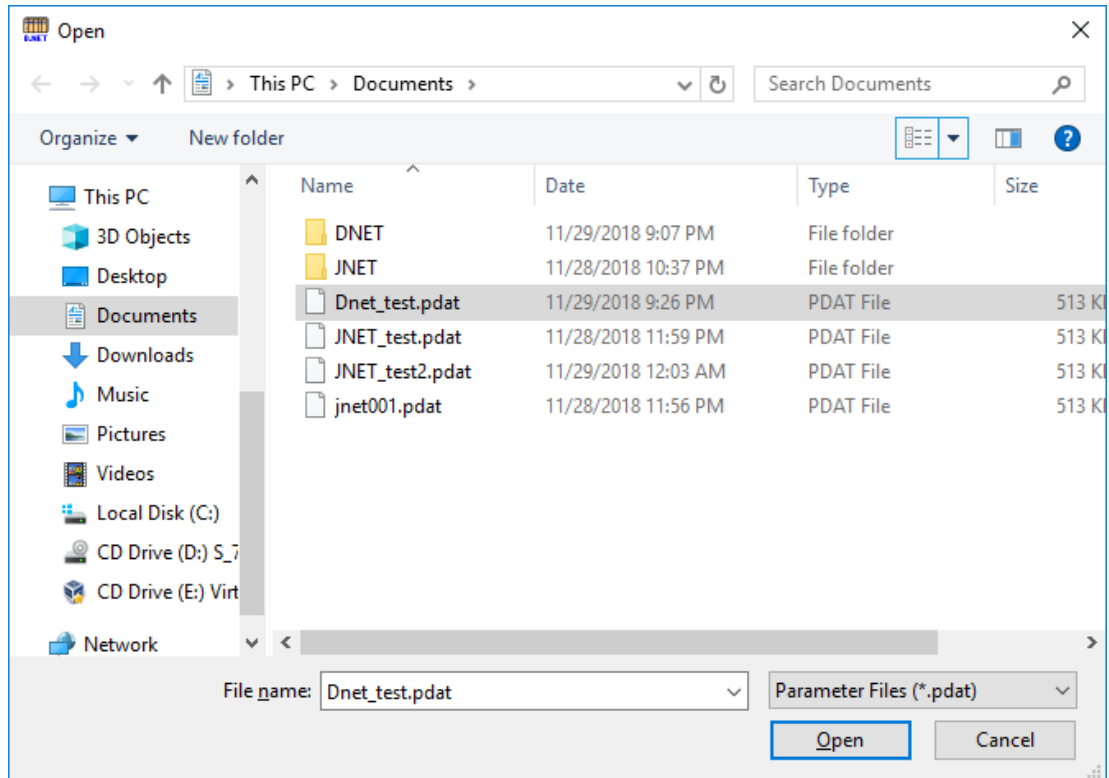


Figure 4-11 Open window

- (3) In the Open window (Figure 4-11), select a file to be edited, and then click the **Open** button. When the Select File window (Figure 4-12) appears, click the **Select File** button.

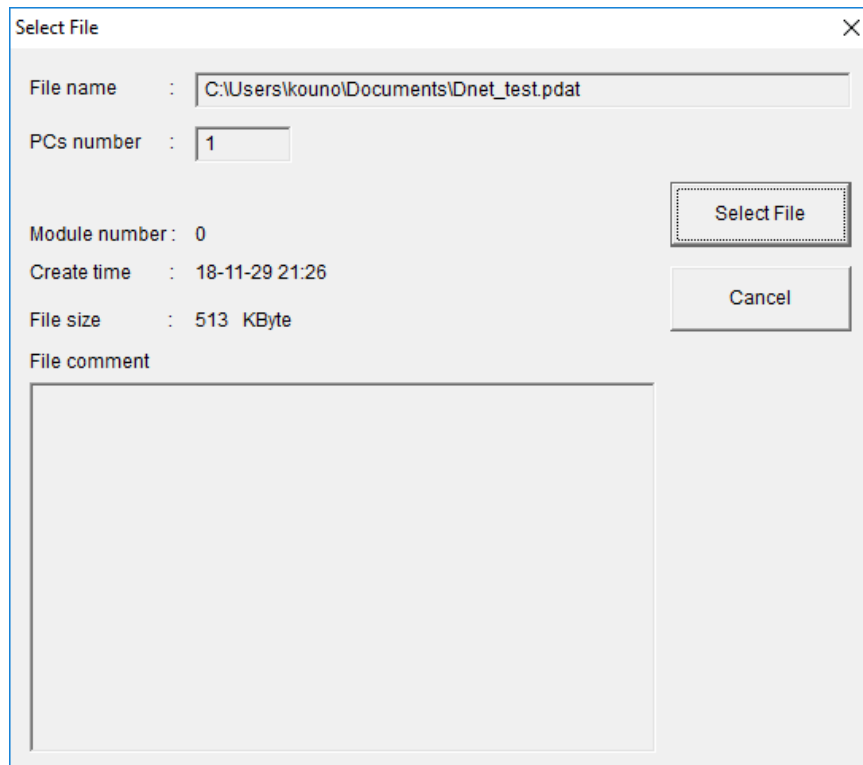


Figure 4-12 Select File window

For details about subsequent operations, see *4.2 Commands*.

4. Operation

4.1.8 Creating an edit file

Function: Creates a new D.NET module configuration information file. This function works in the offline mode.

Operation: The following describes the operation procedure.

- (1) In the main window (Figure 4-8), select the **Offline** radio button.
- (2) Click the **Create edition file** button. The Save As window (Figure 4-13) appears.

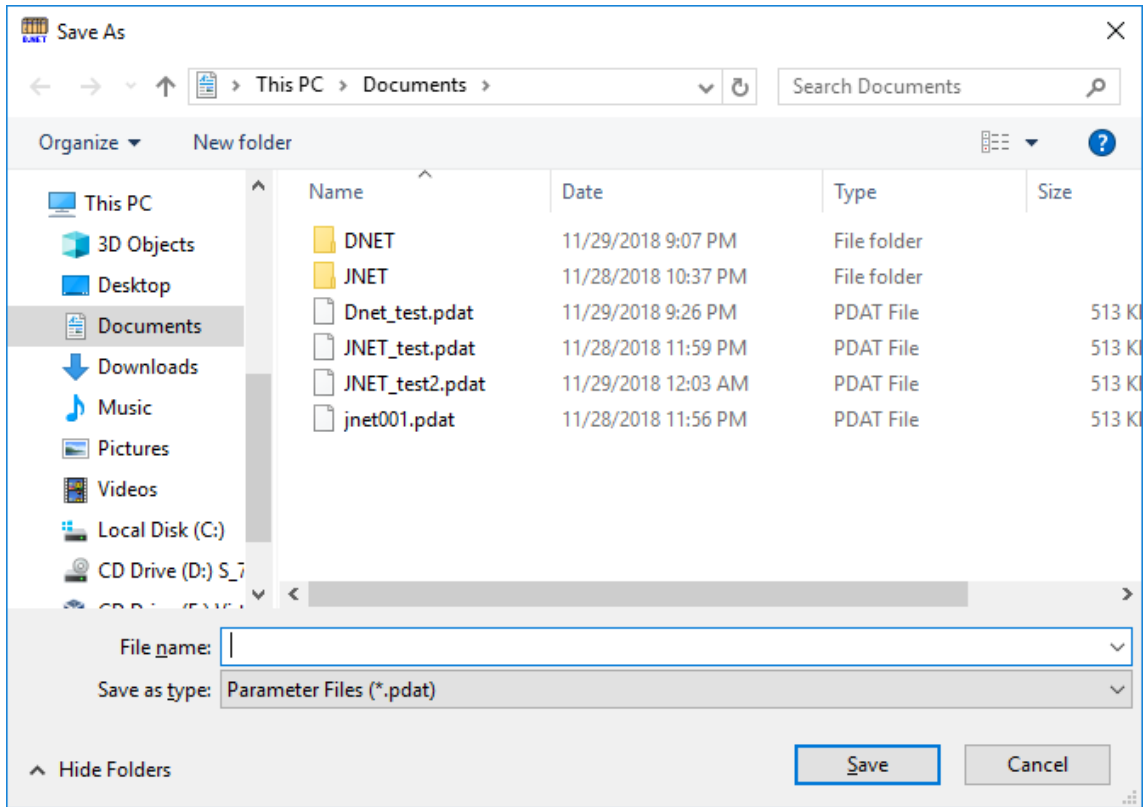


Figure 4-13 Save As window

- (3) Enter a name for the new file, and then click the **Save** button.

When the Creation confirmation window (Figure 4-14) appears, specify a PCs number, select a module (module number), enter a file comment, and then click the **Save File** button.

Figure 4-14 Creation confirmation window

- **PCs number**

Specify the PCs number. By default, the PCs number of the project selected by BASE SYSTEM/S10VE is displayed.

Setting range	0 to 9999
---------------	-----------

- **Module selection**

Select a D.NET module number. Select one of the radio buttons, **Module 0** to **Module 3**.

4. Operation

- **File comment**

You can enter any comment about the file by using a maximum of 512 characters.

For details about subsequent operations, see *4.2 Commands*.

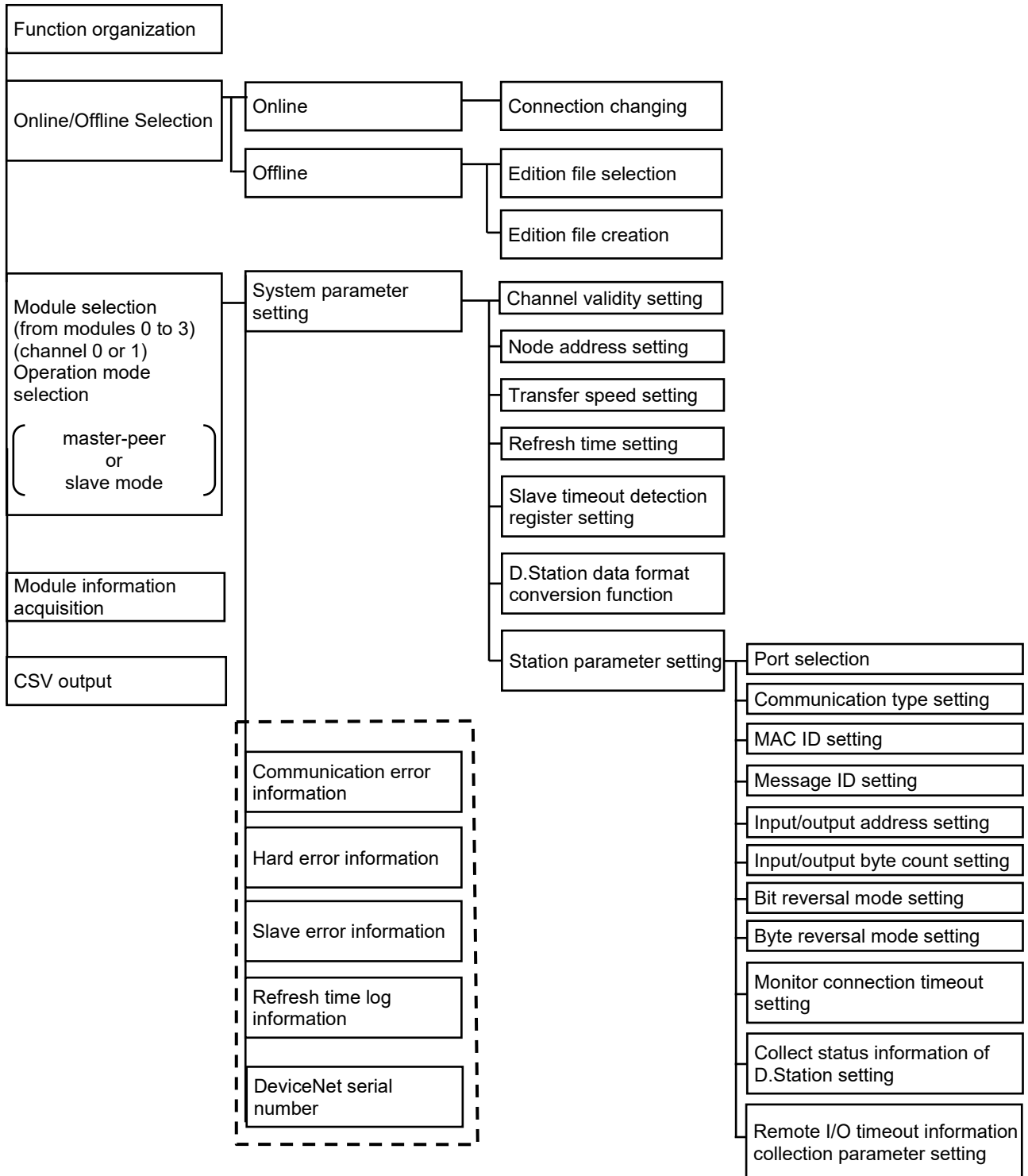
4.1.9 Closing the system

In the main window (Figure 4-6), click the **Close** button.

4.2 Commands

4.2.1 Organization of D.NET SYSTEM/S10VE functions

Figure 4-15 shows the organization of D.NET SYSTEM/S10VE functions.



: Indicates that the functions enclosed can be used only when D.NET SYSTEM/S10VE is running in online mode.

Figure 4-15 Organization of D.NET SYSTEM/S10VE functions

4. Operation

4.2.2 D.NET system main window

The following describes the contents of the main window (Figure 4-16).

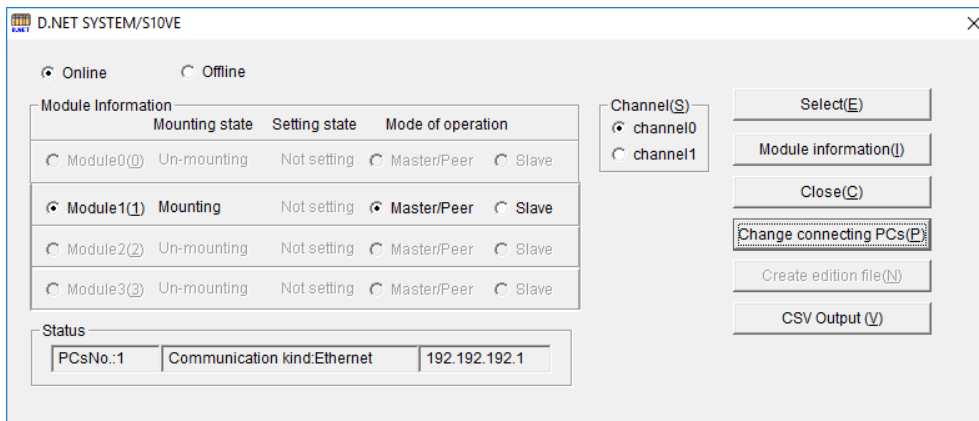


Figure 4-16 Main window

- Status display

In the **Status** area, information shown in *Table 4-1 Status display* is displayed.

Table 4-1 Status display

No.	Item	Not connected / not selected [#]	Offline state	Online state
1	PCsNo.	Blank	File information	Actual machine information
2	Communication kind	Blank	Blank	Ethernet and IP address

[#]: When **Online** is selected, the S10VE is not connected.

When **Offline** is selected, no edition file is selected.

- Mounting state and Setting state display (online mode)

Table 4-2 shows the information displayed for **Mounting state** and **Setting state** in the **Module selection** area.

Table 4-2 Mounting state and setting state display in online mode

No.	D.NET module mounted?	CPU module parameter set?	Mounting state display	Setting state display	Receiving source
1	Yes	Yes	Mounting	Setting	Selected from the Receiving agency selection window
2		No		Not setting	D.NET module
3	No	Yes	Un-mounting	Setting	CPU module
4		No		Not setting	Reception not possible

Receiving source indicates the module from which parameters to be edited are read.

- Mounting status and Setting state display (offline mode)

Mounting state displays **Mounting**, and **Setting state** displays **Setting**.

If no module is mounted and the CPU module is not set with any parameter, you cannot edit parameters online. Editing parameters online is enabled when a module is mounted or after a parameter that is edited offline is sent by using the data transmission/reception function of BASE SYSTEM/S10VE.

4. Operation

4.2.3 Channel numbers and operation mode selection

- (1) In the main window shown in Figure 4-16, select the desired module number (according to the MODU No. setting switch of the D.NET module), channel number, and operation mode, and then click the **Select** button. Select the operation mode depending on the communication mode you use as listed in the following table. (For details about the available communication modes, see *1.2.3 Communication specifications*.) You cannot select different operation modes for the two channels (0 and 1). That is, changing the operation mode of a selected channel automatically sets the same operation mode of the other channel. This automatic change of operation mode takes place when the **Write** button is clicked in the Setup system parameters window shown in Figure 4-19.

In offline mode, you cannot change a module number that was specified during creation of an edit file.

Table 4-3 Selectable operation modes

Communication mode	Operation mode	Applied communication mode
Master	Master-peer mode	Poll, bit strobe transmission, and bit strobe reception
Peer	Master-peer mode	Peer transmission and peer reception
Slave	Slave mode	Poll

To update the module information that appears in the main window, click the **Module information** button.

- (2) Select the module number, operation mode, and channel number from the main window, and then click the **Select** button. The menu list window shown in Figure 4-17 appears. The title bar of the basic window provides information about the microprogram version, module number, operation mode, and channel number for the selected D.NET module.

In the title bar display, M0 to M3 refers to module 0 to module 3, and CH0 to CH1 refers to channel 0 to channel 1.

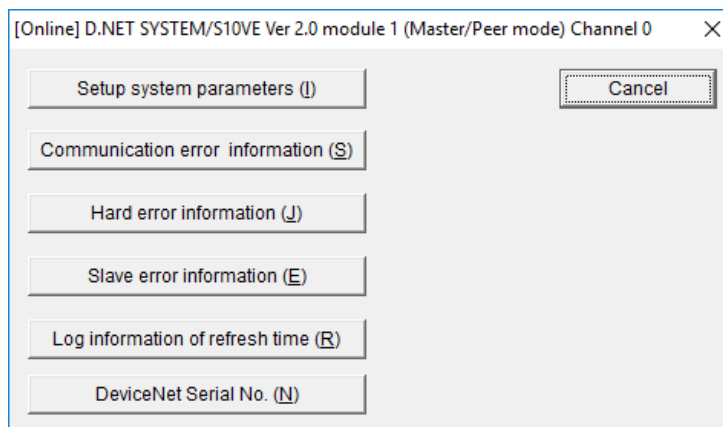


Figure 4-17 Menu list window

4.2.4 System parameter setting

Function: Specifies the system parameters. The system parameters you can set here are mainly as follows: parameters related to refresh time and parameters related to slave timeout detection registers. The setting of a refresh time automatically determines the polling cycle for peer transmission and master/slave communication.

Operation: The following describes the operation procedure.

- (1) In the menu list window (Figure 4-17), click the **Setup system parameters** button.

In online mode, if a D.NET module is mounted and CPU module parameters are set, the Receiving agency selection window (Figure 4-18) appears. In this window, select the CPU module or option module (D.NET module), and then click the **OK** button. If a D.NET module is not mounted or if CPU module parameters are not set, the Receiving agency selection window does not appear. In this case, parameters will be read from the D.NET module or CPU module that is automatically selected.

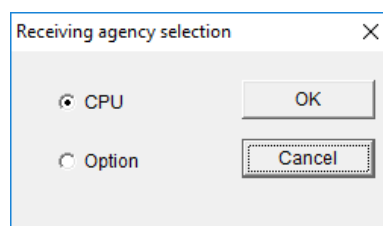


Figure 4-18 Receiving agency selection window

- (2) Set the desired system parameters according to the following procedures.

The Setup system parameters window varies in its appearance, content, and settable items, depending on the operation mode. Figures 4-19 and 4-20 show the Setup system parameters window in master-peer mode and in slave mode, respectively.

4. Operation

<When the master-peer mode is selected>

[Online] Setup system parameters Ver 2.0 module 1 (Master/Peer mode) Channel 0

Channel effective(E)

Node Address(H)
0 (0-63)

Transmission speed(B)
 125kbps 250kbps 500kbps

Peer refresh time(P) 100 (3ms - 1000ms)

Master/Slave refresh time(M) 100 (3ms - 1000ms)

Slave timeout detection register(E) No use(N)

Setup station parameters (S) Setup data format conversion of D.STATION (D)

Write Cancel

Figure 4-19 Setup system parameters window (master-peer mode)

- Channel validity setting
Enable or disable the selected channel. When you clear the **Channel effective** check box, the channel is disabled and no DeviceNet communication is performed through the channel.
- Node address setting
Set the desired node address. The node address set for one channel (0 or 1) can be the same as that for the other channel.

Setting range
0 to 63

- Transfer speed setting
Set the desired transfer speed (baud rate) by clicking one of the radio buttons **125kbps**, **250kbps**, or **500kbps**. The transfer speed selected for one channel (0 or 1) need not be the same as that for the other channel.
- Peer refresh time setting
Specify a cycle time at which the D.NET module transfers send/receive data to or from the I/O area in the CPU module during peer-to-peer communication.
Do not set a peer refresh time shorter than the communication time calculated in section 5.4.

Setting range
3 to 1,000 ms (in units of 1 ms)

- Master/Slave refresh time setting

Specify a cycle time at which the D.NET module transfers send/receive data to or from the I/O area in the CPU module during master-slave communication.

Do not set a master/slave refresh time shorter than the communication time calculated in section 5.4.

Setting range
3 to 1,000 ms (in units of 1 ms)

The set value of this refresh time automatically determines the peer transmission cycle and the polling cycle for master/slave communication.

The system operates on the assumption that the set value of this refresh time is equal to the transmission cycle.

Notice

- Set a refresh time so that the following conditions are met:

The number of transmission frames per 10 ms must be within 16 frames (transfer speed = 500/250 kbps).

The number of transmission frames per 10 ms must be within 8 frames (transfer speed = 125 kbps).

The number of transmission frames (8 output bytes or less) = 1 frame,

(9 output bytes or more) = output byte count ÷ 7 (round up a fraction)

- The D.NET communication capability might be exceeded, resulting in a transmission cycle delay. Do not set a master/slave refresh time and peer refresh time shorter than the communication time calculated in section 5.4.

4. Operation

- Slave timeout detection register setting

Slave timeout detection registers can be used to store information about the occurrence of response timeouts during master-slave communication (poll and bit strobe). (For details, see 5.2 *Slave timeout flags*.) The storage locations are in the I/O area (setting ranges of 64 points listed in the following table) of the CPU module and can be referenced from ladder programs. If you do not require this function, select the **No use** check box.

Setting range	XW0000 to XWFFC0 YW0000 to YWFFC0 JW0000 to JWFC0 QW0000 to QWFFC0 GW0000 to GWFC0 RW0000 to RWFC0 EW0400 to EWFFC0 MW0000 to MWFFC0 LBW0000 to LBWFFC0
---------------	---

Note: When setting slave timeout detection registers, make sure that you do not set the same range of such registers for more than one D.NET module or channel.

<When the slave mode is selected>

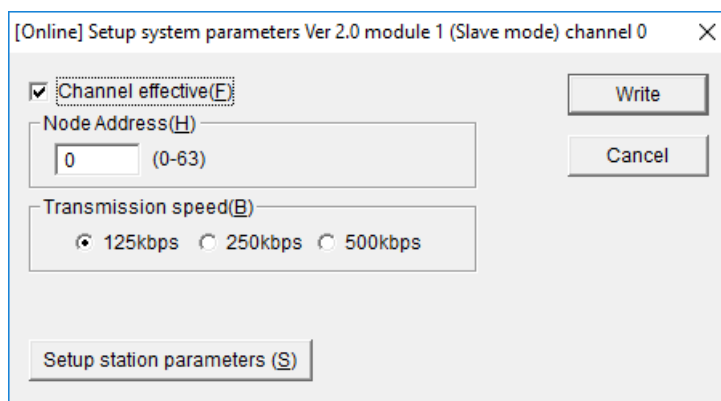


Figure 4-20 Setup system parameters window (slave mode)

- Channel validity setting
Enable or disable the selected channel. When you clear the **Channel effective** check box, the channel is disabled and no DeviceNet communication is performed through the channel.
- Node address setting
Set the desired node address. The node address set for one channel (0 or 1) can be the same as that for the other channel.

Setting range
0 to 63

- Transfer speed setting
Set the desired transfer speed (baud rate) by clicking one of the radio buttons **125kbps**, **250kbps**, or **500kbps**. The transfer speed selected for one channel (0 or 1) does not need to be the same as that for the other channel.

Note: In slave mode, the D.NET module sends back a polling response as soon as it receives a polling request from the master with which it has a connection established. Therefore, the transmission cycle used by the D.NET module does not depend on the master/slave refresh time used in slave mode. In this mode, the transmission cycle is determined based on the one used by the master that has a connection established with the D.NET module running in slave mode.

4. Operation

4.2.5 Station parameter setting

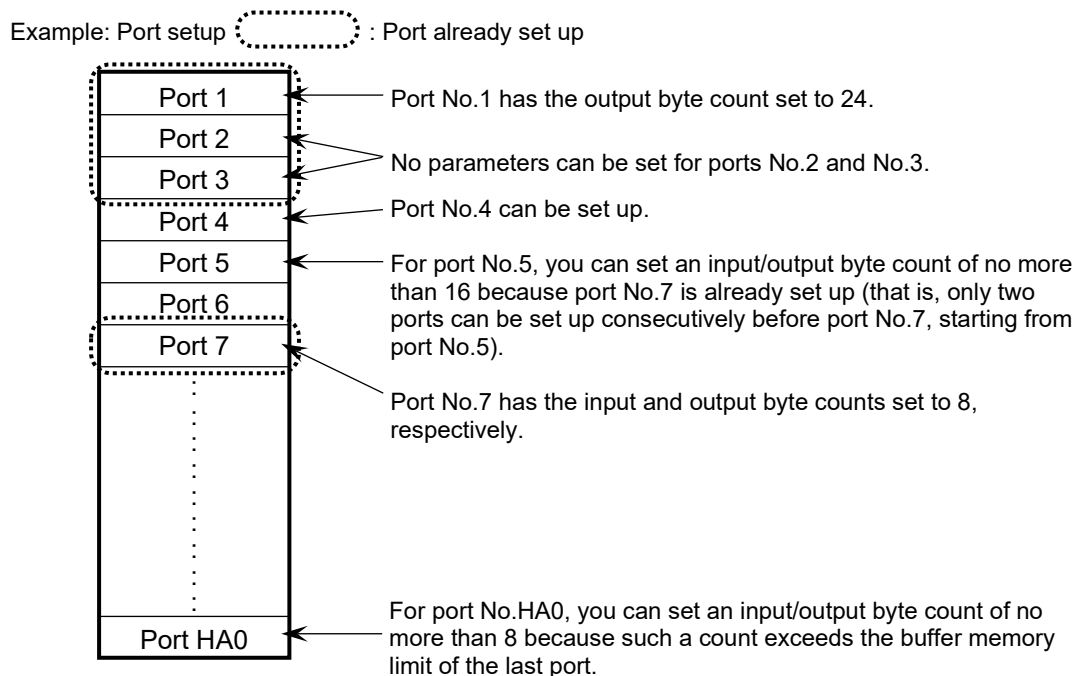
Function: Specifies the station parameters. The Setup station parameters window varies in its appearance, content, and settable items, depending on the operation mode.

Operation: The following describes the operation procedure.

(1) When the master-peer mode is selected

Communication setup for the D.NET module is made by assigning its related station parameters to a port number. You can specify any port number in the range from H01 to HA0 (a total of 160 ports), which can be selected at random.

The D.NET module includes two fixed-size communication buffers for each port: an 8-byte buffer for transmission and an 8-byte buffer for reception. Therefore, if the set input/output byte count exceeds 8 bytes, multiple successive ports are used. For example, if the output byte count is set to 24, the three consecutive ports No.1 through No.3 are employed (because 8 bytes per port times 3 is 24 bytes). In this case, you need only set the parameters for port No.1 (ports No.2 and No.3 cannot be set).



- If you want to set up multiple ports with input and output byte counts more than 8, make sure no overlap occurs between the setups of those ports.
- Set up ports so that the buffer memory limit of the last port (No. HA0) is not exceeded.

- (a) In the Setup system parameters window (Figure 4-19), click the **Setup station parameters** button.
- (b) The Setup station parameters window (master-peer mode) appears as shown in Figure 4-21.

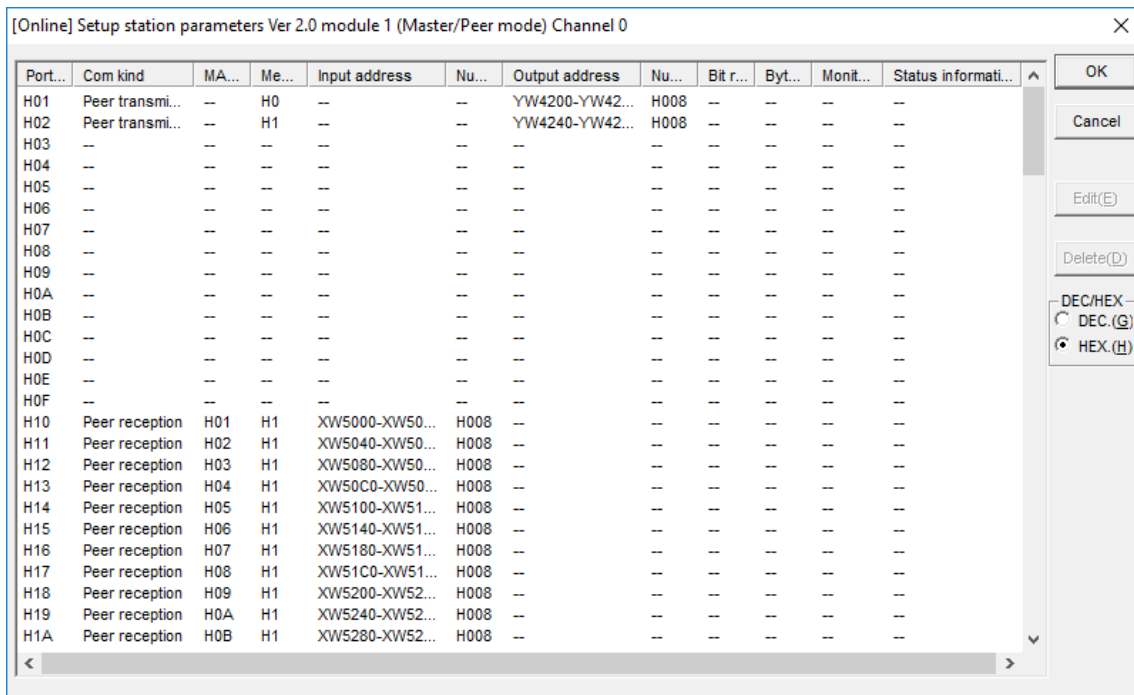


Figure 4-21 Setup station parameters window (master-peer mode)

In the preceding window, all of the port numbers, MAC IDs, message IDs, input byte counts, and output byte counts are displayed in hexadecimal notation by default. If you select the **DEC.** radio button in the **DEC/HEX** group box, those items are displayed in decimal notation. If you select the **HEX.** radio button in the **DEC/HEX** group box, those items are displayed in hexadecimal.

Note: The values of **Monitor connection timeout** are always displayed in decimal.

4. Operation

- (c) Choose the port number you want to use, and then click the **Edit** button. The Parameter edit window (Figure 4-22) appears.

Figure 4-22 Parameter edit window

When specifying station parameters in the window shown in Figure 4-22, you can select the notation for some items. MAC IDs, message IDs, input byte counts, and output byte counts can be displayed in either hexadecimal or decimal notation by selecting the desired radio button in the **DEC/HEX** group box.

By default, these items are displayed in hexadecimal.

- **Communication kind**

The following communication modes can be selected:

Communication mode
No use
Peer transmission
Peer reception
Poll
Bit strobe transmission
Bit strobe reception

- Only one communication mode can be specified for any one single port.
- In master/slave communication, one slave uses 1 to 32 ports. The system provides 160 port numbers. However, the maximum number of slaves that can be registered is 63 because the available MAC IDs are limited to the range H0 to H3F.

- **MAC ID**

Specifies the MAC ID of a communication destination in peer reception or master/slave communication.

Setting range	0 to H3F	(hexadecimal)
	0 to 63	(decimal)

- **Message ID**

Use this item for peer-to-peer communication. Set any value in the following range.

Setting range	0 to HF	(hexadecimal)
	0 to 15	(decimal)

Note: If Peer reception is selected as the communication mode, the data to be received is determined by a combination of the MAC ID and message ID. For example, to receive data from a node for which the MAC ID, communication mode, and message ID are set to H3F, Peer transmission, and HF, respectively, use the following settings:

- Communication mode: Peer reception, MAC ID: H3F, Message ID: HF

Although a total of 160 port numbers are provided in the system, the ports that can be allocated for a particular mode of communication are limited as follows:

No.	Communication mode	Maximum number of ports allocated
1	Peer transmission	16
2	Peer reception	144
3	Poll	63
4	Bit strobe transmission	1
5	Bit strobe reception	63

The total number of ports allocated must satisfy the following condition:

Peer transmission + Peer reception + Poll + Bit strobe transmission + Bit strobe reception \leq 160

If an input/output byte count is set to 9 or higher, multiple ports need to be used. In this case, those ports must be counted as one port in the preceding calculation.

D.NET SYSTEM/S10VE performs a port allocation limitation check, so you do not need to perform this check.

4. Operation

- **Input address, Output address**

Specifies the starting and ending addresses of either a register to store input data or a register to store output data. Select each such address pair from among those in one of the setting ranges listed as follows, and then set it in the input address or output address box.

	Input address	Output address
Setting range	XW0000 to XWFFF0	XW0000 to XWFFF0
	YW0000 to YWFFF0	YW0000 to YWFFF0
	RW000 to RWFF0	RW000 to RWFF0
	MW0000 to MWFFF0	MW0000 to MWFFF0
	GW000 to GWFF0	GW000 to GWFF0
	EW0400 to EWFFF0	EW0400 to EWFFF0
	FW000 to FWBFF	FW000 to FWBFF
	DW000 to DWFFF	DW000 to DWFFF
	JW000 to JWFF0	JW000 to JWFF0
	QW0000 to QWFFF0	QW0000 to QWFFF0
		SW0000 to SWBFF0
	LBW0000 to LBWFFF0	LBW0000 to LBWFFF0
	LWW0000 to LWWFFFF	LWW0000 to LWWFFFF
	LXW0000 to LXW3FFF	LXW0000 to LXW3FFF

Note: Input/output address pairs (register) must be set so they do not overlap with those for other modules or channels.

- **Input bytes, Output bytes**

Specify the size in bytes of data to be transmitted to or from a remote station. Allowable data sizes are listed in the following table.

The setting range varies with the selected communication mode.

Communication mode	Setting range (in bytes)
Peer transmission	0 to H100 (hexadecimal) 0 to 256 (decimal)
Peer reception	
Poll	
Bit strobe transmission	0 or 8
Bit strobe reception	0 to 8

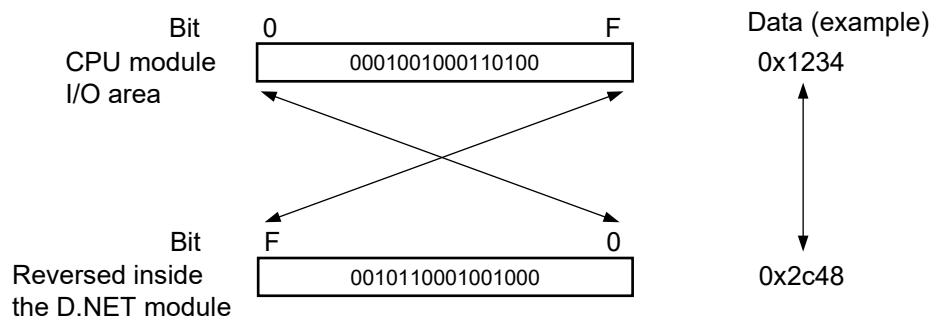
If the input or output byte count is set to a value greater than 8, the D.NET module performs fragment reception or fragment transmission.

- The input and output byte counts must always be specified. If you do not use them, set them to 0.
 - Specify these parameters only in units of bytes.
 - Even when the input or output byte count is set to 1, a 1-word area is used in the CPU memory area defined by a specified input/output address pair.
 - If the output byte count is set to a value greater than 8, the D.NET module performs fragment transmission (split transfer). If the input byte count is set to a value greater than 8, the D.NET module performs fragment reception.
- More specifically, if the D.NET module is used in master mode, it first checks the maximum sizes of send data and receive data to be exchanged with a destination slave. Then, if the relationship between the master and slave is not "fragment transmission - fragment reception" or "non-fragment transmission - non-fragment reception", the D.NET module does not establish a connection with the destination slave. When this occurs, slave error information is generated that includes one of the following slave status values (see 4.2.10 *Slave error information*):
- H31 (The produced connection size on the slave side supporting I/O Poll connections does not match the D.NET module.)
 - H32 (The consumed connection size on the slave side supporting I/O Poll connections does not match the D.NET module.)
- A connection is not established also when the following condition is not met: maximum transmission data size \leq maximum reception data size. Also in this case, the generated slave error information includes one of the preceding slave status values.
- If the D.NET module is used in peer mode, it does not check the data size. You must check the size of data to be exchanged with a destination device in advance.

4. Operation

• Bit reversal mode

Use this item when connecting a device whose input/output bit No. is different from the S10VE CPU module, such as a non-Hitachi slave. If you want to reverse the bit order (MSB and LSB) of each data word during input or output with a non-Hitachi device, select the **Bit reversal mode** check box. In this case, the string `Enable` is displayed in the **Bit reversal mode** column of the Setup station parameters window (see Figure 4-19). If you do not need to use the bit reversal mode (for example, when the slave devices connected to the network are limited to D.NET modules), deselect the check box. In this case, the mark -- is displayed in the **Bit reversal mode** column. (For more details about the bit reversal mode, see 5.6 *Parameter settings required for connecting non-Hitachi DeviceNet-compatible I/O devices.*)



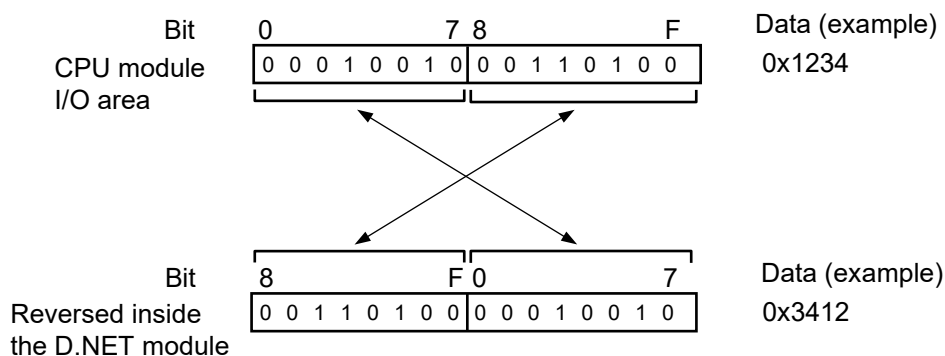
Notice

- Do not use the bit reversal mode when connecting with a slave device (such as AI/AO) that handles analog data or other numeric data. Doing so might cause input/output data to become undefined.
- Do not use the bit reversal mode when connecting with a slave device that handles both digital data and analog data. Doing so might cause input/output data to become undefined.

- **Byte reversal mode**

Use this item when connecting a device whose byte list is different from the S10VE CPU module, such as a non-Hitachi slave. If you want to swap the upper and lower bytes of each data word during input or output with a non-Hitachi slave device, select the **Byte reversal mode** check box. In this case, the string **Enable** is displayed in the **Byte reversal mode** column of the Setup station parameters window (see Figure 4-21).

In most cases, use the D.NET module set to this mode. (This is the default factory setting.) The **Byte reversal mode** check box needs to be deselected only when data cannot be exchanged normally with a non-Hitachi device. In this case, the mark -- is displayed in the **Byte reversal mode** column.



Notice

- Bit reversal processing cannot be applied for any data area specified as the input/output area described under 4.2.6 *D.Station data format conversion setting*, even when the **Bit reversal mode** check box is selected. (This is because bit reversal is not performed for analog modules, including pulse counters, even if bit swap is specified on the D.Station module side.)
- When you establish a connection with the D.Station module, ensure that the bit reversal mode and byte reversal mode settings are consistent with the data swap setting made with the rotary switches on the D.Station module side.

For example, if you make a bit/byte swap setting on the D.Station module side, select both the bit reversal mode check box and the byte reversal mode check box on the D.NET module side.

4. Operation

- **Monitor connection timeout**

Specifies whether to force a slave device that is connected to the D.NET module to detect errors in that D.NET module.

Selecting the check box of this item enables any error in the D.NET module to be detected at the slave. For details about how the slave reacts in the event of a D.NET module (master) error, see the manual for the slave device.

If deselected: Sets the slave not to detect a connection timeout even if the D.NET module stops communication with it.

If selected: Sets the slave to detect a connection timeout if the D.NET module stops communication with it. In this case, the NS or MS LED of the D.NET module blinks in red at intervals of 0.5 seconds. Subsequent operation of the slave depends on its specifications.

Set a connection timeout monitoring time, based on a value that is eight times the master/slave refresh time as described in *4.2.4 System parameter setting*.

Setting range
24 to 60,000 ms (1 ms increments)

- **Collect status information of D.STATION**

Specifies whether to collect the status information of a D.Station module upon establishment of a connection with it, provided that it is the communication destination (slave).

If deselected: Collects no status information of the D.Station module. For communication with a communication destination other than a D.Station module, make sure that you clear the check box of this item.

If selected: Collects the status information of the D.Station module only once upon establishment of a connection with the D.Station module (slave) and saves it in the area set as the information storage register. This collection and save operation is automatically performed by the D.NET module.

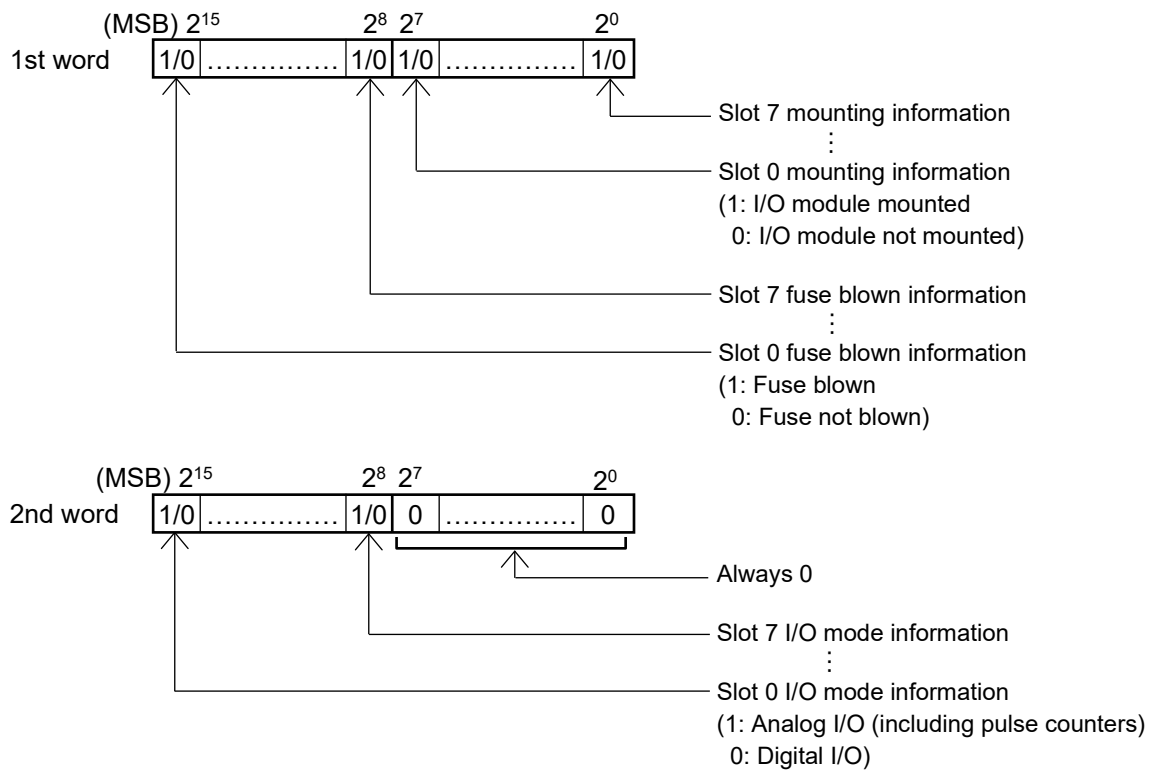
The setting range of the information storage register is as follows.

Setting range	XW0000 to XWFFFF0
	JW0000 to JWFFF0
	YW0000 to YWFFFF0
	QW0000 to QWFFFF0
	GW0000 to GWFFF0
	RW0000 to RWFFF0
	MW0000 to MWFFFF0
	EW0400 to EWFFFF0
	FW0000 to FWBFF
	DW0000 to DWFFF
	LBW0000 to LBWFFFF0
	LWW0000 to LWWFFFF
	LXW0000 to LXW3FFF

Note: Address pairs (register) for D.Station status information collection and storage must be set without their overlapping with those for other modules or channels.

4. Operation

The D.Station module status information is two words long (fixed) and its details are as follows.



Notice

- This setting item is available only when the communication destination is a D.Station module. If you select this item for any communication destination other than a D.Station module, an error occurs and connection is not established. This state can be verified by checking for the slave state value $0x2F$ (I/O status information acquisition failure) described in 4.2.10 *Slave error information*.
- D.Station status information collection is performed only at the establishment of a connection with a D.Station module. Accordingly, even if the status of the D.Station module changes after the establishment of a connection, this status change is not reflected in the D.NET module. If you want to monitor its status constantly, use the I/O error/mounting information adding function of the D.Station module, which adds status information to the input/output data. For details about the I/O error/mounting information adding function, see *HSC-1000 User's Manual D.Station* (manual number PAE-1-003)

- (d) When all the necessary parameters have been set in the Parameter edit window (Figure 4-22), click the **OK** button. The Setup station parameters window (Figure 4-21) appears. In this window, click the **OK** button to display the Setup system parameters window (Figure 4-23).

Figure 4-23 Setup system parameters window (master-peer mode)

Then, click the **Write** button to write the edited parameters to the PCs (online mode) or the configuration information file (offline mode).

For details about the operation at the time of writing parameters, see *4.2.7 Writing editing results*.

Click the **Cancel** button to close the Setup system parameters window. At this time, if you are editing system parameters in offline mode, the message *Are you sure you want to exit the window without saving the contents to a file?* appears. Click the **Yes** or **No** button.

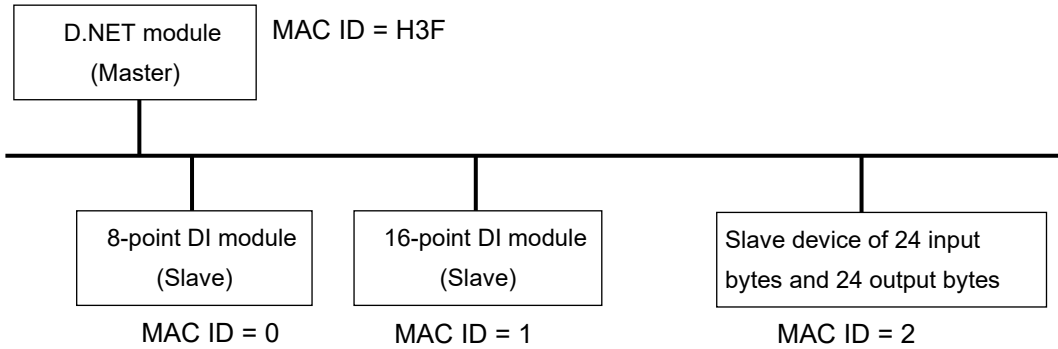
Yes: Closes the Setup system parameters window. The system parameter settings being edited are canceled.

No: Does not close the Setup system parameters window.

4. Operation

(2) Example of station parameter setting in master-peer mode

The following table shows a configuration example for when you perform bit strobe communication with two slaves (identified as MAC ID = 0, 1) and polling communication with a slave identified by MAC ID = 2.



(Setting example)

Port number	Communication mode	MAC ID	Message ID	Input byte count	Output byte count
01	Bit strobe reception	0	--	1	0
02	Bit strobe reception	1	--	1	0
03	Poll	2	--	H18	H18
04	Poll	--	--	--	--
05	Poll	--	--	--	--
06	Bit strobe transmission	--	--	0	0
07	All subsequent ports are unused.				
⋮					

Three ports are used to handle 24 input/output bytes.

Make sure that "bit strobe transmission" is set as the communication mode to use bit strobe communication.

To enable bit strobe communication, make sure that Bit strobe transmission is set as the communication mode.
 If only Bit strobe reception is set, the D.NET module cannot transfer data to and from the slave.
 Setting only one port for bit strobe transmission enables data transfer to and from the slave.

(3) When the slave mode is selected

The slave mode uses only one dedicated port and requires no port selection.

- (a) In the Setup system parameters window (Figure 4-20) for the slave mode, click the **Setup station parameters** button.
- (b) Set the necessary system parameters in the Setup station parameters window (for slave mode, see Figure 4-24) according to the following instructions.

Figure 4-24 Setup station parameters window (slave mode)

- **Communication kind**

Select `No use` or `Poll` from the pull-down menu.

Communication is not established if the communication mode is set to `No use`.

4. Operation

- **Input address, Output address**

Specify the starting and ending addresses of a register to store DeviceNet input data (receive data) or those of a register to store DeviceNet output data (send data). Select each such address pair from among those in one of the setting ranges listed as follows, and then set it in the input address or output address box.

Setting range	XW0000 to XWFFFF
	YW0000 to YWFFFF
	RW0000 to RWFFFF
	MW0000 to MWFFFF
	GW0000 to GWFFFF
	EW0400 to EWFFFF
	FW0000 to FWBFFF
	DW0000 to DWFFFF
	JW0000 to JWFFFF
	QW0000 to QWFFFF
	LBW0000 to LBWFFFF
	LWW0000 to LWWFFFF
	LXW0000 to LXW3FFF

Note: Input/output address pairs (register) must be set without their overlapping with those for other modules or channels.

- **Input bytes, Output bytes**

Specify the size in bytes of data to be transmitted to or received from the master. Allowable data sizes are listed in the following table.

Setting range	0 to H100	(hexadecimal)
	0 to 256	(decimal)

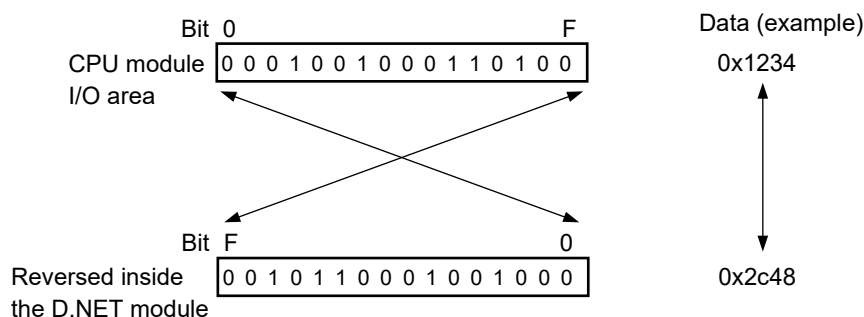
If the input or output byte count is set to a value greater than 8, the D.NET module performs fragment reception or fragment transmission.

Notice

- You must specify the input and output byte counts in bytes. If you do not use the input and output byte counts, set them to 0.
- Even when either the input or output byte count is set to 1, a 1-word area is used in the CPU memory area defined by a specified input/output address pair.
- If you set the output byte count to a value greater than 8, the D.NET module performs fragment transmission (split transfer). If you set the input byte count to a value greater than 8, the D.NET module performs fragment reception.
- If the D.NET module is used in slave mode, it does not check the data size. You must check the size of data to be exchanged with the master in advance.

● **Bit reversal mode**

Use this item when connecting a device whose input/output bit No. is different from the S10VE CPU module, such as a non-Hitachi master. If you want to reverse the bit order (MSB and LSB) of each data word during input or output with a non-Hitachi device, select the **Bit reversal mode** check box. If you do not need to use the bit reversal mode (for example, when the slave devices connected to the network are limited to D.NET modules), deselect the check box. (For more details about the bit reversal mode, see 5.6 *Parameter settings required for connecting non-Hitachi DeviceNet-compatible I/O devices.*)



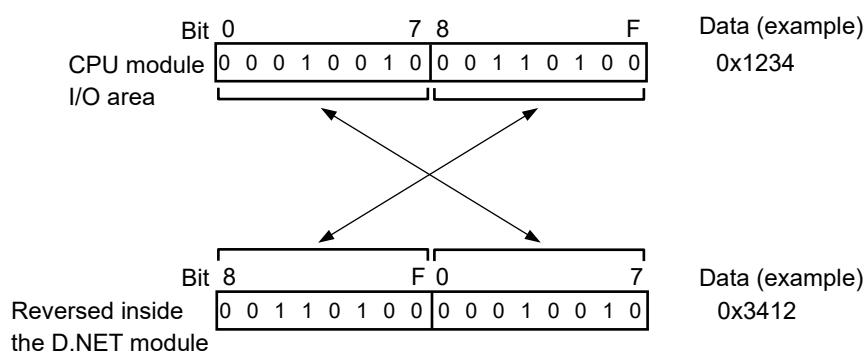
Notice

- Do not use the bit reversal mode when connecting with a master device that inputs and outputs analog data or other numeric data. Doing so might cause input/output data to become undefined.

● **Byte reversal mode**

Use this item when connecting a device whose byte list is different from the S10VE CPU module, such as a non-Hitachi slave. If you want to swap the upper and lower bytes of each data word during input or output with a non-Hitachi slave device, select the **Byte reversal mode** check box. In most cases, use the D.NET module set to this mode. (This is the default factory setting.)

The **Byte reversal mode** check box needs to be deselected only when data cannot be exchanged normally with a non-Hitachi device. (For more details about the byte reversal mode, see 5.6 *Parameter settings required for connecting non-Hitachi DeviceNet-compatible I/O devices.*)



4. Operation

- **Remote I/O timeout information collection parameter**

Sets the parameter for using the remote I/O timeout information collection function. When the D.NET module is in slave mode, this function collects timeout information of the PI/O module mounted in a PI/O unit, and then transmits the information to the master. If you do not use this function, do not set this parameter.

For details about the parameter to be set, see (4) Remote I/O timeout information collection function.

- (c) When all the necessary parameters have been set, click the **OK** button. The Setup system parameters window (Figure 4-20) appears. In this window, click the **Write** button. Then, the edited parameters are written to the PCs (online mode) or the configuration information file (offline mode).

(4) Remote I/O timeout information collection function

<Outline>

Use this function in cases where the hardware configuration is as shown in Figure 4-25 and remote I/O communication data needs to be sent to the master through the DeviceNet. This function sends timeout information for the remote I/O station modules connected to the CPU unit to the master along with the I/O data. The information is stored in the system registers S0380 to S03FF of the S10VE CPU module.

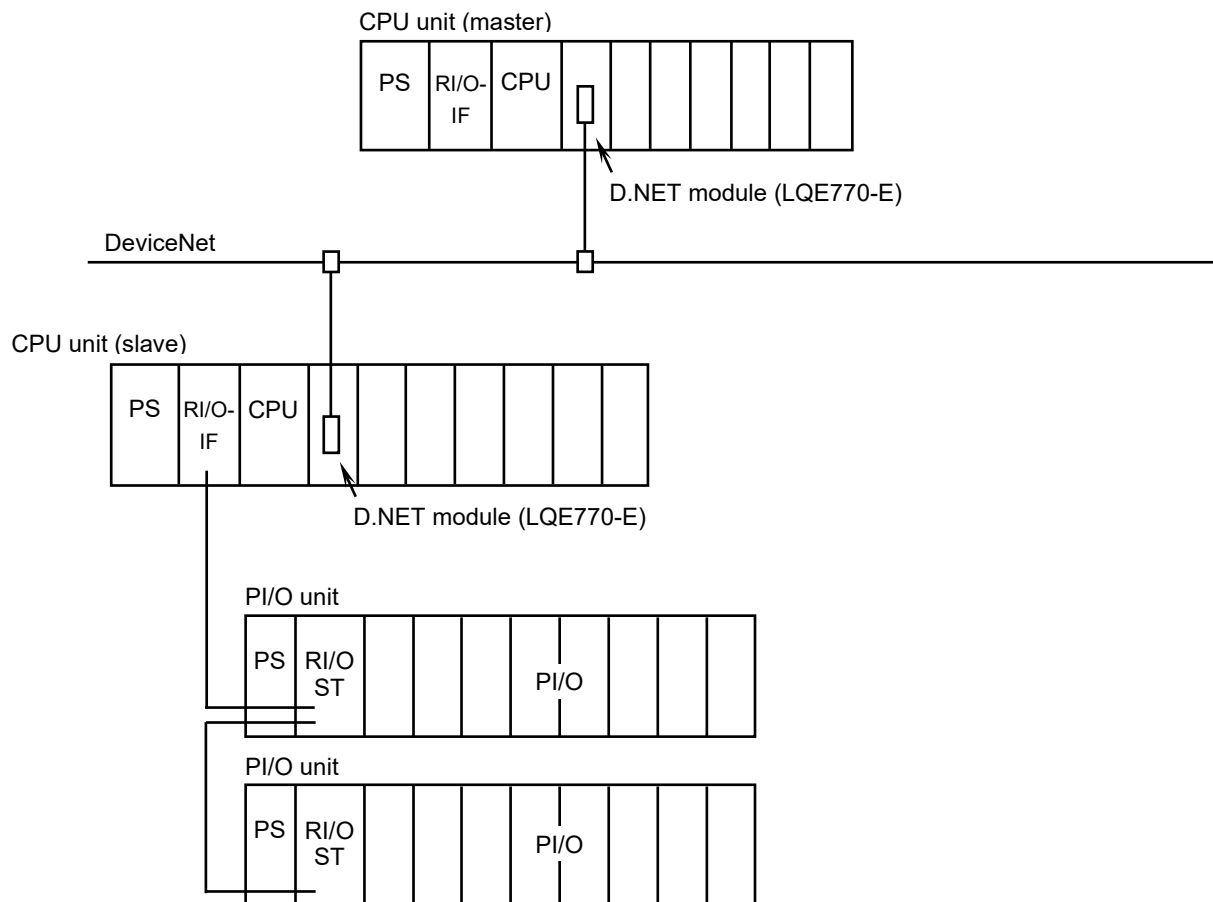


Figure 4-25 Hardware configuration using the remote I/O timeout information collection function

4. Operation

As shown in Figure 4-26, the D.NET module (running in slave mode) creates timeout information for specific remote I/O communication, stores it at a specified address, and sends it (along with PI/O data) to the master. This enables the master to read the timeout information for remote I/O communication. You can freely specify the input and output areas of the master and slave for this purpose.

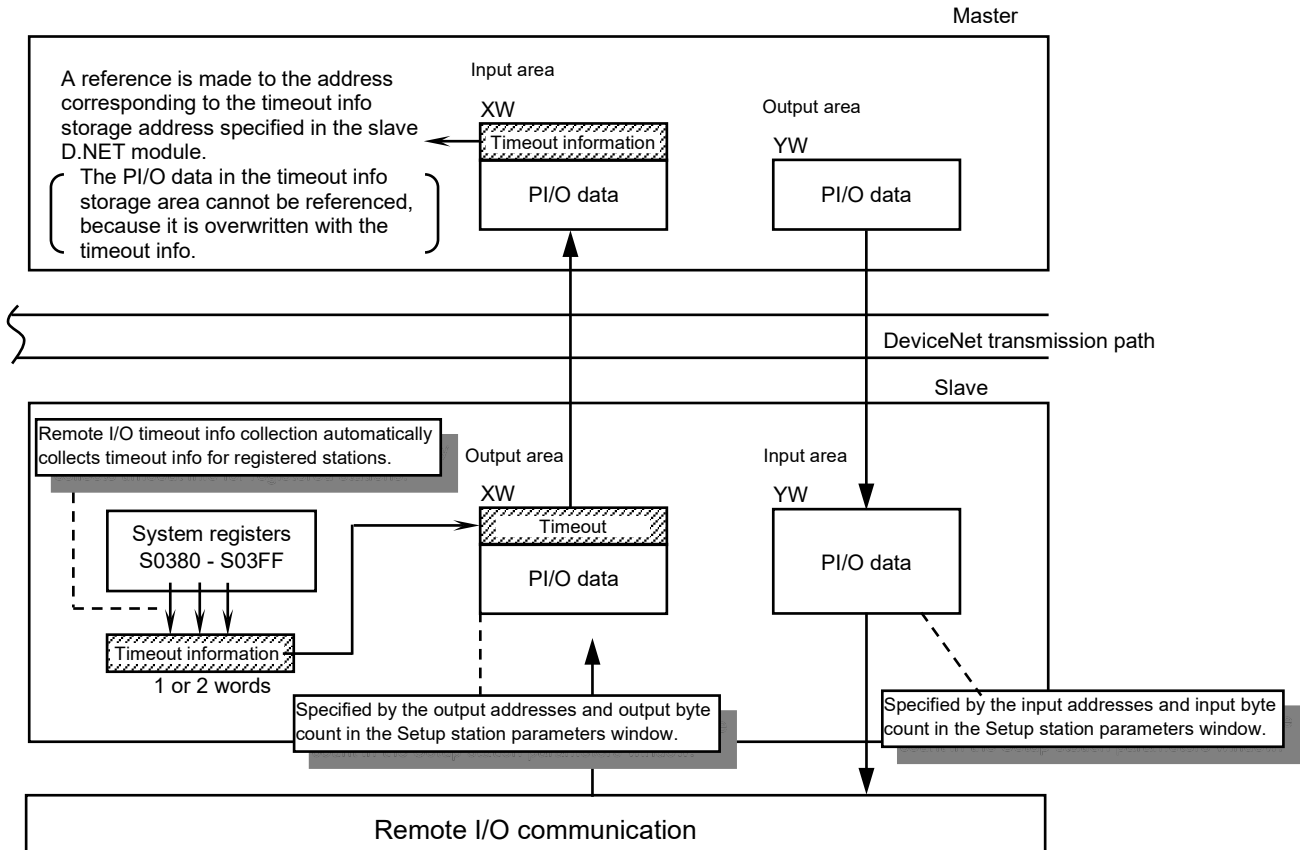


Figure 4-26 Operation of the remote I/O timeout information collection function

<Setting the remote I/O timeout information collection parameter>

In slave mode, you can use the Setup station parameters window to set up the remote I/O timeout information collection parameter. If you do not use this function, do not set this parameter.

- (a) In the Setup station parameters window (slave mode) as shown in Figure 4-24, set a communication mode, an output address, and an output byte count. Then, set the remote I/O timeout information collection parameter as follows.

- **RI/O timeout information address**

Specifies where to store remote I/O timeout information in the defined output area.

Set an address that is in the range of the output area defined by the specified output addresses (D) and output byte count (Y). The preceding example window shows the parameter settings that are used to store the timeout information at the address RW000 in the output area ranging from RW000 to RW030.

Output area	
RW000	Timeout information
RW010	PI/O data (Timeout information)
RW020	PI/O data
RW030	PI/O data

Notice

- The timeout information is 1 or 2 words long, depending on the number of remote I/O station modules registered in the RI/O Timeout information collection station registration window.

4. Operation

- (b) After setting the parameter, click the **RI/O timeout information collection station registration** button. The RI/O Timeout information collection station registration window (Figure 4-27) appears.

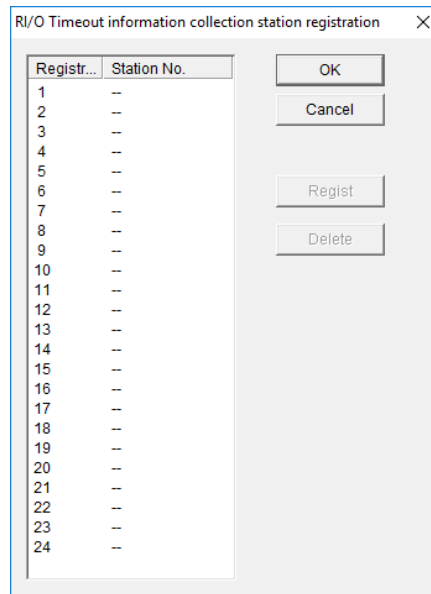


Figure 4-27 RI/O Timeout information collection station registration window

Use the window shown in Figure 4-27 to register a remote I/O timeout information collection station. To register the station, double-click its registration number. (Alternatively, click the registration number, and then click the **Register** button.)

- (c) When the Station No. Registration window (Figure 4-28) appears, register the remote I/O station number.

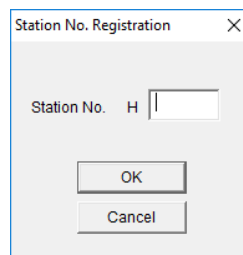


Figure 4-28 Station No. Registration window

- **Station No.**

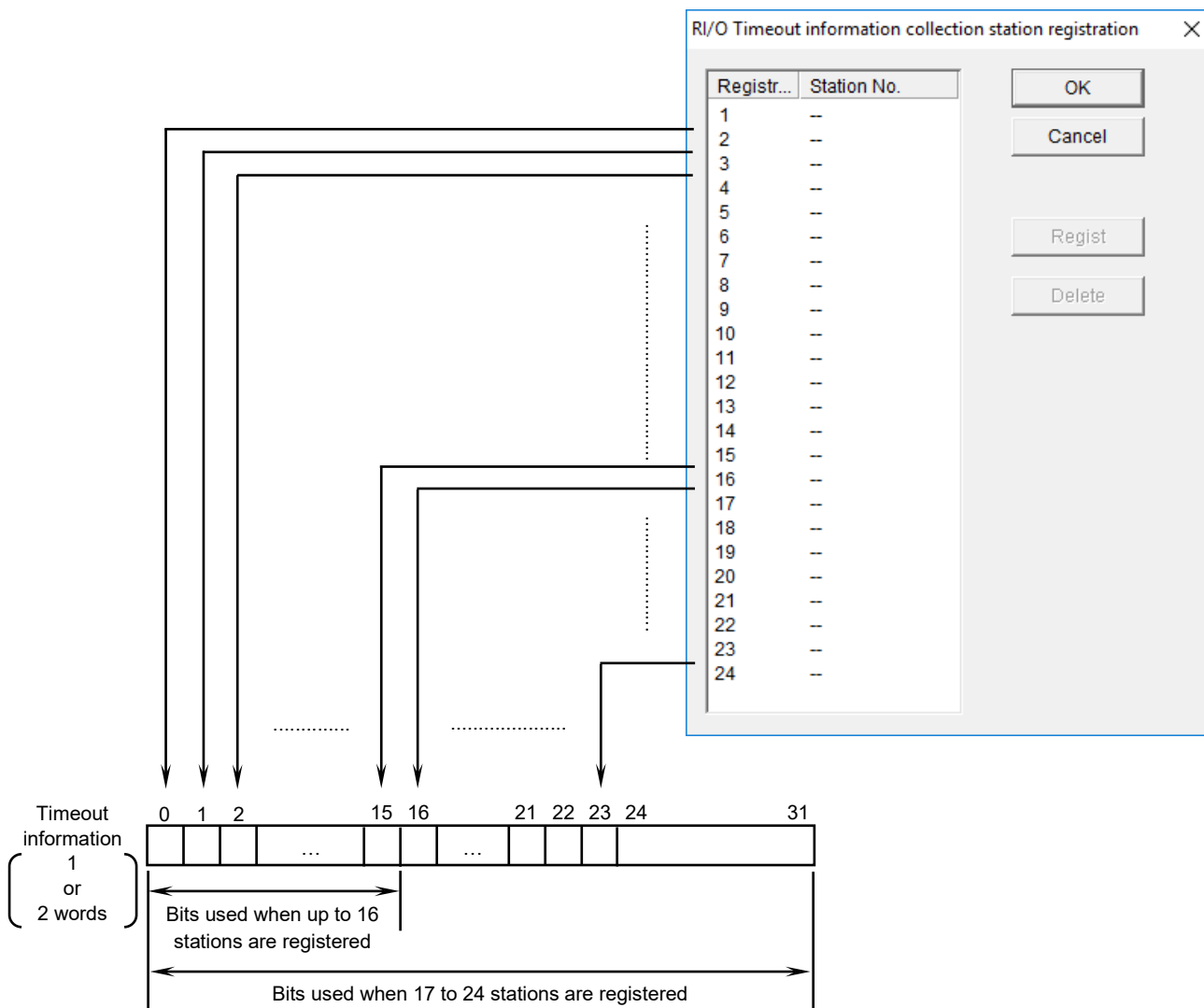
Specifies the station number of the remote I/O station for which to collect timeout information. (This station number must be the same as that set by the STATION No. setting switch on the front panel of the remote I/O station module.)

Setting range	0 to H7F	(hexadecimal)
---------------	----------	---------------

<Remote I/O timeout information>

As shown in the following figure, remote I/O timeout information is conveyed by specific bits that are placed in one-to-one correspondence with the registration numbers registered along with station numbers in the RI/O Timeout information collection station registration window.

Timeout information has a 2-word length if 17 or more stations are registered. This is because a system can have a maximum of 12 stations per line (a total of 24 stations) as remote I/O devices (in a dispersed manner).



Notice

- This function can be used only for transmission (output) in slave mode. (It is not applicable in master-peer mode.)
- The output area in which timeout information is stored cannot be used as an input area for remote I/O communication.
- If you select the **Bit reversal mode** check box, each word of timeout information is also bit-reversed (the MSB and LSB of each data are reversed).

4. Operation

4.2.6 D.Station data format conversion setting

<Outline>

When the D.NET module is used as a master in master-peer mode and the D.Station module is connected as a slave, you might need to convert the input/output data format for AI, AO and pulse counter mounted on the D.Station module. In such a situation, use the D.Station data format conversion function. If you do not connect the D.Station module, do not perform conversion setting.

The D.Station data format conversion function enables conversion to be performed inside the D.NET module. The formats that can be converted are shown in the following figure. You must specify the internal I/O area in the CPU module to store pulse counter data as an assignment data area in the Convert data format of D.STATION window (Figure 4-31).

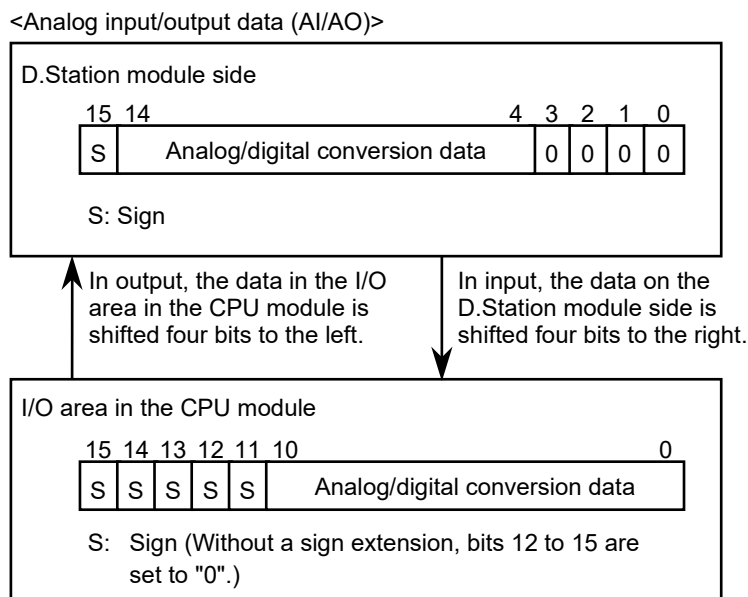


Figure 4-29 Analog input/output data (AI/AO) format

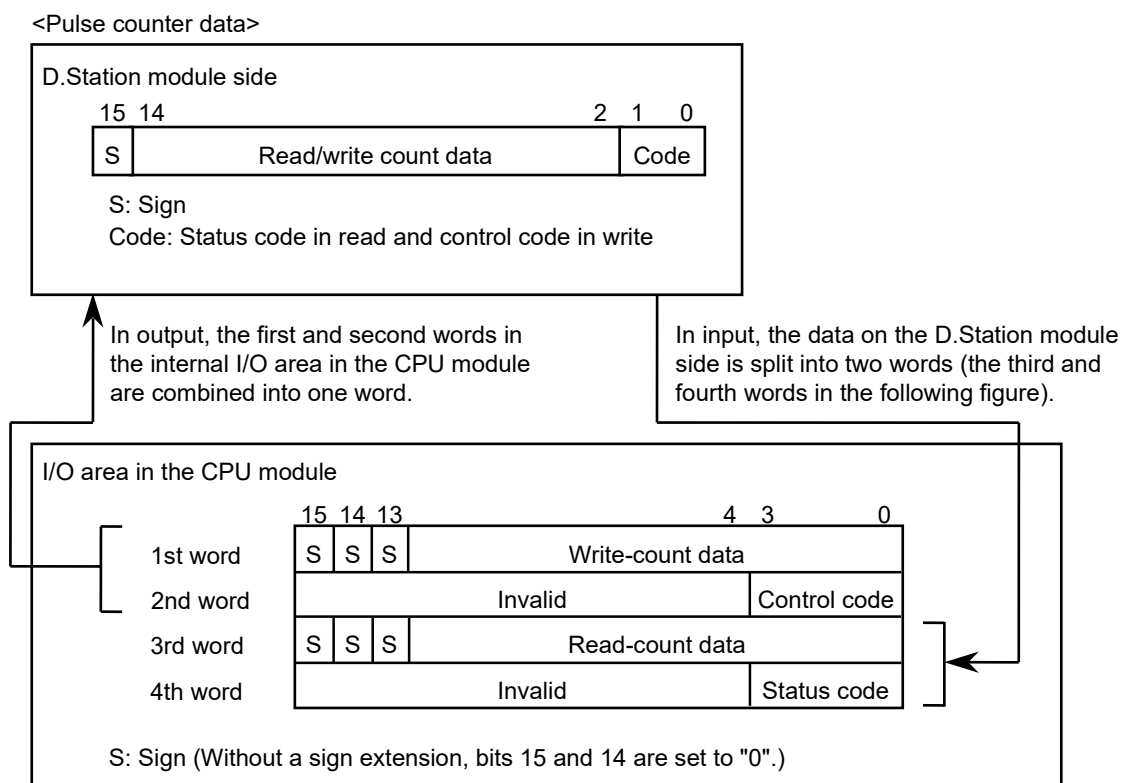


Figure 4-30 Pulse counter data format

- Control codes of the pulse counter and their meanings
(Operation mode 1)

Control code	Meaning	Effect of the setting
8	Counting stop	Stops the pulse measurement in process.
4	Preset start	Sets the preset value in the counter and starting measurement.
2	Comparison value setting	Sets a comparison value in the comparison register and starting measurement.
1	Latch resetting	Resets the latched match signal and starting measurement.
Others	Invalid	--

(Operation mode 2)

Control code	Meaning	Effect of the setting
8	Counting stop	Stops the pulse measurement in process.
4	Preset start	Sets the preset value in the counter and starting measurement.
2	Comparison value setting	Sets a comparison value in the comparison register.
1	Latch resetting	Resets the latched match signal.
Others	Invalid	--

4. Operation

- Status codes of the pulse counter and their meanings

(Operation mode 1)

Status code	Meaning	Status
8	Counting stop	Counting is stopped.
4	$R > C$	The comparison data value is larger than the count value.
2	$R = C$	The comparison data value is equal to the count value.
1	$R < C$	The comparison data value is smaller than the count value.

R: Comparison data value

C: Count value

(Operation mode 2)

Status code	Meaning	Status
8	Counting stop	The control code transferred previously is set.
4	Preset start	
2	Comparison value setting	
1	Latch resetting	

For details about how to use the pulse counter, see the *HSC-1000 User's Manual I/O* (manual number PAE-1-001).

<Setup for the D.Station data format conversion function>

- (1) In the Setup system parameters window in master-peer mode (Figure 4-23), click the **Setup data format conversion of D.STATION** button.
- (2) The Convert data format of D.STATION window (Figure 4-31) appears. Select a number to be set, and then click the **Edit** button. You can select a number in the range 1 to 20 (hexadecimal), and register a maximum of 32 modules under arbitrarily selected numbers.

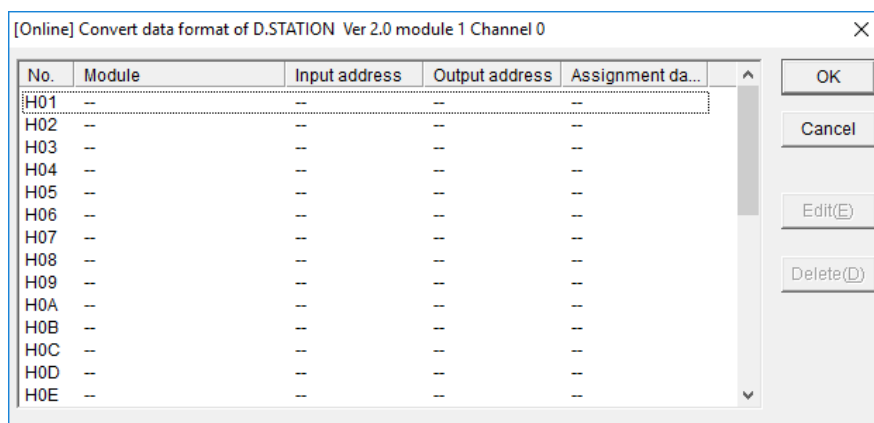


Figure 4-31 Convert data format of D.STATION window

- (3) The Setup data format conversion of D.STATION window (Figure 4-32) appears. In this window, set the necessary format conversion parameters for the selected PI/O module. As the figure shows, the display and input formats of input/output byte counts can be set to either decimal or hexadecimal. By default, these items are displayed in hexadecimal.

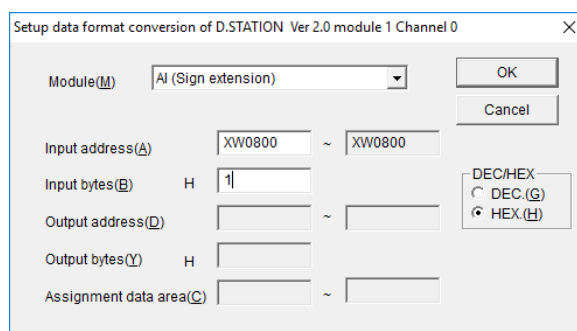


Figure 4-32 Setup data format conversion of D.STATION window

4. Operation

- **Module**

Allows you to select the mode of the PI/O module for which to perform data format conversion. The D.NET module converts data format according to the selected option.

Selectable options	Unused AI (with sign extension) AI (without sign extension) AO Pulse counter (with sign extension) Pulse counter (without sign extension)
--------------------	--

- **Input address, Output address**

Specify the area where the data to be converted is located within the range specified by the input/output addresses (set in the Parameter edit window (Figure 4-22) shown under *4.2.5 Station parameter setting*). Specify the starting address of the area where the data to be converted is located. The starting address must be within the range of the input or output area. These areas are set by the input address pair and input byte count, or by the output address pair and output byte count in the Parameter edit window in *4.2.5 Station parameter setting*.

Setting range	XW0000 to XWFFFF YW0000 to YWFFFF JW0000 to JWFFF0 RW0000 to RWFFF0 MW0000 to MWFFFF0 GW0000 to GWFFF0 EW0400 to EWFFFF0 FW0000 to FWBFF DW0000 to DWFFF QW0000 to QWFFFF0 LBW0000 to LBWFFFF0 LWW0000 to LWWFFFFF LXW0000 to LXW3FFF
---------------	---

- **Input bytes, Output bytes**

Specify this item in the range shown in the following table to set how many data bytes are to be subjected to format conversion.

Format conversion is performed on the input/output bytes specified here, starting from the specified input/output address.

Module	Setting range (in bytes)
AI or AO (both with or without sign extension)	H1 to H40 (hexadecimal) 1 to 64 (decimal)
Pulse counter	Always 2 (you cannot change this setting.)

The input or output area set by the preceding input address pair and input byte count or output address pair and output byte count must be within the specified range. Specifically, it must be in the input or output area specified by the input/output address pair and input/output byte count, which are set as station parameters in the Parameter edit window (Figure 4-22). If an attempt is made to set the former input/output area beyond the limits of the latter, the tool reports it as an out-of-range error and does not write the specified parameters to the PCs. In this case, you have to correct the parameters and retry writing.

Notice

- You can register a maximum of 32 cases of format conversion, 8 cases per D.Station module. If the registration limit is exceeded, the tool displays an error message indicating too many cases for registration, and does not write the specified parameters to the PCs. In this case, you have to correct the parameters and retry writing.
- If a specified module mode is AI or AO (with or without a sign extension) and a specified input/output byte count is an odd number, then the count is rounded up to the nearest even number.
Examples: If a byte count of 1 is specified, it is rounded up to 2.
If a byte count of 3 is specified, it is rounded up to 4.

- **Assignment data area**

The assignment data area is the I/O area in the CPU module to which the pulse count data split into two words is assigned. (This memory area has a size of four words: two words used as write count data, and two words used as read count data. For more information, see *Figure 4-30 Pulse counter data format*.) By storing write count data and control data in the first and second words of this area, respectively, you can control the pulse counter module. The third and fourth words are used to store read count data and status codes, respectively. These last two words can be used when reading the current count value from the pulse counter module. This memory area does not serve as a user interface for reading from or writing to the input/output address.

4. Operation

<Example of setting parameters>

The following table shows an example of settings used to convert the data formats of the AI modules (slot Nos. 0 to 3) and pulse counter module (slot No.7) mounted in the D.Station module in the configuration shown in Figure 4-33.

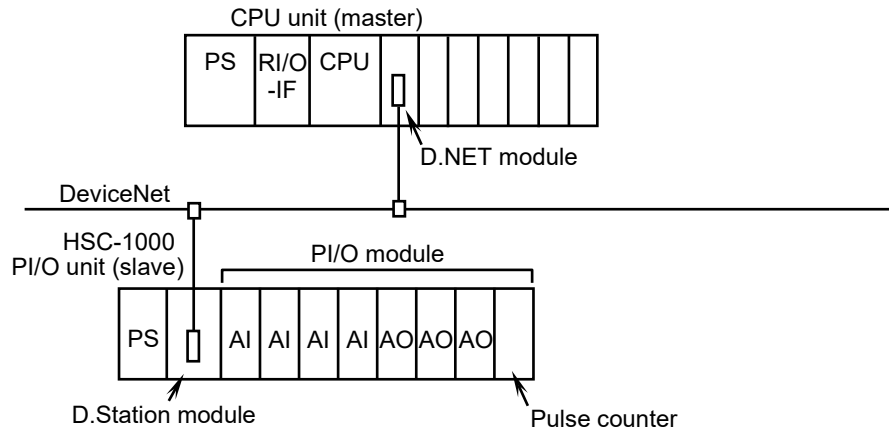


Figure 4-33 Configuration using the D.Station data format conversion function

(a) D.Station module settings

Switch name	Set value	Meaning/Effect of set value
NA	Any value can be set in the range H0 to H3F, but it must not be identical to that of the D.NET module.	MAC ID of the D.Station module
SLOT	2	64 points is set, and ordinary transfer mode is selected.
FUNC1	0 to 2 (Set a value in accordance with the baud rate to be used.)	No module information is prepared.
FUNC2	0	Byte swap, RESET, FREE

(b) D.NET module settings

The following figures show the settings to use an input area of XW0800 onward, an output area of YW0800 onward, and an assignment data area of FW000 onward for the pulse counter.

<Station parameter settings>

The screenshot shows the 'Parameter edit module 0 (Master/Peer mode) channel 0 Port01' window. Key settings include:

- Communication kind: Poll
- MAC ID: H 3F
- Message ID: H 0
- Bit reversal mode: Bit reversal mode(W), Byte reversal mode(X)
- DEC/HEX: DEC.(G), HEX.(H)
- Input address(A): XW0800 ~ XW09F0
- Input bytes(B): 040
- Output address(D): YW0800 ~ YW09F0
- Output bytes(Y): 040
- Monitor connection timeout: Monitor connection timeout (Q), Monitoring time of connection timeout (U): 800 (24ms - 60000ms)
- Collect status information of D.STATION: Collect status information of D.STATION (C)

 Callouts indicate:

- 'Select the **Byte reversal mode** check box on the D.NET module side when byte swap is selected on the D.Station module side.'
- 'Set these items to H40 (hex) because the input and output byte counts of the D.Station module are both 64 (determined from 64 points × 8 slots = 64 bytes).'

Figure 4-34 Parameter edit window

<D.Station data format conversion settings>

The screenshot shows the '[Online] Convert data format of D.STATION Ver 2.0 module 1 Channel 0' window. It contains a table with the following data:

No.	Module	Input address	Output address	Assignment da...
H01	AI (Sign extension)	XW0800-XW0...	--	--
H02	Pulse counter (Sign ext...	XW0900-XW0...	YW0900-YW0...	FW000-FW003
H03	--	--	--	--
H04	--	--	--	--
H05	--	--	--	--
H06	--	--	--	--
H07	--	--	--	--
H08	--	--	--	--
H09	--	--	--	--
H0A	--	--	--	--
H0B	--	--	--	--
H0C	--	--	--	--
H0D	--	--	--	--
H0E	--	--	--	--

Figure 4-35 Convert data format of D.STATION window

4. Operation

<AI settings>

Starting address of slot 0

Set this item to /20 (hex) because 4 words (64 points set) × 4 slots (slots 0 to 3) = 32 bytes.

Figure 4-36 Setup data format conversion of D.STATION window (AI settings)

<Pulse counter settings>

Starting address of slot 7

Starting address of the assignment data area for the pulse counter

Figure 4-37 Setup data format conversion of D.STATION window (pulse counter settings)

4.2.7 Writing editing results

To write the edit results, click the **Write** button in the Setup system parameters window (master-peer mode) as shown in Figure 4-19, or the Setup system parameters window (slave mode) as shown in Figure 4-20.

- Online mode: Editing results are written to the PCs.
- Offline mode: Editing results are written a configuration information file.

- Writing editing results online (into the PCs)

(1) In the Setup system parameters window (Figure 4-19), click the **Write** button.

The Option module parameter setup list window (Figure 4-38) appears.

This window displays option modules set in the CPU module. If **NONE** (*module-ID, module-number*) is displayed for **Module name**, the setup tool for the option module identified by the module ID and number is not installed. Install the setup tool.

Click the number of the module for which you want to write parameter, and then click the **OK** button.

To cancel the writing operation, click the **Cancel** button.

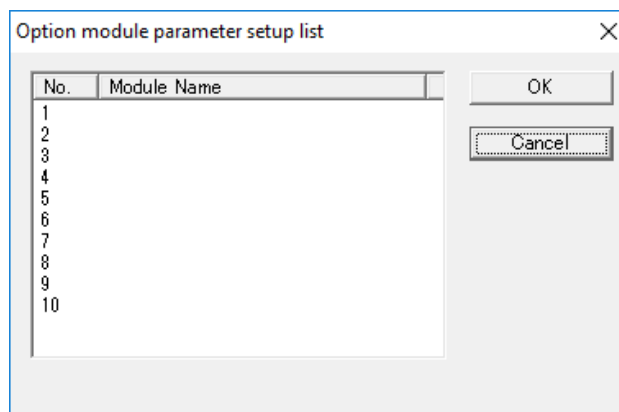


Figure 4-38 Option module parameter setup list window

4. Operation

- (2) When parameters have been written into the CPU module, a reset confirmation message (Figure 4-39) appears, asking you whether you want to reset the PCs.

To reset the PCs, click the **OK** button. If you do not want to reset the PCs, click the **Cancel** button. In this case, the parameters are written to the CPU module. Note that, the parameters prior to write are used in communication until the PCs are reset.

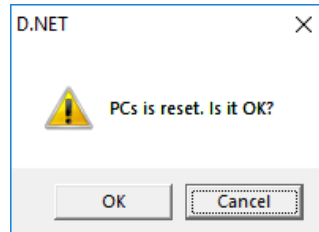


Figure 4-39 Reset confirmation message

- (3) If PCs are reset successfully, the message `PCs reset successful` appears. Then, the D.NET module begins communication by using the written parameters. If reset of the PCs fails, the message `PCs reset not successful` appears. In this case, manually reset the PCs or perform a power-on reset. For details about how to reset the PCs manually, see 8.4.3.5 *Online menu: Remote reset* in the *SIOVE User's Manual General Description* (manual number SEE-1-001).

Notice

- Until the PCs are reset, the parameters written to the CPU modules do not take effect. If you do not reset the PCs, or if reset of the PCs fails, manually reset the PCs, or perform a power-on reset.

- Writing edit results offline (into a file)

- (1) In the Setup system parameters window (Figure 4-19), click the **Write** button. The Save File window (Figure 4-40) appears.

You can change the **PCs number** and **File comment** settings. After checking the displayed information, click the **Save File** button. To cancel the write operation, click the **Cancel** button.

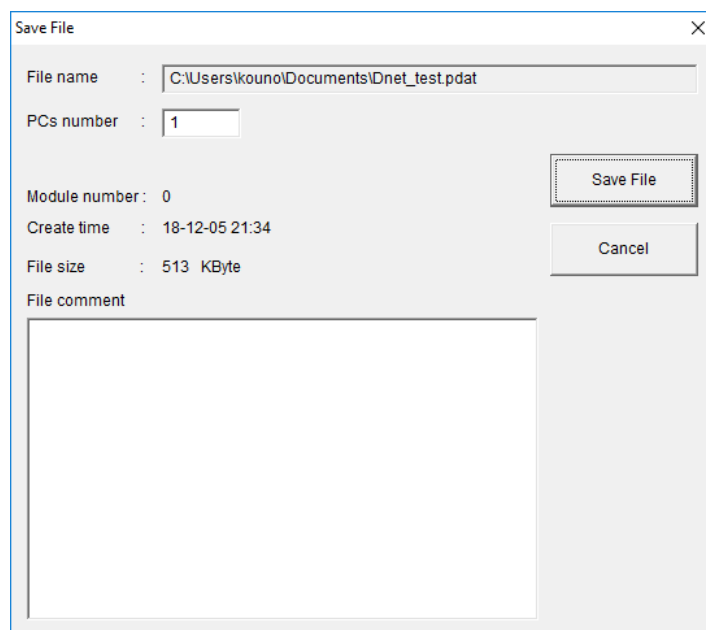


Figure 4-40 Save File window

- (2) Click the **Save File** button causes the following message appear, and the save operation is completed.

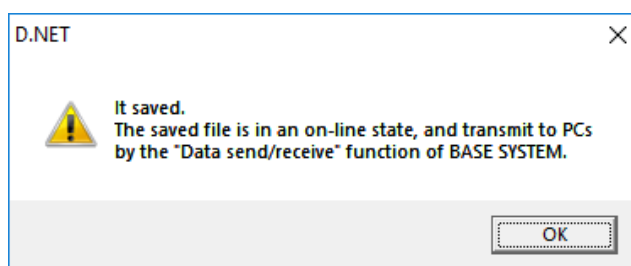


Figure 4-41 File save completion message

Notice

- Set the PCs number of the S10VE you want to configure. If the S10VE does not match the PCs number, configuration information that is edited offline cannot be sent by the data transmission/reception function of BASE SYSTEM/S10VE. Setting 9999 as the PCs number enables transmission regardless of the PCs number of the S10VE. However, note that it becomes impossible to check transmission to unintended PCs.

4. Operation

- Changing the operation mode

You cannot set different operation modes (master-peer/slave) for channel 0 and 1.

If the master-peer mode is changed to slave mode, for example, the operation mode change confirmation message (Figure 4-42) appears at the time of writing, regardless of online/offline mode.

The following figure shows an example of this message. To continue, click the **OK** button. To cancel processing, click the **Cancel** button.

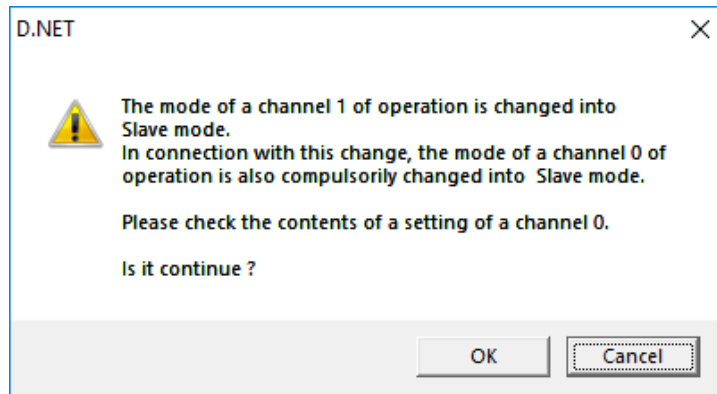


Figure 4-42 Operation mode change configuration message

- Supplementary information about editing of parameters

Editing parameters in master-peer mode does not change slave parameters. Similarly, editing parameters in slave mode does not change master-peer parameters.

Therefore, even if content read and set online from the CPU or D.NET module is the same as content created and set offline, comparing these contents by using the BASE SYSTEM/S10VE data transmission/reception function results in a comparison error.

4.2.8 Communication error information

Function: Displays error information about non-hardware errors, such as network errors, that have occurred in the D.NET module.

Operation: The following describes the operation procedure.

- (1) In the menu list window (Figure 4-17), click the **Communication error information** button.
- (2) If an error occurs, an error code or details about the error are displayed in the Communication error information window (Figure 4-43). For details about the error codes, see the *SIOVE User's Manual General Description* (manual number SEE-1-001).

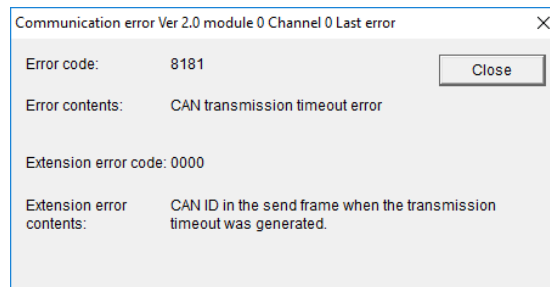


Figure 4-43 Communication error information window (reporting on a generated CAN transmission timeout)

The following information appears at the end of the window title:

- Last error: This is a previous error. The system is now working normally.
- Error occurring: An error is now occurring.

To clear an error, reset the PCs or turn power supply module off and then on again. For details about how to reset the PCs, see the *SIOVE User's Manual General Description* (manual number SEE-1-001).

If no such error has occurred, the message indicating no error has occurred appears as shown in Figure 4-44.

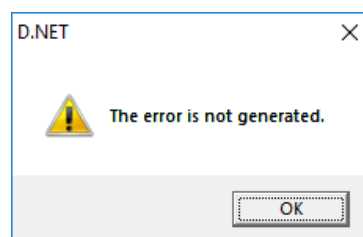


Figure 4-44 Message indicating no error has occurred

- (3) Click the **Close** or **OK** button in the window or message. After this, the menu list window becomes active again.

4. Operation

4.2.9 Hard error information

Function: Displays error information about hardware errors (module shutdown) that have been detected by the D.NET module. Error information is generally classified into two types: initial diagnosis errors and operation errors.

Operation: The following describes the operation procedure.

- (1) In the menu list window (Figure 4-17), click the **Hard error information** button.
- (2) If an error occurs, its error code, content, and other extended error information appears. (For details about the information according to error code, see Table 4-4.) Figure 4-45 shows an example of error code 1403. For details about error codes, see the *SIOVE User's Manual General Description* (manual number SEE-1-001).



Figure 4-45 Initial diagnostic error information window

Table 4-4 Extended error information by error code

No.	Error code	Flash memory starting address	SRAM address	Write data	Read data	Sum value	MODU No. switch setting	Error No.	Error No. content	Register and Instruction# ¹
1	0x1401	--	--	--	--	--	--	--	--	--
2	0x1402	--	--	--	--	--	--	--	--	--
3	0x1403	Y	--	Y	Y	--	--	--	--	--
4	0x1405	Y	--	--	Y	--	--	--	--	--
5	0x1406	Y	--	--	--	Y	--	--	--	--
6	0x1407	--	Y	Y	Y	--	--	--	--	--
7	0x1409	--	--	--	--	--	--	Y	Y	--
8	0x140A	--	--	--	--	--	Y	--	--	--
9	0x140D	Y	--	--	--	Y	--	--	--	--
10	0x2403	--	--	--	--	--	--	--	--	Y
11	0x2404	--	--	--	--	--	--	--	--	Y
12	0x3404	--	--	--	--	--	--	--	--	Y
13	0x3406	--	--	--	--	--	--	--	--	Y
14	0x3409	--	--	--	--	--	--	--	--	Y
15	0x34XX ^{#2}	--	--	--	--	--	--	--	--	Y
16	0x4401	--	--	--	--	--	--	--	--	Y ^{#3}
17	0x4402	--	--	--	--	--	--	--	--	Y ^{#3}

Y: Supported --: Unsupported

#1: Indicates MPU general registers, SH built-in peripheral module registers, and PC peripheral instructions.

#2: XX is filled with a value other than Nos. 12, 13, and 14.

#3: Registers and instructions are all filled with 0.

If no such error has occurred, the message indicating no error has occurred appears as shown in Figure 4-46.

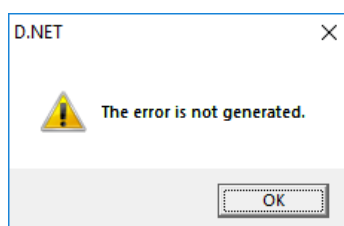


Figure 4-46 Message indicating no error has occurred

- (3) Click the **Close** or **OK** button in the window or message. The menu list window (Figure 4-17) then becomes active again.

4. Operation

4.2.10 Slave error information

Function: Displays error information for slave devices connected to the D.NET module. This error information is applicable only to the master-peer mode. When the slave mode is selected, all status values (except those of the local D.NET module) are set to H00 (indicating that no slave is registered).

Operation: The following describes the operation procedure.

- (1) In the menu list window (Figure 4-17), click the **Slave error information** button.
- (2) The status of the slave identified by each MAC ID is displayed in the Slave error information window as shown in Figure 4-47.

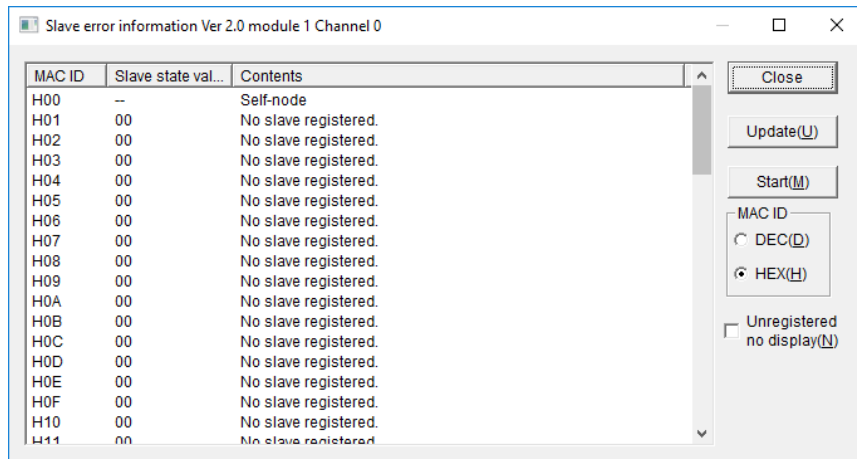


Figure 4-47 Slave error information window

<Switching the MAC ID notation system>

You can display MAC IDs in decimal or hexadecimal notation by clicking the desired radio button in the **MAC ID** group box. By default, MAC IDs are displayed in hexadecimal notation.

- Click the **DEC** radio button to display MAC IDs in decimal.
- Click the **HEX** radio button to display MAC IDs in hexadecimal.

<Updating slave error information>

When you click the **Update** button, the current slave error information is read once and displayed in the window.

<Monitoring slave error information>

When you click the **Start** button, slave error information is read at intervals of approximately 100 ms and displayed in the window. When monitoring starts, the **Update** button becomes inactive and the **Start** button changes to the **Stop** button.

When you click the **Stop** button during the monitoring and display process, the process stops, the **Update** button becomes active again, and the **Stop** button is replaced by the **Start** button.

<Hiding non-registered MAC IDs>

You can hide all non-registered MAC ID information from view by selecting the **Unregistered no display** check box. In this case, only the registered MAC ID information is displayed starting from the top of the list.

If you deselect the **Unregistered no display** check box, all registered and non-registered MAC ID information is displayed. By default, the **Unregistered no display** check box is deselected.

4. Operation

Table 4-5 shows a list of all slave status values and their meanings.

Table 4-5 Slave status values

No.	Slave status value	Meaning
1	0x00	No slave is registered.
2	0x01	A connection is being established.
3	0x02	A connection has been established normally (this state lasts during normal communication).
4	0x80	A timeout occurred (establishment of an Explicit connection failed).
5	0x81	A timeout occurred (establishment of an I/O [Poll] connection failed).
6	0x82	A timeout occurred (establishment of an I/O [Bit Strobe] connection failed).
7	0x83	A timeout occurred (establishment of an I/O [Bit Strobe] connection failed, but an I/O [Poll] connection was established successfully).
8	0x84	A timeout occurred (acquisition of the produced connection size on the I/O [Poll] slave side failed).
9	0x85	A timeout occurred (acquisition of the consumed connection size on the I/O [Poll] slave side failed).
10	0x86	A timeout occurred (explicit EPR setting failed).
11	0x87	A timeout occurred (Poll EPR setting failed).
12	0x88	A timeout occurred (Bit Strobe EPR setting failed).
13	0x89	A timeout occurred (Bit Strobe EPR setting failed, but I/O [Poll] EPR setting was done successfully).
14	0x90	A Poll response timeout occurred.
15	0x91	A Bit Strobe response timeout occurred.
16	0x11	Establishment of an Explicit connection failed (Open Explicit error).
17	0x12	Establishment of an Explicit connection failed (an Explicit connection already open could not be opened).
18	0x13	Establishment of an Explicit connection failed (an Explicit connection already made with another master could not be opened).
19	0x14	Establishment of an Explicit connection failed (an Explicit connection could not be opened due to a Master/Slave [M/S] service error).
20	0x15	Establishment of an Explicit connection failed (an Explicit connection could not be opened due to an Master/Slave [M/S] service connection already established).
21	0x16	Establishment of an I/O (Poll) connection failed (an error response was received).
22	0x17	Establishment of an I/O (Poll) connection failed (an I/O connection was already established).
23	0x18	Establishment of an I/O (Poll) connection failed (an I/O connection already connected to another master could not be opened).
24	0x19	Establishment of an I/O (Bit Strobe) connection failed (an error response was received).
25	0x1A	Establishment of an I/O (Bit Strobe) connection failed (an error response was received), but an I/O (Poll) connection was established successfully.
26	0x1B	Establishment of an I/O (Bit Strobe) connection failed (an I/O connection was already established).
27	0x1C	Establishment of an I/O (Bit Strobe) connection failed (an I/O connection was already established), but an I/O (Poll) connection was established successfully.
28	0x1D	Establishment of an I/O (Bit Strobe) connection failed (a connection already connected to another master could not be opened).
29	0x1E	Establishment of an I/O (Bit Strobe) connection failed (a connection already established with another master could not be opened), but an I/O (Poll) connection was established successfully.
30	0x21	EPR setting failed (Explicit).
31	0x22	EPR setting failed (I/O [Poll]).
32	0x23	EPR setting failed (I/O [Bit Strobe]).
33	0x24	EPR setting failed (I/O [Bit Strobe]), but I/O (Poll) EPR setting was done successfully.
34	0x31	The produced connection size on the I/O (Poll) slave side was found not matching the D.NET module.
35	0x32	The consumed connection size on the I/O (Poll) slave side was found not matching the D.NET module.
36	0x33	Acquisition of the produced connection size on the I/O (Poll) slave side failed.
37	0x34	Acquisition of the consumed connection size on the I/O (Poll) slave side failed.
38	0x2D	EPR setting during I/O communication failed (an error response was received).
39	0x2E	EPR setting during I/O communication failed (a response timeout occurred).
40	0x2F	Acquisition of I/O status information failed.
41	0x50	Establishment of an Explicit connection failed (it was already assigned).
42	0x51	Establishment of an Explicit connection failed (it was in a condition other than already open and assigned).
43	0x52	Establishment of an Explicit connection failed (it was already open).
44	0x70	Release of a Group 3 Explicit connection failed.
45	0x8A	Establishment of an Explicit connection failed (a response timeout occurred).
46	--	Local station

If any of the preceding errors (except the normal communication status 0x02) occurs, check the parameter settings, wiring, and other required settings.

4.2.11 Refresh time log information

Function: Displays the currently used actual refreshing cycles of peer transmission and master/slave communication. You can use this function to check the actual cycles in which refreshing is currently performed.

Operation: The following describes the operation procedure.

- (1) In the menu list window (Figure 4-17), click the **Log information of refresh time** button.
- (2) The Log information of refresh time window (Figure 4-48) appears. Each refresh time represents the time when the window is displayed or when the **Update** button is clicked.

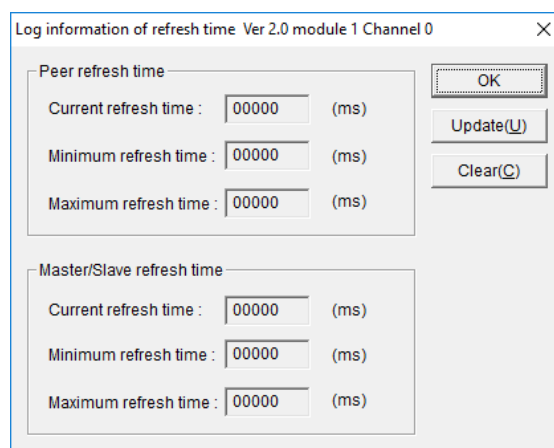


Figure 4-48 Log information of refresh time window

If you want to display the latest refresh time, click the **Update** button.

If you want to clear the refresh time, click the **Clear** button.

When quitting this function, click the **OK** button.

4.2.12 DeviceNet serial number

Function: Displays the DeviceNet serial number. The DeviceNet serial number is a product-specific ID number conforming to the DeviceNet standard. This function requires no parameter setting.

Operation: In the menu list window (Figure 4-17), click the **DeviceNet Serial No.** button. The DeviceNet serial No. window (Figure 4-49) appears.

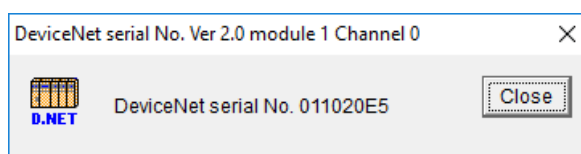


Figure 4-49 DeviceNet serial No. window

4. Operation

4.2.13 CSV output

Function: Outputs configuration information for a module and channel to a file in CSV format. In online mode, the configuration information for the actual target machine is output. In offline mode, configuration information contained in a selected file is output.

Operation: The following describes the operation procedure.

- (1) In online mode, establish a connection between the D.NET system and the PCs (see 4.1.6 *Changing connections*). If it is running in offline mode, choose the desired edit file (see 4.1.7 *Selecting an edition file*).
- (2) Select a module and channel whose information you want to output in CSV format (selectable only in online mode) in the D.NET system main window (Figure 4-16), and then click the **CSV Output** button.
- (3) The Save As window (Figure 4-50) appears. Specify the desired folder and file to which you want to output the configuration information, and then click the **Save** button.

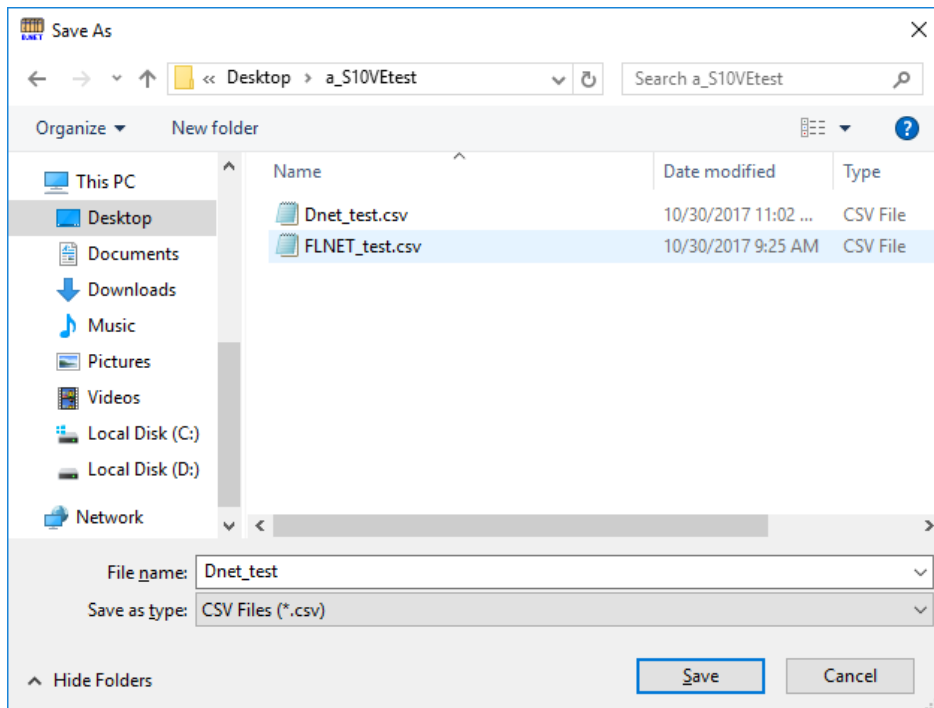


Figure 4-50 Save As window

- (4) The configuration information of the selected module and channel is output in the CSV format. However, in online mode, if a D.NET module is mounted and parameters are set in the CPU module, the Receiving agency selection window (Figure 4-51) appears. Select the **CPU** or **Option** radio button, and then click the **OK** button. The configuration information about the selected CPU module or option (D.NET module) is output in the CSV format.

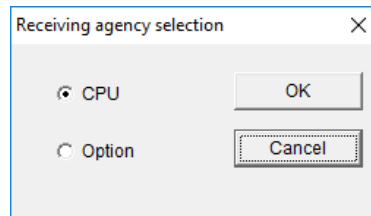


Figure 4-51 Receiving agency selection window

4. Operation

<CSV file output example>

(1) Operation mode is master-peer mode

In online mode, the communication type is displayed.
Example: Ethernet (192.192.192.1)

```
D.NET      2018/01/15      14:26:39
File name = C:\temp\Settings\2ch.pdat
PCs number: 100

Module number,1
Kind,2ch D.NET
Channel,0
Mode of operation,Master/Peer

Setup system parameters
Channel,Effective
Node address,0
Transfer speed,125[kbps]
Peer refresh time,50[ms]
Master/Slave refresh time,50[ms]
Slave timeout detection register,No use

Setup station parameters
Port number,Com kind,MAC ID,Message ID,Input address,Number of input
bytes,Output address,Number of output bytes,Bit reversal mode,Byte
reversal mode,Monitoring time of connection timeout,Status information
of D.STATION
H01, Poll, H02, --, FW000-FW008, H012, FW020-FW021, H004, --, Enable, 400, --
H02, Poll, --, --, --, --, --, --, --, --, --, --, --, --, --, --, --, --, --
H03, Poll, --, --, --, --, --, --, --, --, --, --, --, --, --, --, --, --, --
H04, Poll, H03, --, FW100-FW103, H008, FW108-FW10B, H008, Enable, Enable, 400, --

Setup data format conversion of D.STATION
No., Module, Input address, Output address, Assignment data area
H01, AI (Sign extension), FW000-FW008, --, --
```

(2) Operation mode is slave mode

```
D.NET      2018/01/15      2:36:39 PM
File name = C:\temp\Settings\2ch.pdat
PCs number: 100
```

```
Module number,1
Kind,2ch D.NET
Channel,0
Mode of operation,Slave
```

```
Setup system parameters
Channel,Effective
Node address,0
Transfer speed,125[kbps]
```

```
Setup station parameters
Communication kind,Poll
Bit reversal mode,No Use
Byte reversal mode,Effective
Input address,FW000-FW008
Input bytes,H012
Output address,FW020-FW021
Output bytes,H004
```

```
RI/O timeout information address,FW020-FW020
```

```
RI/O timeout information collection station registration
Registration number,Station No.
1, H01
2, H02
```

In online mode, the communication type is displayed.
Example: Ethernet (192.192.192.1)

4. Operation

4.2.14 Module information acquisition

Function: In online mode, acquires the current information from the CPU module to update the content of the main window to the latest information.

Operation: The following describes the operation procedure.

- (1) In the main window (Figure 4-16), click the **Module information** button.
- (2) The content of the main window is updated to the latest information.

5. Programming

5.1 Software configuration of D.NET SYSTEM/S10VE

Figure 5-1 shows the software configuration of D.NET SYSTEM/S10VE.

The communication control program is a ROM program and does not need to be loaded.

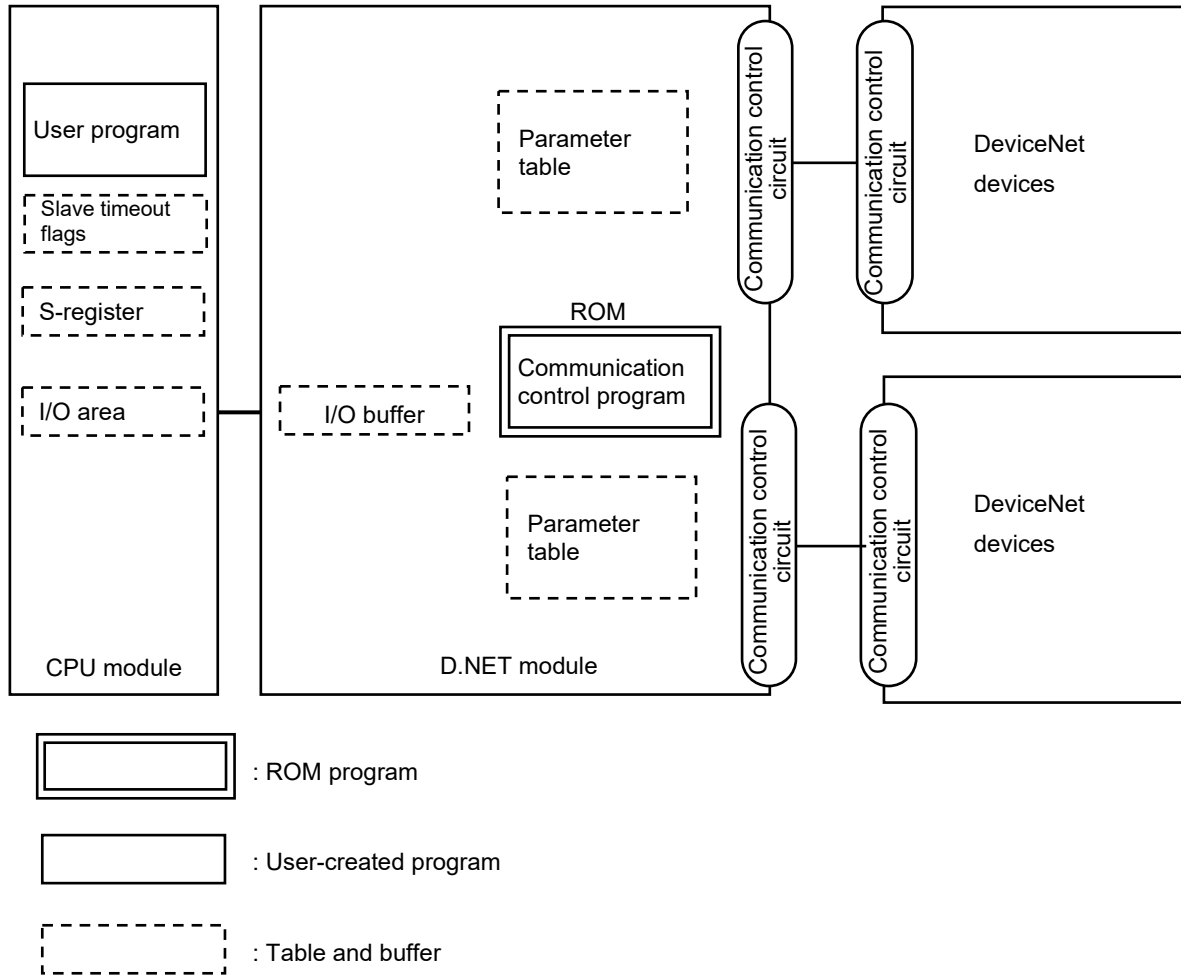


Figure 5-1 Software configuration of the D.NET module

5. Programming

- Communication control program

The major function of this program is as follows:

- The communication control program performs communications with DeviceNet devices.

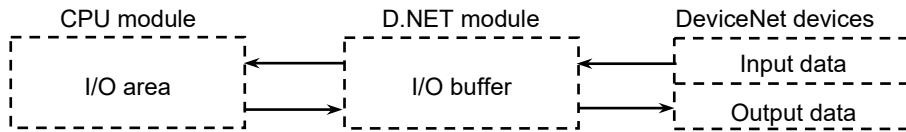


Figure 5-2 Communication data flow of the communication control program

Notice

- Data is transferred word by word between the I/O area of the CPU module and the I/O buffer of the D.NET module. Therefore, the unit of data transfer that can assure the simultaneity of data is one word. However, to assure simultaneity of data in the whole configuration, including DeviceNet devices, the DeviceNet devices themselves must also ensure simultaneity of data.

- Slave timeout flags and S-register

These registers are accessed by the communication control program when it sets data transmission/reception information and error information in them. The user program handles errors according to this information.

- I/O area

Table 5-1 lists the memory areas that can be used as the I/O area for data communication.

Table 5-1 Memory areas usable as the I/O area

Name	Symbol range	Number of points
External input	XW0000 (X0000) to XWFFFF (XFFFF)	4,096 words (65,536 points)
External output	YW0000 (Y0000) to YWFFFF (YFFFF)	4,096 words (65,536 points)
Internal register	RW000 (R000) to RWFFF (RFFF)	256 words (4,096 points)
Global link register	GW000 (G000) to GWFFF (GFFF)	256 words (4,096 points)
Transfer register	JW000 (J000) to JWFFF (JFFF)	256 words (4,096 points)
Receive register	QW0000 (Q0000) to QWFFFF (QFFFF)	4,096 words (65,536 points)
Event register	EW0400 (E0400) to EWFFFF (EFFFF)	3,072 words (64,512 points)
Extended internal register	MW0000 (M0000) to MWFFFF (MFFFF)	4,096 words (65,536 points)
Function work register	FW000 to FWBFF	3,072 words
Function data register	DW000 to DWFFF	4,096 words
Work register	LBW0000 (LB0000) to LBWFFFF (LBFFFF)	4,096 words (65,536 points)
Word work register	LWW0000 to LWWFFFF	65,536 words
	LXW0000 to LXW3FFF	16,384 words

You can specify whether to use each slave timeout flag from a setup window in master-peer mode only. This function is not available in slave mode.

Notice

- Each slave timeout flag is set (= 1) when no data is received from the slave device for a certain period. However, this is not the case when data cannot be transmitted normally as a result of a CAN transmission timeout or bus-off condition. The reason for this is that reception monitoring always starts upon completion of a normal transmission. You can check the occurrence of a CAN transmission timeout or bus-off condition by accessing the S-register described in 5.3 *S-register*.

5.3 S-register

The S-register stores information about errors that occur in modules, and can be referenced in a ladder program. An error bit in the S-register is set to 1 (ON) when an error of the corresponding error type occurs in any one of the DeviceNet devices connected to the modules.

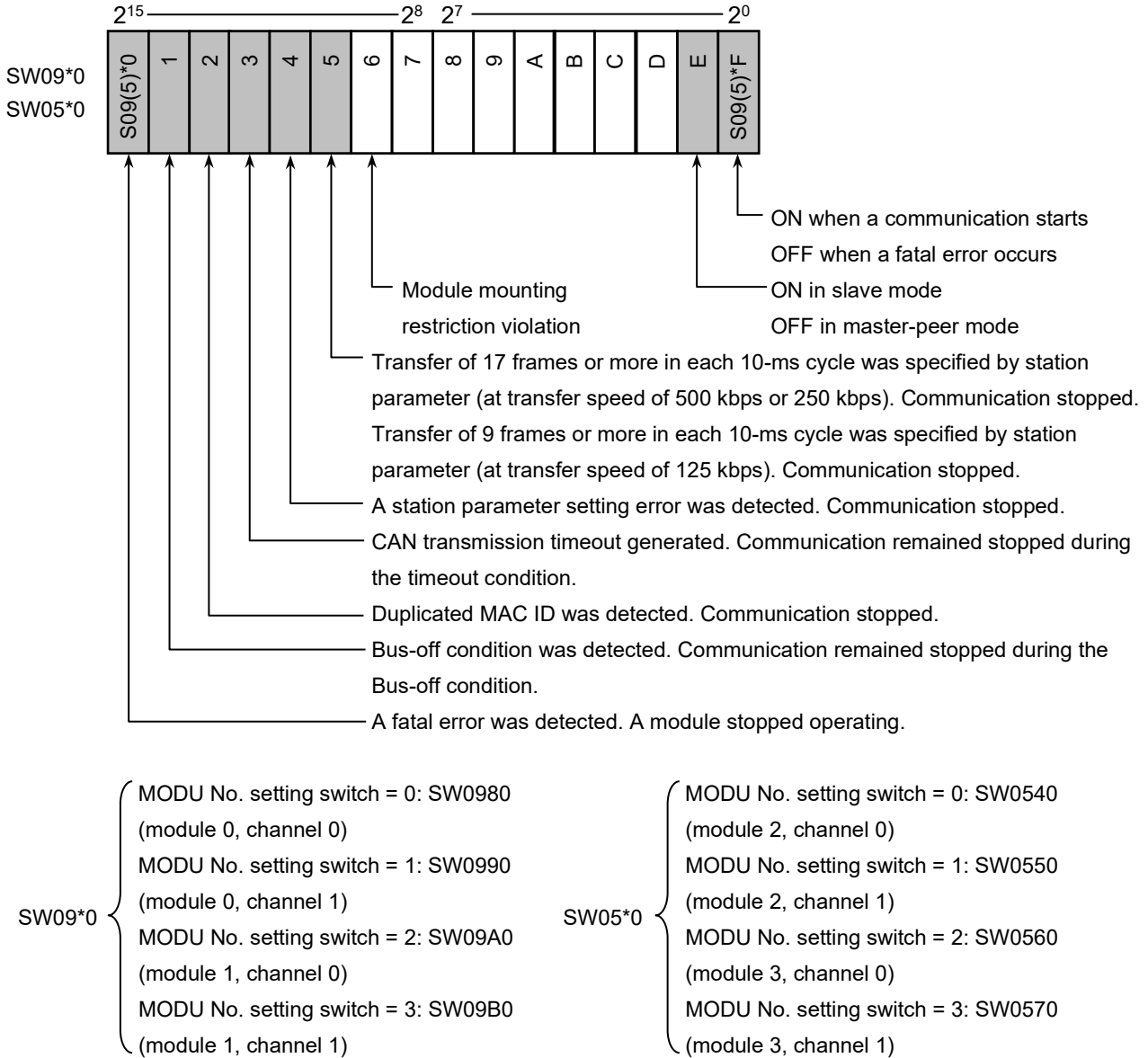


Figure 5-5 S-register

Notice

- The bus-off and CAN transmission timeout error bits are set to 0 (OFF) when the corresponding error conditions are cleared. Therefore, if a communication cable is damaged or the communication connector is connected incompletely, these bits might be set and reset repeatedly. Keep this in mind when referencing this register in a ladder program.

5.4 Communication time

Each of the option modules (including D.NET modules) periodically updates I/O data on the basis of respective communication time. The CPU module uses the I/O data updated by the option modules for control by the ladder program. The CPU module repeatedly runs the ladder program in a constant cycle (sequence cycle). To prevent an I/O data fetch error, it is necessary to set the communication time of each option module to half (or shorter) the sequence cycle.

The communication time of an option module depends on its communication word count setting or the number of option modules mounted on the CPU unit. Calculate the communication time (refresh time) of the D.NET module according to the following procedure. For details about how to calculate the communication time of option modules other than the D.NET module, see the manual for each option module.

- Expression for calculating communication time

The D.NET module transmits/receives data to/from slave devices (master/slave communication) or performs peer transmission within the specified communication time. The communication time of a D.NET module is the sum total of the communication time for slave devices and the peer communication time. If the slave devices connected to the D.NET module are defined as slave 1, slave 2, ... slave n , and the message IDs for peer communication are defined as ID1, ID2, ... ID n , communication time is obtained from the following expression. Calculate the communication time on a channel basis.

$$\begin{aligned} \text{Communication time [ms]} = & \text{Ts of slave 1} + \text{Ts of slave 2} \dots + \text{Ts of slave } n \\ & + (\text{Tps} + \text{Tpr}) \text{ of ID1} + (\text{Tps} + \text{Tpr}) \text{ of ID2} \dots \\ & + (\text{Tps} + \text{Tpr}) \text{ of IDn} + \text{Tpf} \end{aligned}$$

$$\begin{aligned} \text{Processing time per slave Ts [ms]} = & (\text{Fs} + \text{Fr}) \times \text{Vt} + (0.015 + 0.0007 \times \text{J}) \times \text{Ns} + (0.013 + 0.0007 \times \text{J}) \\ & \times \text{Nr} + 0.12 \end{aligned}$$

$$\text{Peer transmission time per message ID Tps [ms]} = (0.015 + 0.0007 \times \text{J}) \times \text{Ns} + 0.1$$

$$\text{Peer reception time per message ID Tpr [ms]} = (0.013 + 0.0007 \times \text{J}) \times \text{Nr} + 0.02$$

$$\text{Transmission time of peer communication frames flowing on a network Tpf [ms]} = \text{Fa} \times \text{Vt}$$

Ns: Output byte count

Nr: Input byte count

Vt: Transmission time of 1 frame (depending on transfer rate)

$$500 \text{ kbps} = 0.222, 250 \text{ kbps} = 0.444, 125 \text{ kbps} = 0.888$$

Fs: Transmission frame count (depending on the output byte count)

Output byte count range from 0 to 8: one

Output byte count range from 9 to 256: Output byte count \div 7 (round up the fraction)

Fr: Reception frame count (depending on input byte count)

Input byte count range from 0 to 8: one

Input byte count range from 9 to 256: Input byte count \div 7 (round up the fraction)

Fa: Total frame count of peer communication flowing on a network

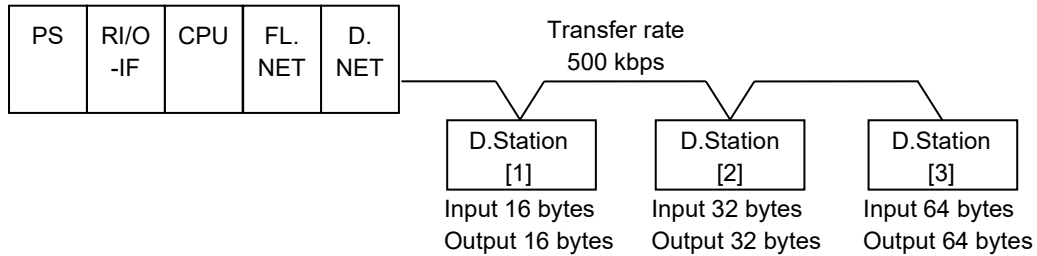
J: Sum total of option modules mounted on the CPU unit other than the D.NET module. For details about the type of target option module, see Table 2-1 in the *SIOVE User's Manual General Description* (manual number SEE-1-001).

5. Programming

- Communication time calculation example

The configuration shown in Figure 5-6 provides an example of communication time calculation.

Communication time is the sum of the communication of D.Station [1], D.Station [2], and D.Station [3]. In this example, the calculated communication time is 11.46 ms.



$$\begin{aligned}
 \text{Communication time} &= \text{Communication time of D.Station [1]} \\
 &+ \text{Communication time of D.Station [2]} \\
 &+ \text{Communication time of D.Station [3]} \\
 &= (3 + 3) \times 0.222 + (0.015 + 0.0007 \times 1) \times 16 + (0.013 + 0.0007 \times 1) \times 16 + 0.12 \\
 &+ (5 + 5) \times 0.222 + (0.015 + 0.0007 \times 1) \times 32 + (0.013 + 0.0007 \times 1) \times 32 + 0.12 \\
 &+ (10 + 10) \times 0.222 + (0.015 + 0.0007 \times 1) \times 64 + (0.013 + 0.0007 \times 1) \times 64 + 0.12 \\
 &= 1.92 \\
 &+ 3.28 \\
 &+ 6.44 \\
 &= 11.64 \text{ [ms]}
 \end{aligned}$$

One FL.NET module is mounted.

Figure 5-6 Communication time calculation example

5.5 Response time of the D.NET module in slave mode

Figure 5-7 shows the internal processing time of the D.NET module in slave mode from reception of a polling request until transmission of a polling response. The internal processing time varies depending on the number of input and output bytes. Use the following graph as a reference when designing a user system.

The response processing time in the following graph does not include any amount of time to transmit frames to the communication line. The reason for this is that the response processing time is the internal processing time from reception of a polling request until the start of transmission of a polling response. This amount of time varies depending upon the line speed.

Point (a) in the following graph indicates that, when the total number of input and output bytes with the LQE770-E is 128 bytes, the response processing time is about 1,000 μs .

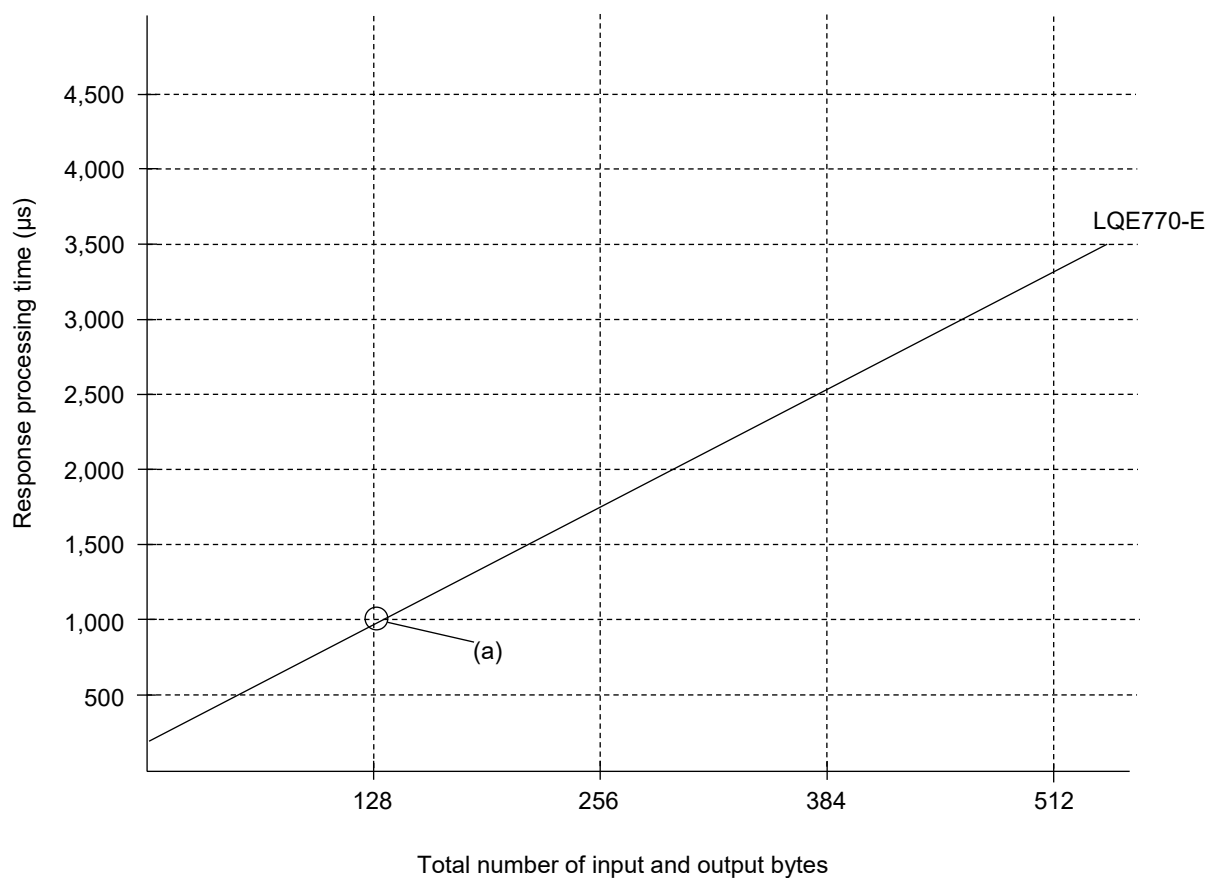


Figure 5-7 A graphical representation of the response time in slave mode

5.6 Parameter settings required for connecting non-Hitachi DeviceNet-compatible I/O devices

Where non-Hitachi DeviceNet I/O devices are connected to the D.NET module, you have to set the bit reversal mode and byte reversal mode according to the specifications of the slave I/O device (see Table 5-2). If the slave I/O device handles AI/AO data as long type, it requires swapping (of high-order and low-order words) at the application level. In addition, if the slave I/O device is a combination of AI/AO and DI/DO, it requires swapping (for both DI/DO and AI/AO) at the application level.

For details about the bit and byte arrangements used with given reversal mode settings, see 5.6.4 *Data reversal modes*.

Table 5-2 I/O devices and required reversal mode settings

I/O devices	Bit reversal mode	Byte reversal mode	Swapping at application level
DI/DO (Hitachi) only	D ^{#1}	D	Not required
DI/DO (non-Hitachi) only	E	D	Not required
AI/AO (byte data)	D	D	Not required
AI/AO (word data) ^{#2}	D	E	Not required
AI/AO (long data)	D	E	High-order and low-order words must be swapped.
Combination of DI/DO and AI/AO	D	D	DI/DO and AI/AO data must be swapped separately.

E: Set to Enable.

D: Set to Disable.

#1: Note the following points when using the D.NET module and D.Station module as slave devices:

- D.NET module

If the bit reversal mode of the slave unit is disabled, also disable the bit reversal mode of the master unit. If it is enabled, also enable that of the master unit.

- D.Station module

If the FUNC2 rotary switch of the D.Station module is set to *no bit swapping*, disable the bit reversal mode. If it is set to *bit swapping*, enable the bit reversal mode. For more information about the D.Station module, see the *HSC-1000 User's Manual D.Station* (manual number PAE-1-003).

#2: This category of I/O devices includes analog pulse counter modules.

5.6.2 Caution when enabling the bit reversal mode

If the bit reversal mode is enabled, the D.NET module internally reverses the order of the bits in each word before inputting and outputting the data. Therefore, you can transfer data between the D.NET module and a non-Hitachi DeviceNet I/O device (DI/DO) without the need to consider the order of the I/O numbers of the bits. However, this mode cannot be enabled for slave devices containing analog data or other numeric data, because such data is made undefined if enabled.

CPU module	D.NET module	Non-Hitachi DeviceNet I/O device		
		8-point module (Module with 1 bytes)	16-point module (Module with 2 bytes)	Analog module (1 channel with 2 bytes)
<p>I/O number</p> <p>↓</p> <p>□000 2¹⁵ (MSB)</p> <p>□001</p> <p>□002</p> <p>□003</p> <p>□004</p> <p>□005</p> <p>□006</p> <p>□007 2⁸</p> <p>□008 2⁷</p> <p>□009</p> <p>□00A</p> <p>□00B</p> <p>□00C</p> <p>□00D</p> <p>□00E</p> <p>□00F 2⁰ (LSB)</p> <p>↑</p>	<p>↔</p> <p>Reversed inside the D.NET module</p>	<p>I/O number</p> <p>↓</p> <p>0 2¹⁵ (MSB)</p> <p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7 2⁸</p> <p>8 2⁷ (MSB)</p> <p>9</p> <p>A (Ignored)</p> <p>B</p> <p>C</p> <p>D</p> <p>E</p> <p>F 2⁰ (LSB)</p> <p>↑</p>	<p>I/O number</p> <p>↓</p> <p>0 2¹⁵ (MSB)</p> <p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7 2⁸</p> <p>8 2⁷</p> <p>9</p> <p>A</p> <p>B</p> <p>C</p> <p>D</p> <p>E</p> <p>F 2⁰ (LSB)</p> <p>↑</p>	<p>2¹⁵ (MSB)</p> <p>2⁸</p> <p>2⁷</p> <p>2⁰ (LSB)</p>
(□: Register symbol)		The I/O numbers of the bits of each word used in the CPU module are in the same order as those used in non-Hitachi DeviceNet I/O devices.	Do not enable the bit reversal mode when processing numeric data.	

<h3 style="margin: 0;">Notice</h3> <ul style="list-style-type: none"> The bit reversal mode can only be enabled for individual slaves. Do not use the bit reversal mode when connecting with a slave device (such as AI/AO) that handles analog data or other numeric data. Doing so might cause input/output data to become undefined. Do not use the bit reversal mode when connecting with a slave device that handles both digital data and analog data. Doing so might cause input/output data to become undefined.

5.6.3 Handling analog data

(1) Bytes of analog data

To handle bytes of analog data, disable the byte reversal mode (by clearing the check box).

(2) Words of analog data

To handle words of analog data, enable the byte reversal mode (by selecting the check box).

(3) Long or longer words of analog data

- Assurance of data simultaneousness

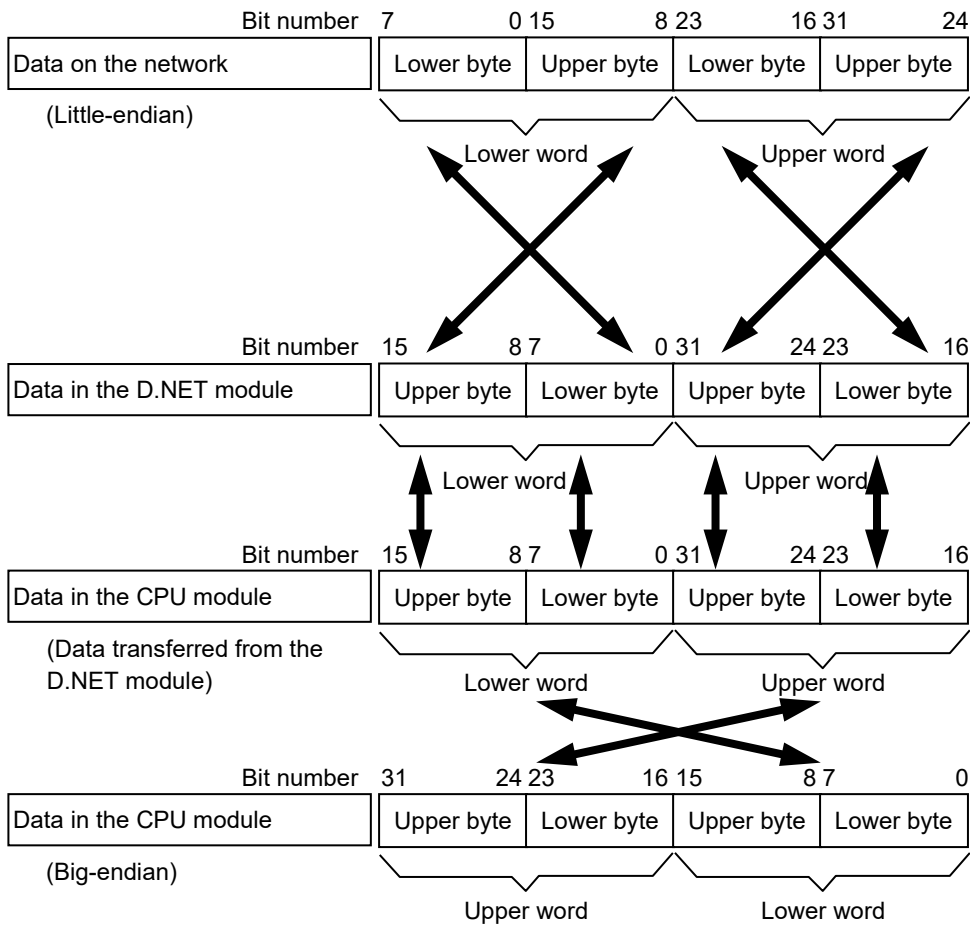
The D.NET module can assure the simultaneousness of input and output data only in units of words. It cannot assure the simultaneousness of long words (4 bytes long) or longer words of analog data.

- Endian

The DeviceNet message format is little-endian as specified in the DeviceNet standard, but the CPU module internally uses the big-endian format. By using the bit conversion mode, you can handle digital data, such as DI/DO, without paying attention to the endian. However, the bit conversion mode cannot be applied to analog data, such as AI/AO. Therefore, when handling long or longer words of analog data, you must perform data swapping as shown in the following figure.

5. Programming

Example: Data swapping for long (4-byte) words of data



When data is transferred between the CPU module and D.NET module, the upper and lower bytes of each upper/lower word are swapped (automatically by the D.NET module) if the byte reversal mode is enabled. You can specify the byte reversal mode setting.

You must swap the upper and lower words of each long word.

Notice

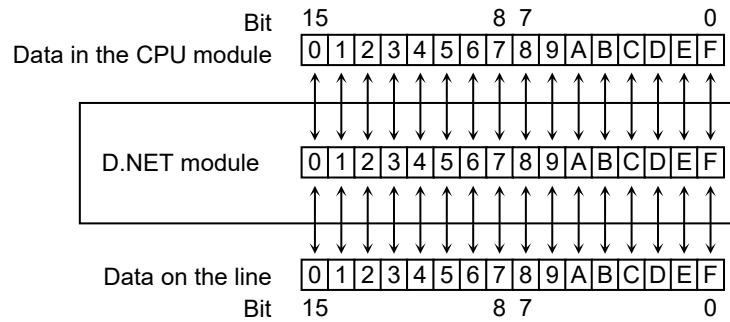
- Data swapping is required only when the data is made up of bytes or long or longer words. In this case, you need to swap data regardless of the number of data bytes to be input or output. For example, if data is transferred to and from a 4-channel AI slave (1 word/channel), the number of input bytes is 8, but no data swapping is required because the data is transferred in words.

5.6.4 Data reversal modes

The bit reversal and byte reversal modes can be set individually for each slave or peer device. Data conversion in each data reversal mode is described as follows.

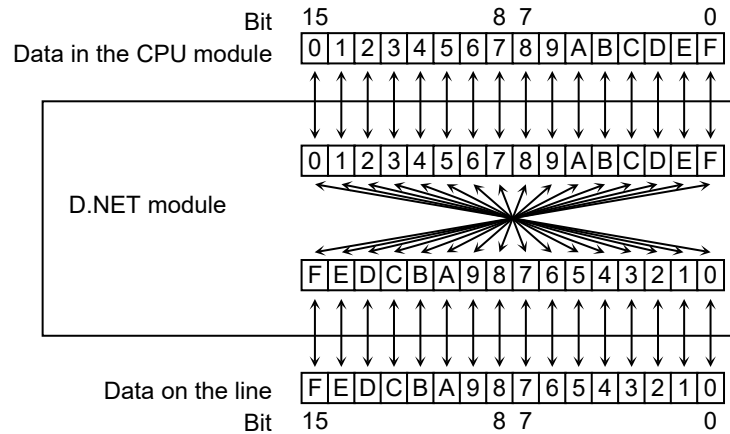
- (1) No-conversion mode (both the bit reversal mode and byte reversal mode are deselected)

In this mode, data in the CPU module is sent out to the DeviceNet line without any rearrangement (as shown in the following figure), or data from the DeviceNet line is transferred to the CPU module without any rearrangement.



- (2) Bit conversion mode (only the bit reversal mode is selected)

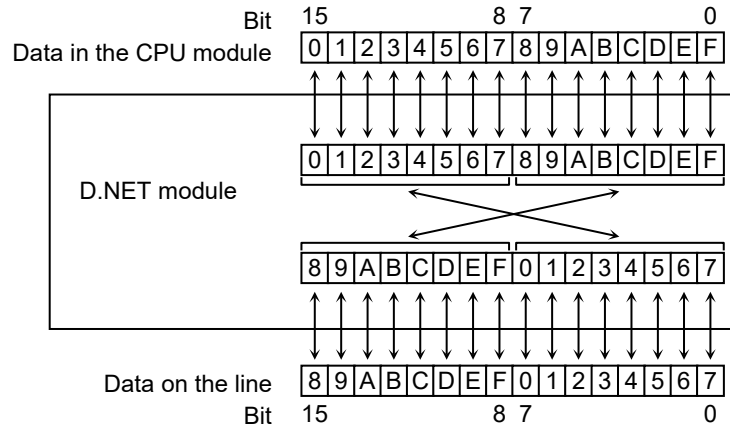
In this mode, data in the CPU module has its bit order reversed for each word (as shown in the following figure) and is sent out to the DeviceNet line. Also, data from the DeviceNet line has its bit order reversed for each word and is transferred to the CPU module.



5. Programming

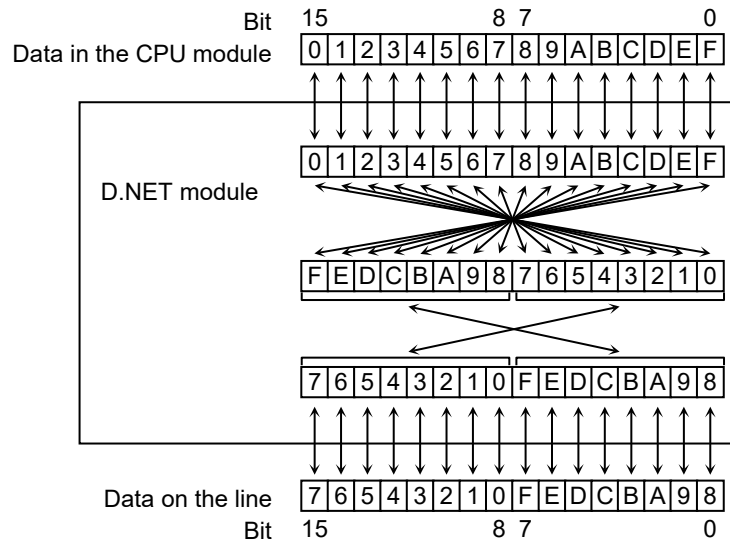
(3) Byte conversion mode (only the byte reversal mode is selected)

In this mode, data in the CPU module has its high-order and low-order bytes swapped for each word (as shown in the following figure) and is sent out to the DeviceNet line. Likewise, data from the DeviceNet line is processed by the same byte swapping for each word and is transferred to the CPU module.



(4) Bit and byte conversion mode (both the bit reversal mode and byte reversal mode are selected)

In this mode, data in the CPU module is processed by the conversions (2) and (3) described in the preceding explanation for each word and is sent out to the DeviceNet line. Likewise, data from the DeviceNet line is processed by the same conversions for each word and is transferred to the CPU module.



Notice

- The bit reversal and byte reversal modes need to be enabled or disabled, depending on the data handling of application programs and the specifications of connected devices.
- Any area set for the D.Station data format conversion function is invalid in bit conversion mode, where no bit conversion is performed.

5.7 CPU module switch settings and D.NET module operation

The operation of the D.NET module is controlled by the settings of the CPU RUN/STOP switch, LADDER RUN/STOP switch, and mode setting (MODE) of the CPU module, as shown in the following table. For information on the settings of these switches, see the *SIOVE User's Manual General Description* (manual number SEE-1-001).

CPU RUN/STOP switch	LADDER RUN/STOP switch	Mode setting (MODE)	D.NET module operation
RUN	STOP	NORM	Stops communication.
RUN	STOP	SIMU	Stops communication.
RUN	RUN	NORM	Starts communication.
RUN	RUN	SIMU	Stops communication.
STOP	unmentioned	unmentioned	Stops communication.

The D.NET module also stops communication in the following cases:

- The CPU module has gone down (the ERR LED is lit).
- 100 V AC or 100 V DC is applied to the STOP/RUN contact input on the terminal board of the RI/O-IF module (LQE950).

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6. Maintenance

6.1 Maintenance and inspection

To use D.NET modules under optimum conditions, perform the inspections shown in Table 6-1 periodically (at least twice a year).

Table 6-1 Maintenance and inspection items

Item	Description	Frequency
Unit cleaning	Turn off all the power supplies and then vacuum the interior of the D.NET module through the slits in its casing. Do not scatter dust during cleaning.	At least twice a year
Mechanical check	Check D.NET module mounting screws and communication cable mounting screws for looseness and damage. Tighten any loose screws and replace any damaged ones.	At least twice a year

Notice

- Check for loose connector fixing screws periodically (every 3 to 6 months), and tighten any loose screws (by using a tightening torque of 0.2 to 0.3 N·m).

6.2 Replacing or adding the module

For details about how to replace or add a D.NET module, see *Chapter 14. Adding and Replacing Modules* in the *S10VE User's Manual General Description* (manual number SEE-1-001).

6.3 Troubleshooting

As a guide for troubleshooting a D.NET module, use the indicator of the CPU module and LED indicators (MS LED and NS LED) of the D.NET module.

For details about how to perform troubleshooting, see *Chapter 13. Troubleshooting* in the *S10VE User's Manual General Description* (manual number SEE-1-001).

6.4 Installation work check list

No.	Category	Item	Check	Result of check
1	D.NET module	MODU No. setting switch	Is the module number set by the MODU No. setting switch unique (among those of the other modules)?	
2	Cable	Cable length	Check the total cable length and total length of branch lines in the network. Are they within the limits imposed by the communication speed? (See 3.4 <i>Wiring</i> .)	
3		Wiring environment	Are all network cables placed at a suitable distance from power lines and other lines that might generate induction noise?	
4		Current capacity	Are the currents flowing through cables within tolerances? (See 3.4 <i>Wiring</i> .)	
5		Cable specification	Do all the cables satisfy the specified requirements? (See 3.4 <i>Wiring</i> .)	
6	Connector	Cable connection	Are all the color-coded cables connected correctly? (See 3.4 <i>Wiring</i> .)	
7		Shield-type connector	Are all the connectors inserted completely and screwed firmly? Are all the fastening screws driven squarely into their holes?	
8		Open-type connector	Are all the ferrules of the cables crimped and screwed with the proper torque (0.5 to 0.6 N·m)?	
9			Is there any double-wire connections? No two wires must be connected to a single terminal of the open-type connector.	
10	Terminating resistor	Connection	Are terminating resistors to terminate the CAN-H and CAN-L signal lines connected to both ends of the trunk line? They cannot be connected to any other parts of the trunk line, except its farthest ends.	
11		Resistance error	Is the terminating resistor's resistance $121\Omega \pm 1\%$ (1/4 W or more)?	
12	Grounding	Grounding point	Is the shield of the communication cable grounded at only one point near the center of the network? Is the V- power line grounded via only one power supply in the network?	
13		Grounding environment	Does the grounding satisfy the requirements of class D grounding with the ground resistance of 100 Ω or less? Is the grounding environment at a suitable distance from power lines (for electric motors and the like)?	

7. Test and Maintenance Diagnosis

7.1 Details of Test and Maintenance diagnosis

Table 7-1 describes details of Test and Maintenance diagnosis for a D.NET module. Test and Maintenance diagnosis is a mode for verifying communication between modules. At least two D.NET modules are required for Test and Maintenance diagnosis. For details about how to start Test and Maintenance, see *7.3 Starting Test and Maintenance*.

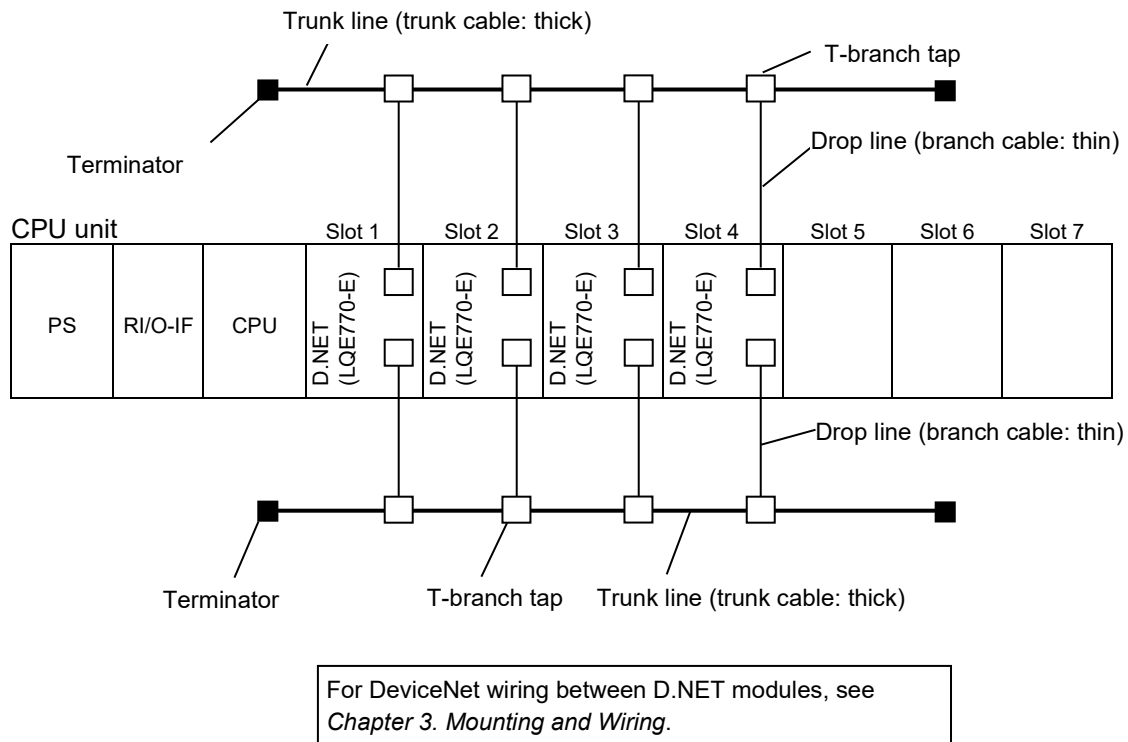
Table 7-1 Details of Test and Maintenance diagnosis for D.NET modules

No.	Test item	Description	Wiring required?
1	Inter-module connection check	Connect two to four D.NET modules to one another through a DeviceNet line to confirm that data can be transmitted and received normally.	Yes

Note: Test and Maintenance requires a wired connection between modules. Perform wiring according to *7.2 Wiring method*, and then start Test and Maintenance.

7.2 Wiring method

Perform wiring between D.NET modules, as shown in Figure 7-1. At least two D.NET modules are required. You can connect a maximum of four modules for Test and Maintenance diagnosis.



Note 1: Four D.NET modules (LQE770-E) are mounted in this figure, but Test and Maintenance diagnosis is also available with two or three modules.

Note 2: D.NET modules are mounted into Slot 1 to Slot 4 in this figure. Note that, Test and Maintenance diagnosis is also available if the modules are mounted into other slots.

Figure 7-1 Wiring when target modules are LQE770-E only

7.3 Starting Test and Maintenance

Observe the following rules and perform Test and Maintenance by using steps (1) to (6).

- Back up data.
- Do not perform Test and Maintenance for other modules at the same time.
- Write down the settings of all switches in advance to ensure that the settings are restored after the Test and Maintenance operation is completed.
- Turn off the power switch of the power supply module.

- (1) Perform wiring as shown in 7.2 *Wiring method*.
- (2) Select the Test and Maintenance module type by using the MODU No. setting switch of each D.NET module. Table 7-2 shows module types that can be selected by using the MODU No. setting switch, and the switch settings of the CPU module for starting Test and Maintenance.

Table 7-2 Module types that can be selected by the MODU No. setting switch

MODU No. setting switch	Module type	CPU module switch setting	
		CPU RUN/STOP	LADDER RUN/STOP
8	Module 0	RUN	RUN
9	Module 1		
A	Module 2		
B	Module 3		

Avoid overlapping of module numbers. Make sure that you mount module 0 (MODU No.8).

- (3) Set the CPU RUN/STOP and LADDER RUN/STOP switches of the CPU module to RUN.
- (4) Start the Test and Maintenance operation by turning on the power switch of the power supply module. During the Test and Maintenance operation, the MS/NS LEDs of all the mounted D.NET modules are lit in green.
- (5) To stop the Test and Maintenance operation, turn off the power switch of the power supply module.
- (6) To return to normal operation, restore the setting switches to the original states and then restore backed-up data.

7. Test and Maintenance Diagnosis

7.4 Checking errors

If an error is detected during the Test and Maintenance operation, the NS LED of module 0 (MODU No.8) lights in red. For detailed information, connect the tool system to the CPU unit. Then, refer to the error log information, and take the required action. For details about the tool system, see the *SIOVE User's Manual General Description* (manual number SEE-1-001).