# DeviceNet Module DN611/DN611A for

# Integrated Controller V Series

# model 2000 S2T

# Instruction Manual

REQUIREMENTS

- Read this instruction manual carefully before operating.
- Keep the manual aside to use when necessary.
- Pack the manual with the DN611/DN611A when transferring or reselling.

**August, 2002**

TOSHIBA CORPORATION

Important Information

Misuse of this equipment can result in property damage or human injury. Because controlled system applications vary widely, you should satisfy yourself as to the acceptabillity of this equipment for your intended purpose. In no event will Toshiba Corporation be responsible or liable for either indirect or consequential damage or injury that may result from the use of this equipment.

No patent liability is assumed by Toshiba Corporation with respect to the use of information, illustration, circuits equipment, of application examples in this publication.

# Safety Precautions

Thank you for purchasing Toshiba's DeviceNet module (DN611/DN611A) for Integrated Controller V series model 2000 S2T. This instruction manual describes the handling, precautions and operation of the DN611/DN611A.

Be sure to carefully read this manual and all of other related documents to learn the safety precautions, notes, and knowledge about the DN611/DN611A before its installation, operation, or inspection. This will allow you to operate your DN611/DN611A comfortably.

### Important Information

1. Toshiba's DN611/DN611A is designed and manufactured for use with general industrial equipment(manufacture line control devices, machine tools, etc.); it is not intended for use with equipment and systems which will endanger people's life during operation.

   Contact the Toshiba dealer in advance when you are going to use your DN611/DN611A for special applications such as transport vehicles(train, etc.), medical equipment, aerospace equipment, nuclear power control equipment, underwater relay equipment, or other similar applications.

2. Toshiba's DN611/DN611A is manufactured under strict quality control. However, be sure to install safety systems to minimize the effect of a possible accident before you apply your DN611/DN611A to the equipment which will endanger people's life or cause serious damage on the surroundings if the DN611/DN611A should break down.

3. Toshiba's DN611/DN611A is meant for those who have general knowledge of handling control equipment, especially the knowledge about installation, wiring, operation, and maintenance of the DN611/DN611A. Incorrect handling of the DN611/DN611A can cause electric shock, fire, failure, or/and malfunction. Therefore, don't engage in the installation, wiring, operation, or maintenance of the DN611/DN611A if your knowledge including electrical knowledge is not enough to handle control equipment. Instead, ask the qualified person to do such work.

4. This instruction manual and accompanying documents are meant for those who have general knowledge about the programmable controller and how to handle control equipment. If you have any questions on the content of this manual, don't hesitate to contact the Toshiba dealer.

# Safety Precautions (continued)

**[Warning indication]**

This instruction manual has the following important indications and symbols to prevent bodily injury and property damage during operation. Be familiar with these safety indications to follow during operation. After reading the text, keep the manual aside to consult when necessary.

**Description of Safety Signs**

| Indication | Meaning |
|---|---|
| ⚠ DANGER | **Indicates misuse of the handling could cause a fatal accident or serious injury.** |
| ⚠ CAUTION | **Indicates misuse of the handling could cause injury or material damage.** |

Injury means a hurt, burn, or electric shock, which requires neither hospitalization nor long-term medical treatment by visits. Some of the **CAUTION** items, however, could bring about grave consequences depending on the situation. So be sure to always follow the CAUTION instructions.

# Safety Precautions (continued)

· **Precaution for operation**

**⚠ DANGER**

1. Configure an emergency-stop circuit, interlock circuit, and/or other similar safety circuits outside the PC and DN611.

   If the PC or DN611 gets failed or malfunctioned, it can cause an accident which will lead to bodily injury and/or mechanical damage.

   S2T User's manual

**⚠ CAUTION**

2. Secure the safe environment before executing program modification, forcible output, RUN, or HALT instruction during operation. An operational mistake can cause mechanical damage or accident.

   S2T User's manual

· **DIP switch for setting the operating mode/communication rate**

**⚠ CAUTION**

1. Set and keep "OSEN" on the DIP switch to OFF. Setting it to ON can get failed or malfunctioned.
2. When you set "BUSOFF" on the DIP switch to OFF, transmission will restart automatically even when busoff occurs. Unless the cause of the DN611's busoff (cause of communication error) is solved, however, busoff may get repeated.
3. When you set both of communication rate DR0 and DR1 to ON and turn on the power of the S2T, "Communication Rate Setting Failed" will appear with the following indications:
   - The "MS" LED is blinking red.
   - "F7" and the local station node address are being displayed alternately on the 7-segment LED.

   To clear these indications, set DR0 and DR1 correctly and, issue a reset request or turn OFF and ON the power.
4. Set the communication rates of your nodes being connected to the network, to the same communication rate. **Setting different communication rates on your different nodes will cause slave devices or the DN611 to get malfunctioned, resulting in no communication started.**

   Read the relevant manuals and descriptions to set the communication rate of your slave devices.
5. Don't change over the communication rates while your S2T is rising just after the turning on power. In particular, never change the communication rate while communicating with slave devices. Failing to do so will cause "Communication Rate Setting Failed" to appear.

   To clear this indication, set the DIP switch to the correct setting and, issue a reset request or turn OFF and ON the power.

   3.2.1 DIP Switch for Setting the Operation Mode/Communication Rate

# Safety Precautions (continued)

· **Rotary switch for setting the node address**

**⚠ CAUTION**

1. When you set a value within 64 to 99 to the node address of your DN611 and turn ON the power of your S2T, "Node Address Setting Failed" will appear with the following indications:
   - The "MS" LED is blinking red.
   - "F6" and the local station node address are being displayed alternately on the 7-segment LED.

   To clear these indications, set the correct value to the node address and, issue a reset request or turn OFF and ON the power.
2. If your DN611 node address has the same value with another node and when the DN611 comes into run state, "Node Address Duplicated" will appear with the following indications:
   - The "MS" LED is lighting red and/or the "NS" LED is lighting red.
   - "70" and the local station node address are being displayed alternately on the 7-segment LED.

   To clear these indications, set the correct value to the node address and, issue a reset request or turn OFF and ON the power.

3.2.2 Rotary Switch for Node Address Setting

· **Mounting in the base unit**

**⚠ CAUTION**

1. Since the DN611 is designed for Toshiba's S2T, be sure to mount your DN611 in the base unit, instead of using it in stand-alone; don't use it for other applications. Unauthorized applications can cause electric shock, bodily injury, and/or mechanical malfunction.
2. Be sure to turn OFF the power (on the S2T side and network side) before attaching or detaching the DN611 and/or the terminal block. Failing to do so will cause electric shock, malfunction, and/or failure.
3. Keep the DN611 free from foreign matter such as electric-wire waste. Failing to do so could cause fire, failure, and/or malfunction.
4. Check the connectors, cables, and base unit of the DN611, for their firm connection and mounting using stoppers and screws. Note loose connection or mounting can be shaky or easily disconnected off, resulting in failure or malfunction of the DN611.

3.3 Mounting in the Base Unit

# Safety Precautions (continued)

· **Connection with the network**

| ⚠ CAUTION |
|---|
| 1. Don't engage in attaching or detaching the DeviceNet cable with the network side connector during network operation. Failing to do so can cause reverse connection or short circuit of the network power, resulting in no communication with other nodes. |
| 2. When you connect the DeviceNet cable with the network side connector, be sure not to make the wrong connection. Failing to do so can cause short circuit of the network power, resulting in no communication with other nodes. |
| 3. Neither attach nor detach the network side connector with the device side connector on the DN611 front panel while S2T is rising just after the power is turned ON. Failing to do so can cause the DN611 to fail or malfunction. |
| 4. Attaching the opposite end of the network side connector with/from the device side connector is not possible because of the specific form. Trying connecting the wrong end by excessive force can damage both the network side connector and the device side connector. |
| 5. Be sure not to wire the cable in too tightly stretched state or in bent state.<br>Also, don't put heavy stuff on the cable. Otherwise, the cable could break. |
| 6. Ask the qualified expert for the installation work of the DeviceNet cables because it requires sufficient safety and noise-suppression measures. Refer to DeviceNet Volume I, Release 1.3, for the standard installation. |
| 3.4 Connection with the Network |

# Safety Precautions (continued)

· **Turning ON/OFF the power of master/slave and the network**

**⚠ CAUTION**

1. Be sure to turn ON the network power before turning ON the power of the DeviceNet devices.

   Some nodes of the slave devices use the network power as the operation power while other slave devices indicate an error when their work power is not supplied. Therefore, be sure to switch ON the network power. Also note unless the network power is switched ON, your DN611 cannot start communication with slave devices.

2. Be sure the network power is supplied to all the nodes being connected with the network. The node to which no network power is supplied could cause communication obstacle to other nodes.

3. Make sure the power of all slave devices is switched ON before the DN611 begins communication. When the DN611 begins communication while the power of a slave device is not switched ON, the DN611 will display an error message of no response from that device.

4. While network communications are operating, don't shut OFF the network power. Failing to do so will cause the entire network communications to stop and, one of the nodes become busoff state.

5. Switch OFF the S2T side power at last after the DN611 begins communications. This helps the master device (DN611) to be recognized from the network and prevents slave devices from malfunctioning.

3.5 The Network Power/Grounding

# Safety Precautions (continued)

**Relating to the following sections:**

- **How to handle your DN611 (software)**
- **Examples of DN611 applications**
- **RAS information**

| ⚠ CAUTION |
|---|
| 1. Chapter 4 describes the subjects necessary for using diverse functions of the DN611 from the S2T. Chapter 5 describes, based on the subjects explained in Chapter 4, setting the DN611 parameters, activating transmission, inputting/outputting data with slave devices, and the procedure for reading RAS information including event history, and sample programs.<br><br>Write programs after understanding the contents. As sample programs are basic, you need to examine your programs from beginning to end before applying them to actual systems.<br><br>4. How to Handle Your DN611 (software)<br>5. Examples of DN611 Applications<br>6. RAS Information (except RAS area on communication memory) |

- **Allocation of slave device data to input/output data area**

| ⚠ CAUTION |
|---|
| 1. When a slave device has odd transmission/reception bytes in size, **the actual size plus 1 byte are allocated to the DN611 input/output area.**<br><br>2. When you add a new slave device, enter a new value larger than the node addresses of the present slave devices. For Figure 4.8, enter a value larger than "41" for the node address of a new slave. If the node address of a new slave device is set to "18", allocating data area of node addresses 20/30/40 will be shifted.<br><br>3. Don't change the input/output data size for slave devices (FLEX-I/O, etc.) which are flexible in data allocation size. If changed, the slave devices with a node address larger than that of the slave device changed data size will be shifted in their data allocation.<br><br>4.4 Allocating Slave Device Data to the Input/Output Data Area |

- **Operating mode of the S2T and the DN611**

| ⚠ CAUTION |
|---|
| 1. If the S2T turns into HALT/ERROR mode, the DN611 in run mode becomes standby mode.<br><br>4.6.1 DN611 Operation Mode<br>5. Examples of DN611 Applications |

# Safety Precautions (continued)

· **Action when your DN611 is reset**

**⚠ CAUTION**

1. Neither issue a request from the S2T to DN611 while the DN611 is being reset nor execute data input/output. Otherwise, the instruction requested will be completed abnormal (error of station mode abnormal), or the module self-check will fail turning into down mode.

[4.6.2 Reset Request]

· **Setting slave device parameters**

**⚠ CAUTION**

1. The parameter setting request (slave device) sets the parameters of slave devices on to the non-volatile memory in the DN611. As long as the slave devices configuration is unchanged, you don't need to execute this request every time when the power is switched ON. In addition, when the parameters of the slave device requested and the parameters of the slave device in the non-volatile memory are same, this setting request is not executed.
2. When the slave devices configuration needs to be changed, delete the salve devices parameters using a reset request before setting new slave devices parameters.
3. The number of times available for setting slave devices parameters in the non-volatile memory of the DN611 is 300 times.
4. The DN611 has the following restriction for transmitting "0 byte" to a slave device from the DN611.
   - When a slave device comes into no communication state with the DN611 due to some reason (for example, the power of the slave device is OFF; the connector is disconnected, etc.), the DN611 cannot recognize the slave device is abnormal. Even after the cause of the failed communications is solved, the DN611 and the slave device cannot communicate with each other.

   Note: The above restriction of the present DN611 will be solved by a version-up of the internal software.

4.6.4 Parameter Setting Request (slave device)

· **Installation environment and mounting in the base unit**

**⚠ CAUTION**

1. Apply the environment specified in the User's Manual of the S2T.

   When using your DN611 in the environment other than specified, the DN611 can cause electric shock, fire, failure, and/or malfunction.
2. Mount your DN611 in the way specified in the User's Manual of the S2T.

   If mounted in the direction other than specified or if mounted incorrectly, the DN611 could fall off, or cause fire, failure, and/or malfunction.

8.1 Installation Environment and Mounting in the Base Unit

# Safety Precautions (continued)

· **Mounting/removing the module**

**⚠ CAUTION**

1. Since the DN611 is designed for the S2T, be sure to attach it to the base unit. Don't use your DN611 in stand-alone state or to other applications.

   Failing to do so could cause electric shock, injury, and/or failure.

2. Be sure to turn OFF the power before mounting, removing, wiring, or un-wiring the DN611. Failing to do so can cause electric shock, malfunction, and/or failure.
3. Keep your DN611 free from foreign matter such as electric-wire waste. Failing to do so could cause fire, failure, and/or malfunction.
4. Check the connectors and cables and the DN611 mount in the base unit, for their firm connections and mount using stoppers/screws. Loose connection and mounting becomes shaky and disconnected, resulting in failure or malfunction.

8.2 Mounting/Removing the Module

· **Wiring the power and grounding**

**⚠ CAUTION**

1. Be sure to turn OFF the power before wiring cables. Failing to do so could cause electric shock.
2. Use crimp-on connectors with sheath or cover the conducting part with tape when wiring your S2T power module. Also, handle the terminal block cover correctly to avoid fall-off and damage when fixing. Be sure to fix the cover on the terminal block when completing the wiring. If the conducting part is exposed, you can have electric shock.
3. Be sure to have grounding. When not grounded, electric shock and/or malfunction can occur.
4. Make sure the wiring is correct when connecting the DeviceNet cables to the network side connector. The short circuit of the network power, etc. can fail communication with other nodes.
5. When you are going to detach or connect the network side connector to/from the device side connector on the DN611 front panel, don't engage yourself while the S2T side power is rising. Failing to do so can cause the DN611 to fail or malfunction.
6. Attaching the opposite end of the network side connector with/from the device side connector is not possible because of the specific form. Trying connecting the wrong end by excessive force can damage both the network side connector and the device side connector.
7. Ask a qualified person to wire cables. Incorrect wiring can cause fire, failure, and/or electric shock.

8.3 Power Unit Wiring/Grounding

# Safety Precautions (continued)

· **Basic caution in network Installation**

**⚠ CAUTION**

1. Ask the qualified subcontractor for sufficient safety and noise-suppression measures when installing the DeviceNet cable.

   Refer to DeviceNet Volume I, Release1.3, for the standard installation.

2. It is recommended to consign a subcontractor specialized in safety measures and standards.

3. Avoid the network components of the DeviceNet cable from being installed in a noisy environment. When installing, be sure to furnish noise-suppression measures as described in the following section.

   8.4 Network Installation

· **Maintenance**

**⚠ CAUTION**

1. Be sure to turn OFF the power mounting or removing the module, terminal block, and cable. Failing to do so can cause electric shock, malfunction, and/or failure.

2. Carry out daily check, periodical check, and cleaning to keep the system in normal condition.

3. If your DN611 does not operate normally, refer to "7. Troubleshooting" to identify the cause of the trouble.

   Contact a Toshiba's branch office (or dealer) or service agency for returning your DN611 for repair when failed. Operation and safety of your DN611 can be guaranteed only when repaired by Toshiba or a Toshiba's authorized service agency.

4. Neither try to disassemble nor modify the hardware of the module. Similarly, don't modify the software by any means. Failing to do so could cause fire, electric shock, and/or injury due to failure or malfunctioning.

5. Make sure you are safe when measuring the voltage on the connector of the module.

   Failing to do so could cause electric shock.

6. Stop the network and turn OFF the S2T side power before replacing the module.

   Failing to do so could cause electric shock, malfunction, and/or failure.

7. Don't use your DN611 in abnormal condition such as smoking or nasty smelling.

   Failing to do so could cause fire, electric shock, and/or failure.

   If such an abnormal condition happens, turn OFF all the power supplies immediately and contact a Toshiba branch office (or dealer) or authorized service agency.

   Since it is very dangerous, don't engage yourself in modifying or repairing your DN611 by any means.

   Appendix (maintenance)

# Usage Recommendations

This section puts together the knowledge and handling manners necessary for correct operation. Read the section carefully and be familiar with equipment knowledge, safety information, and notes.

· **Network cnfiguration**

| Usage Recommendation |
|---|
| 1. Don't make a network configuration whose extended trunk line and drop lines have no node being connected.<br>2. Don't attach a terminal resistor to the node. It could cause communication error.<br>3. Attach a terminal resistor to both ends of the trunk line; don't attach a terminal resistor on the end of a drop line. Attach only to both ends of the trunk line.<br>1.2 Network Configuration of the DeviceNet |

· **Switch setting**

| Usage Recommendation |
|---|
| 1. Use a small minus screwdriver for changing the value of the DIP switch.<br>3.2.1 DIP Switch for Setting the Operation Mode/Communication Rate |

| Usage Recommendation |
|---|
| 1. Use a small minus screwdriver for changing values of the rotary switch.<br>3.2.2 Rotary Switch for Node Address Setting |

· **Connecting your DN611 with the network side connector**

| Usage Recommendation |
|---|
| 1. Loosen the cable fixing screws on the connector before inserting a cable into the network side connector. The cable cannot be fixed when the screws are kept tightened.<br>2. Colors corresponding to cable colors are printed by the device side connector of the DN611. Match the cable colors with the printed colors to have correct wiring.<br>3. The DN611 and the DN311 (DeviceNet module for T3/T3H) have different directions for attaching the network side connector.<br>4. DeviceNet cable, power tap, and device tap (connecting the trunk line with drop lines) are necessary when constructing a system using a DeviceNet. Refer to "3.6 The Network Components" for detail.<br>Some of the network components must be prepared by the user.<br>5. When you use the network side connector that has the upper and lower rows with holes for cables (at the left-side Figure 3.5), the connector protrudes from the left-side DN611 about 5mm. When you attach or detach the left-side module of DN611, you must detach the connector from DN611.<br>3.4.2 Connecting Network Side Connector to the DN611 |

# Usage Recommendations (continued)

· **Network power configuration**

| Usage Recommendation |
|---|
| 1. Consider not only current capacity of the trunk line but also current capacity of drop lines when you install a node on a drop line.<br>2. In particular, when you are connecting nodes in daisy chain on a drop line, be careful not to have insufficient current capacity.<br>3. Use a network power whose capacity is much larger than the total current consumption necessary for the network.<br>3.5.2 How to Configure Network Power Units |

· **Network power unit**

| Usage Recommendation |
|---|
| 1. Use a network power whose capacity is much larger than the total current consumption necessary for the network.<br>3.5.3 The Network Power Unit(24Vdc) |

· **Registering your DN611 module**

| Usage Recommendation |
|---|
| 1. When your DN611 is going to be I/O registered in the S2T, leave blank for the slot where the DN611 is installed.<br>After automatic allocation is performed, the DN611-installed slot is left blank.<br>4. How to Handle Your DN611 (software) |

· **Node address of your DN611**

| Usage Recommendation |
|---|
| 1. Set the node address of your DN611 to a value smaller than the node addresses of slave devices(because of the feature of CAN currently used in the DeviceNet).<br>4.6.3 Parameter Setting Request (local node) |

· **How to solve overrun errors**

| Usage Recommendation |
|---|
| 1. Reduce the network communication speed when an overrun error occurs (500 kbps -> 250 kbps -> 125 kbps).<br>7. Troubleshooting (Data Communication with Slave Devices) |

# About This Manual

Thank you for purchasing Toshiba's Integrated Controller V series model 2000 S2T.

This manual describes the specification, handing manners, and sample programs of the DeviceNet module (called as the "DN611/DN611A") used for S2T. Read this manual to handle and operate your DN611/DN611A correctly.

This manual consists of the following chapters:

### Chapter 1: Overview of the DeviceNet Module

Outlines functions of the DN611/DN611A, specification, and application systems, etc. Read this chapter to know basic performances of the DN611/DN611A.

### Chapter 2: Names and Functions of DN611/DN611A Parts

Describes the names and functions of DN611/DN611A parts. Read this chapter carefully since important information, required for hardware settings in the next chapter, is included in this chapter.

### Chapter 3: Preparation for Operation (hardware)

Describes the hardware preparation and setting necessary for your DN611/DN611A operation.

### Chapter 4: How to Handle Your DN611 (software)

Explains accessing the DN611/DN611A from the S2T and software settings.

### Chapter 5: Examples of DN611 Applications

Describes sample programs of handling the DN611/DN611A explained in Chapter 4.

### Chapter 6: RAS Information (except RAS area on communication memory)

Describes the formats and contents of RAS information on the DN611/DN611A (except for RAS area on communication memory).

### Chapter 7: Troubleshooting

Explains possible causes and solutions when your DN611/DN611A malfunctions.

### Chapter 8: Installation/Wiring Work

Explains how to install your DN611/DN611A and S2T, how to wire transmission cables, and how to arrange other preparation work.

### Appendix

Describes the maintenance and check items, the execution time of READ/WRITE instructions of the S2T and the distinction between DN611 and DN611A.

In addition to this instruction manual, the S2T instruction manuals are also prepared for your reading.

### Registered Trademarks:

- DeviceNet is a registered trademark of ODVA (Open DeviceNet Vendor Association).
- PowerTap, T-Port Tap, DeviceBox Tap, and FLEX I/0 are registered trademarks of RockWell Automation Co., Ltd.
- COMBICON is a registered trademark of Phoenix Contact Corporation.

# Contents

**1. Overview of The DeviceNet Module .....19**

**1.1 Features and System Configuration Examples of the DeviceNet Module (DN611) .....19**

**1.2 Network Configuration of DeviceNet .....21**

1.2.1 The Network Configuration .....21
1.2.2 Trunk Line/Drop Line and Maximum Cable Length .....22
1.2.3 The Terminal Resistor .....24

**1.3 Conformity Specification and Trademarks .....25**

**1.4 The Basic Functions .....26**

1.4.1 The Polling Instruction/Response Mode .....26
1.4.2 The Bit Strobe Instruction/Response Mode .....27
1.4.3 Synchronization/Asynchronous Mode and Data Update Cycle .....28

**1.5 The DN611 Specification .....30**

1.5.1 The Function Specification .....30
1.5.2 Number of Mounting Modules .....31

**2. Names and Functions of DN611 Parts .....33**

**2.1 Outer Dimensions and Sizes .....33**

**2.2 Names of DN611 Parts .....34**

**2.3 Functions of DN611 Parts .....36**

**3. Preparation for Operation (hardware) .....38**

**3.1 DN611 Setting Flowchart (hardware) .....38**

**3.2 Switch Setting .....39**

3.2.1 DIP Switch for Setting the Operation Mode/Communication Rate .....39
3.2.2 Rotary Switch for Node Address Setting .....41

**3.3 Mounting in the Base Unit .....42**

**3.4 Connection with the Network .....43**

3.4.1 Connecting DeviceNet Cables to Network Side Connectors .....44
3.4.2 Connecting the Network Side Connector to the DN611 .....45

**3.5 The Network Power/Grounding .....47**

3.5.1 The Network Power Mechanism .....47
3.5.2 How to Configure Network Power Units .....48
3.5.3 The Network Power Unit (24 Vdc) .....54
3.5.4 The Network Grounding .....55
3.5.5 Procedure for Switching-ON/Shutting-OFF the Power .....56

**3.6 The Network Components .....57**

**4. How to Handle Your DN611 (software) .....60**

**4.1 Configuration of the DN611 Communication Memory .....61**

**4.2 The Input/Output Data Area .....62**

**4.3 The RAS Information Area .....66**

**4.4 Allocating Slave Device Data to the Input/Output Data Area ..... 75**

**4.5 The Semaphore Area ..... 76**

**4.6 Requests to the DN611 ..... 79**

4.6.1 The DN611 Operation Modes ..... 80
4.6.2 Reset Request ..... 81
4.6.3 Parameter Setting Request (local node) ..... 82
4.6.4 Parameter Setting Request (slave device) ..... 85
4.6.5 Operation Mode Control Request ..... 88
4.6.6 RAS Information Read Request ..... 89
4.6.7 Time Setting Request ..... 90

**4.7 Completion Status ..... 91**

**5. Example of DN611 Applications ..... 92**

**5.1 The DN611 Operation Order ..... 92**

**5.2 Module Setting Procedure ..... 93**

5.2.1 Accessing the DN611 in Module Setting ..... 94
5.2.2 Configuration of a Module Setting Sample Program ..... 96
5.2.3 Reset Request ..... 97
5.2.4 Parameter Setting Request (local node) ..... 99
5.2.5 Parameter Setting Request (slave device) ..... 100
5.2.6 Operation Mode Control Request ..... 106
5.2.7 RAS Information Read ..... 111
5.2.8 Time Setting Request ..... 114

**5.3 Slave Data Input/Output ..... 116**

5.3.1 Slave Device Check ..... 116
5.3.2 Asynchronous Mode Data Input/Output ..... 117
5.3.3 Synchronous Mode Data Input/Output ..... 122

**6. RAS Information (except RAS area on communication memory) ..... 129**

**6.1 Module Status / Network Status LED (MS/NS) ..... 130**

**6.2 Indications of the 7-Segment LED ..... 131**

**6.3 RAS Information Reading Data ..... 133**

6.3.1 The RAS Counter ..... 133
6.3.2 Event History ..... 136
6.3.3 Execution Node Information ..... 139

**7. Troubleshooting ..... 141**

**7.1 When Starting up the Module ..... 141**

**7.2 Reset Request (scan list clear) ..... 142**

**7.3 When the Module Doesn't Become Run Mode ..... 143**

**7.4 Data Communication with Slave Devices ..... 146**

**8. Installation/Wiring Work..... 148**

**8.1 Installation Environment and Mounting in the Base Unit..... 148**

**8.2 Mounting/Removing the Module ..... 148**

**8.3 Power Unit Wiring/Grounding ..... 149**

8.3.1 Power Unit Wiring..... 149
8.3.2 Grounding..... 149

**8.4 Network Installation..... 150**

8.4.1 Installation Gists Outside the Board ..... 150
8.4.2 Installation Gists Inside the Board..... 153

**Appendix**

Appendix 1 Maintenance and Inspection..... 154
Appendix 2 READ/WRITE Instruction Execution Time ..... 156
Appendix 3 DN611A..... 157
Appendix 4 Added/ corrected function of DN611A firmware (rev. B)..... 161

# 1. Overview of the DeviceNet Module

## 1.1 Features and System Configuration Examples of the DeviceNet Module (DN611)

This section describes the features and system configuration examples of the DeviceNet module (DN611/DN611A) for the Integrated Controller V series model 2000 S2T. The DN611/DN611A is an interface module for connecting the DeviceNet, which is a device level network for FA, to the S2T.

Hereafter, the Integrated Controller model 2000 S2T is respectively called the "S2T". Likewise, the DeviceNet module for the Integrated Controller model 2000 series is also called the "DN611." The differences between DN611 and DN611A are in appendix 3.

### (1) Conformed with DeviceNet

DeviceNet is a standardized device level network for factory automation(FA), developed by RockWell Automation Co. in USA. A nonprofit organization, called ODVA (Open DeviceNet Vendor Association), is serving as the center for the maintenance/extension of the DeviceNet specification and for conformable products introduction.

The DN611, functioning as the master (parent station) device on a DeviceNet, performs data input/output between the master device and the DeviceNet slave (child station) devices, which are developed by different makers (vendors) in and outside Japan and conform with the DeviceNet, to interface such slave devices with the S2T .

### (2) Input/Output Data Size, Number of Slave Devices, communication Rate and Network Length

A DN611 allows a DeviceNet to have one network to be connected. The sizes of inputting and outputting data, allowed between a DN611 and slave devices are 128 words for input and 128 words for output (one word = 16 points).

Input data and output data, so far as each of them is within 128 words in total, can be exchanged data with up to 63 slave devices. (Since the amount of data outputted to a slave device and the amount of data inputted from a slave device vary depending on the slave device, check the slave device specification of data size).

The definition of input data and output data, dealt in this book, is shown in the following figures.

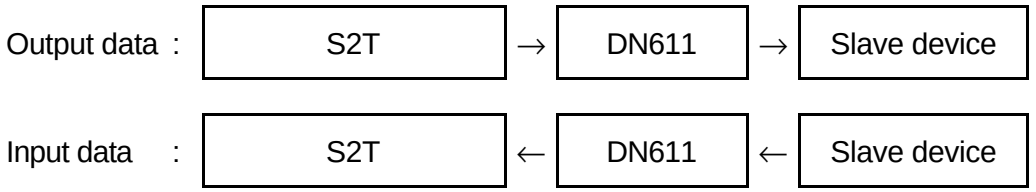



**Figure 1.1 Definition of Output Data and Input Data**

Three types of communication rates, namely 500 kbps, 250 kbps and 125 kbps are available. The maximum network length varies depending on the communication rate (l00 m for 500 kbps, 250 m for 250 kbps, and 500 m for 125 kbps).

The detail is explained in "1.2 Network Configuration of DeviceNet."

### (3) Means of Inputting/Outputting Data

The DN611 supports "polling instruction/response" and "bit strobe instruction/response," both of which are specified in the DeviceNet specification as the means of inputting/outputting data to/from slave devices. The details of "polling instruction/response" and " bit strobe instruction/response" are explained in "1.4 The Basic Functions."

### (4) Examples of the System Configuration

This section describes a typical system configuration using the DN611, which is mounted on the I/O slot of the S2T. The DN611 allows the S2T to exchange data with slave devices on the DeviceNet.

In the following example, the DN611 is connected with slave devices, such as input/output devices, sensor, and drive unit, which conforms with the DeviceNet specification. Moreover, a control LAN (FL-net) is used to connect the S2T with a higher-rank controller.

A number of wiring combinations meeting the installation environment are available because the T branch topology and the multi-drop topology are combinable when wiring a DeviceNet.

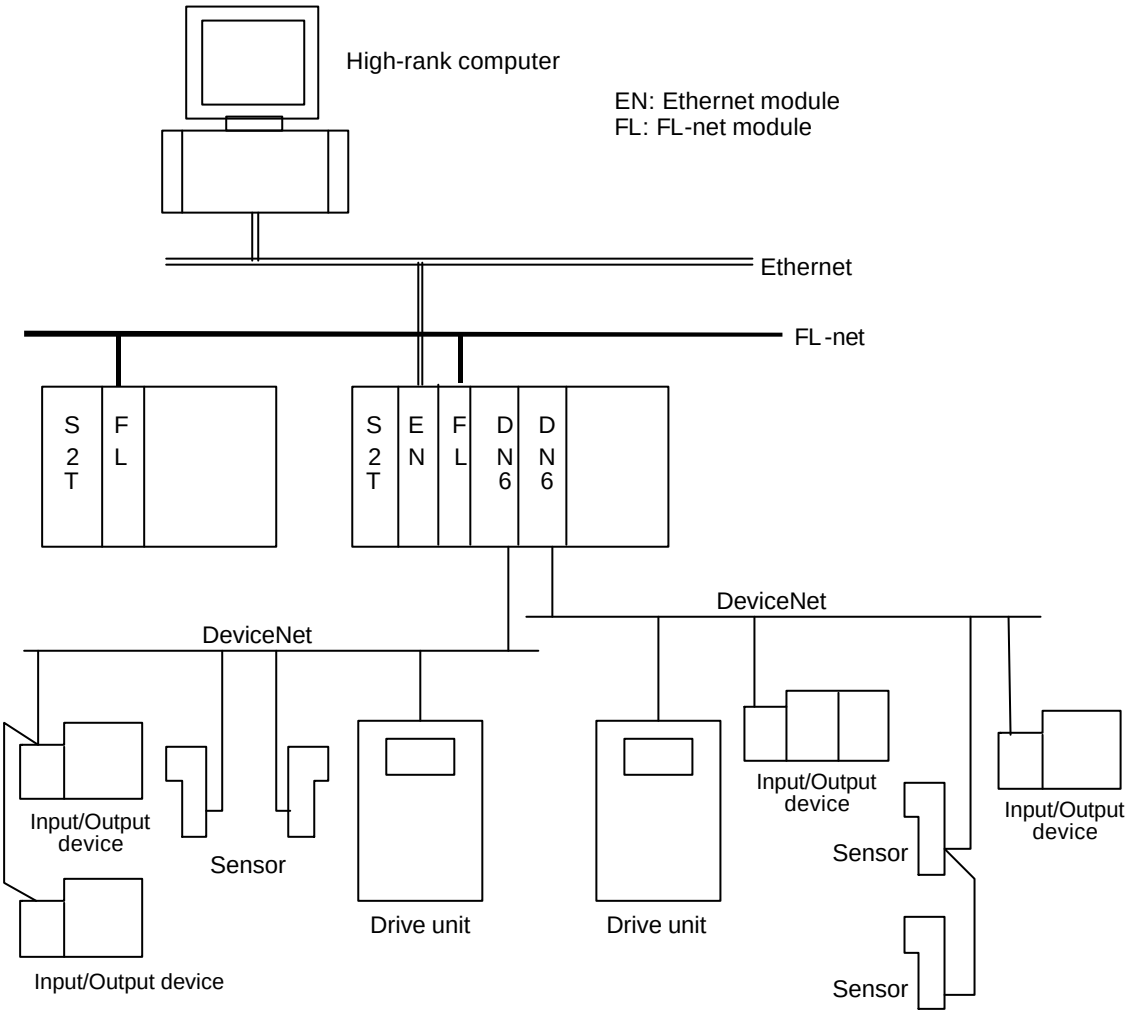



**Figure 1.2 Example of the System Configuration**

## 1.2 Network Configuration of DeviceNet

This section describes the network configuration of the DeviceNet.

### 1.2.1 The Network Configuration

The network configuration of a DeviceNet consists of a trunk line and drop lines as shown in Figure 1.3.

#### (1) The Nodes

The nodes of the DeviceNet in Figure 1.3 have slave devices such as input/output devices, sensors, and drive units, and a master device such as the DN611, to exchange data with each other. One network can have up to 64 nodes and one master device. Physical arrangement of a master device and slave devices has no particular restrictions.

Each of the DeviceNet devices on a network has a unique number (NA: node address) to identify the node from the other nodes. The node address values must be within 0 to 63 in decimal scale, and the node addresses in the network must be different from the others.

#### (2) The Trunk Line

According to the DeviceNet specification, a trunk line is a cable which connects nodes located most distant. The trunk line can have nodes directly-connected with it (connection with no drop line). The length of the trunk line varies depending on the communication rate of the network. The both ends of the trunk line need a terminal resistor.

#### (3) The Drop Line

All the cables branched from taps on the trunk line fall on drop lines. The drop line has a maximum length of 6 meters (from tap to most distant node) regardless of the communication rate on the network (The total extension of drop lines varies depending on the communication rate on the network). A drop line can have one or more nodes connected. The following three types of node configurations are available, as shown in Figure 1.3.

a) Configuration of drop lines short from the tap/multiport tap

b) Configuration of multidrops on a drop line

c) Configuration of branches on a drop line (no branch configuration for the trunk line)

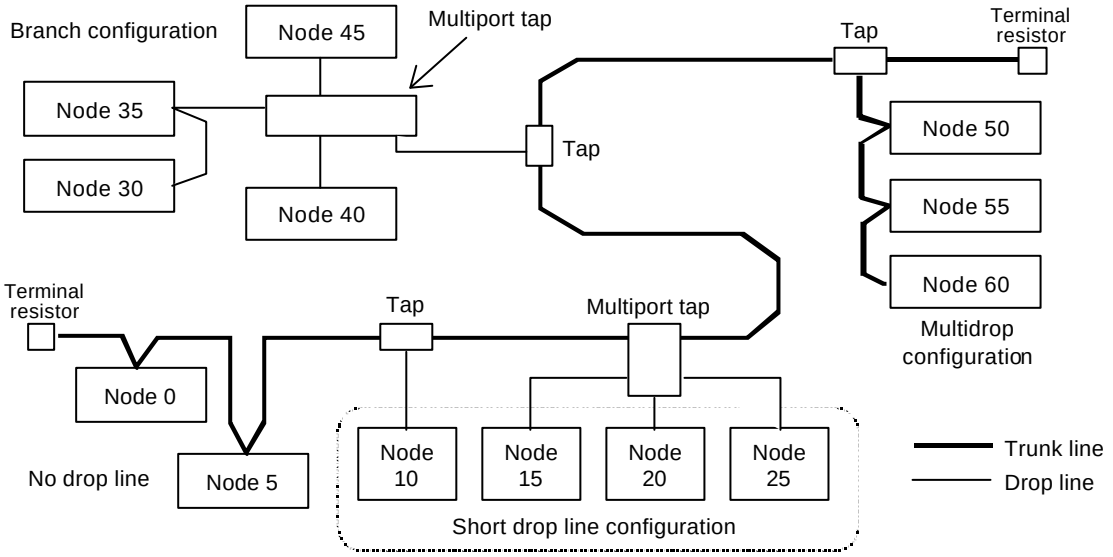



**Figure 1.3 Example of DeviceNet Network Configuration**

### 1.2.2 Trunk Line/Drop Line and Maximum Cable Length

The DeviceNet specification stipulates the Thick Cable and the Thin Cable. For detail, see DeviceNet Volume I. Currently, cables conforming with the standards of the Thick Cable and Thin Cable are available in the commercial market. Buy ones which meet the configuration of your network (Details are explained in "3.6 The Network Components").

#### (1) The Trunk Line

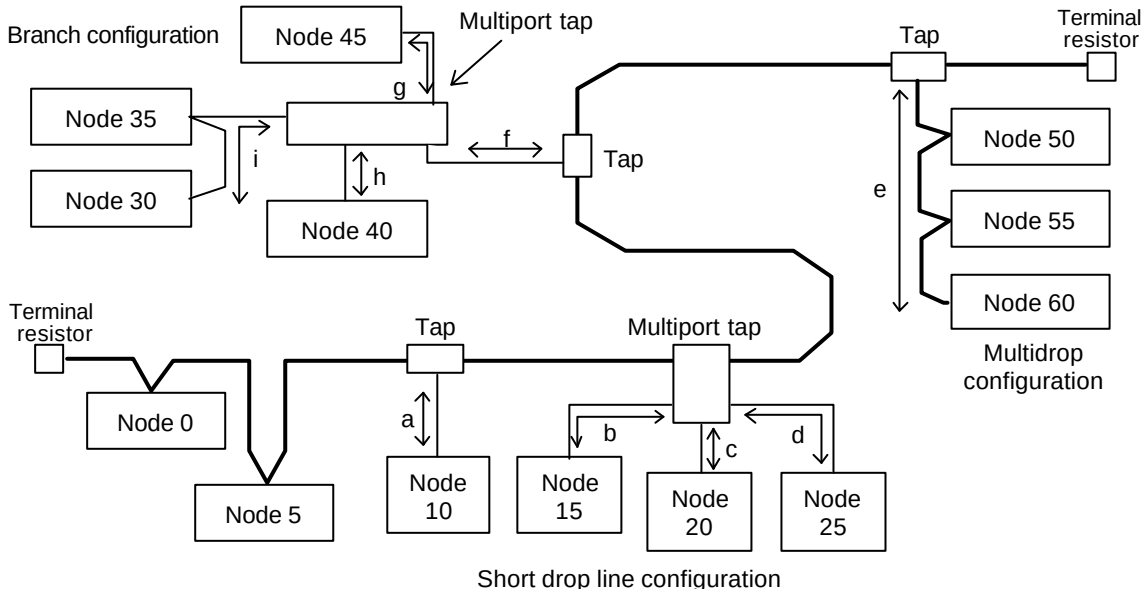
The trunk line of a DeviceNet consists of a Thick Cable or a Thin Cable (their mixture is also possible). Since the Thin Cable is flexible compared with the Thick Cable, wiring the cable is easy. Conversely, the Thick Cable allows longer network cabling than the Thin Cable. A maximum of the trunk line length varies depending on the type of cable used and the communication rate on the network. For details, see "3 The Maximum Network Length."

#### (2) The Drop Line

The drop lines of a DeviceNet consists of Thin Cables. Table 1.1 lists the length of drop lines and the total length. A node on a drop line can be configured in a short drop line configuration/multi-drops configuration/short brunch configuration. Figure 1.4 shows how to calculate the drop line length and the total length by different configurations.

**Table 1.1 Maximum Drop Line Length**

| Communication Rate | Drop Line | Total Extension by Network |
|---|---|---|
| 125 kbps | 6 meters | 156 meters |
| 250 kbps | | 78 meters |
| 500 kbps | | 39 meters |




Individual drop line length: a ≤ 6 m, b ≤ 6 m, c ≤ 6 m, and d ≤ 6 m (short drop line configuration)
e ≤ 6 m (multi-drops configuration)
f + g ≤ 6 m, f + h ≤ 6 m, f + i ≤ 6 m (branch configuration)

Total of drop lines extended : a + b + c + d + e + f + g + h + i

**Figure 1.4 Example of Calculating the Drop Line Length**

### (3) The Maximum Cable Length

The distance between two nodes on the network cannot exceed the "Maximum cable length" specified in the DeviceNet specification. In Figure 1.4, the distance from node 0 to node 60 is not allowed to exceed the "Maximum cable length."

**The "Maximum cable length" varies depending on the communication rate of the network and the type of the cable used for the trunk line**.

a) Table 1.2 lists the maximum cable length for the case that the trunk line consists of a Thick Cable alone and no drop line is connected on it (that is, all nodes are connected on the trunk line), as shown in Figure 1.5. In this case, "maximum trunk line length between node 0 and node n" = "maximum cable length."
Moreover, when the "maximum trunk line length between node 0 and node n" = "maximum cable length," no new node can be attached outside node 0 and node n..

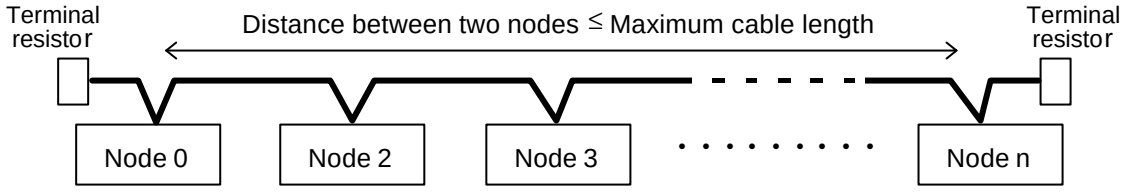



**Figure 1.5 Distance Between Two Nodes on a Network With No Drop Line**

**Table 1.2 Maximum Cable Length (Thick Cable/Thin Cable alone)**

| Communication Rate | Thick Cable alone | Thin Cable alone |
|---|---|---|
| 125 kbps | 500 m | 100 m |
| 250 kbps | 250 m | 100 m |
| 500 kbps | 100 m | 100 m |

b) Figure 1.6 shows the **maximum distance between two nodes** in the case that a Thick Cable or Thin Cable alone is used for the trunk line and that drop lines are used.
Table 1.2. lists the **maximum cable length.** In this case, the "**maximum trunk line length** between two nodes" is as follows:

Maximum trunk line length between two nodes
= Maximum cable length(value in Table 1.2)
– Total length of drop lines for both ends nodes of trunk line

For Figure 1.6, the maximum trunk line length between node 0 and node n is equal to the maximum cable length (value in Table 1.2) minus total length of drop lines for node 0 and node n.

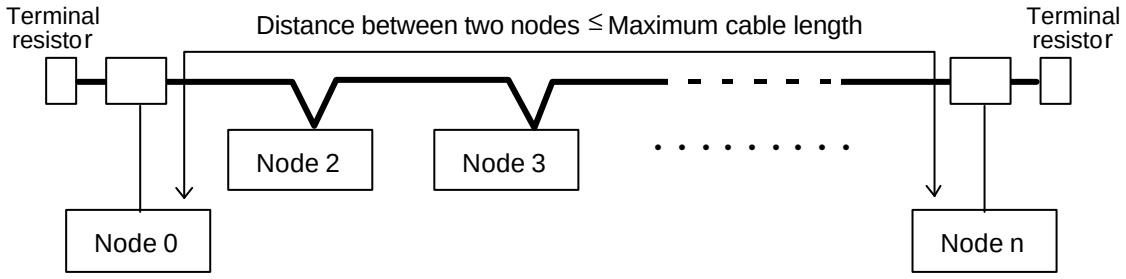



**Figure 1.6 Distance Between Two Nodes on a Network with Drop Lines**

c) Figure 1.7 shows the **maximum distance between two nodes** in the case that the trunk line consists of Thick Cable and Thin Cables and that drop lines are connected. Use the formulas in Table 1.3. for calculating the **maximum cable length.**

In this case, the '**maximum trunk line length** between two nodes" is represented in the following formula:

Maximum trunk line length between two nodes
= Maximum cable length (value in Table 1.3)
– Total length of drop lines for the nodes at both ends of trunk line

For Figure 1.7, the maximum trunk line length between node 0 and node n is equal to the maximum cable length (value in Table 1.3) minus the total length of the drop lines for node 0 and node n.

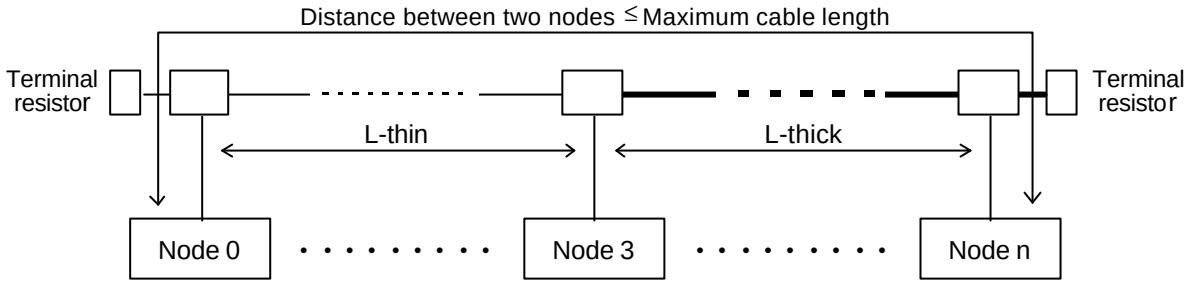



**Figure 1.7 Distance Between Two Nodes on a Network with Drop Lines**

**Table 1.3 Maximum Cable Length (Mixture of Thick Cable/Thin Cable)**

| Communication Rate | Calculation Formula |
|---|---|
| 125 kbps | **L-thick** + 5 × **L-thin** ≤ 500 m |
| 250 kbps | **L-thick** + 2.5 × **L-thin** ≤ 250 m |
| 500 kbps | **L-thick** + **L-thin** ≤ 100 m |

**L–thin**: Length of trunk line using thin cable (m)
**L–thick**: Length of trunk line using thick cable (m)

### 1.2.3 The Terminal Resistor

The DeviceNet needs a terminal resistor on both ends of the trunk line in order to reduce signal reflections and stabilize communications. The specifications of the terminal resistor are as follows:

- 121Ω
- 1% of the metal film
- 1/4 W

Terminal resistors conforming with the above specifications are available in the commercial market. See "3 .6 The Network Components."

| Usage Recommendation |
|---|
| 1. Don't make a network configuration whose extended trunk line and drop lines have no node being connected. |
| 2. Don't attach a terminal resistor to the node. It could cause communication error. |
| 3. Attach a terminal resistor to both ends of the trunk line; don't attach a terminal resistor on the end of a drop line. Attach only to both ends of the trunk line. |

## 1.3 Conformity Specification and Trademarks

DeviceNet is a standardized device level network for factory automation (FA), which is developed by RockWell Automation Co., Ltd. in USA. Currently, a nonprofit organization called ODVA (Open DeviceNet Vendor Association) is serving as the center for the maintenance and extensions of DeviceNet and introduction of conformable products.

The DeviceNet specification has Volume I: DeviceNet Communication Model and Protocol, and Volume II: DeviceNet Device Profiles and Object Library, in which the hardware and software specifications are defined.

The DeviceNet specification that the DN611 conforms with is found in Volume I, Release 1.3, and Volume II, Release 1.2.

Trademarks:

- DeviceNet is a registered trademark of ODVA (Open DeviceNet Vendor Association).
- PowerTap, T-Port Tap, DeviceBox Tap, and FLEX I/0 are registered trademarks of RockWell Automation Co., Ltd.
- COMBICON is a registered trademark of Phoenix Contact Corporation.

## 1.4 The Basic Functions

This section describes the following two functions for communicating between the DN611 and slave devices.

1) Polling instruction/response mode

2) Bit strobe instruction/response mode

### 1.4.1 The Polling Instruction/Response Mode

The polling instruction/response mode is used for exchanging an arbitrary size of data between the master device ⇔ slave devices. The master device has information on slaves devices (items of scan list, such as node address, input/output data volume, etc.) on the network.

For polling instructions, based on such information, the master device outputs an arbitrary size of data to slave devices. Slave devices transmit response data (arbitrary data size) to a polling instruction to the master device (polling response).

It depends on the specification of a slave device how the slave device interprets the polling instruction and what data the slave device transmits as the polling response. For this communication function, it is prerequisite that the slave device supports the polling instruction/response mode. (Almost all the slave devices on the DeviceNet support this communication system).

#### (1) The Polling Instruction

The example in Figure 1.8 indicates the DN611 is polling sensors, inputting sensor input information, and trying to send output control data to the actuator. How to write polling output data to the DN611 from the S2T is found in "5. Communication with Slave Devices."

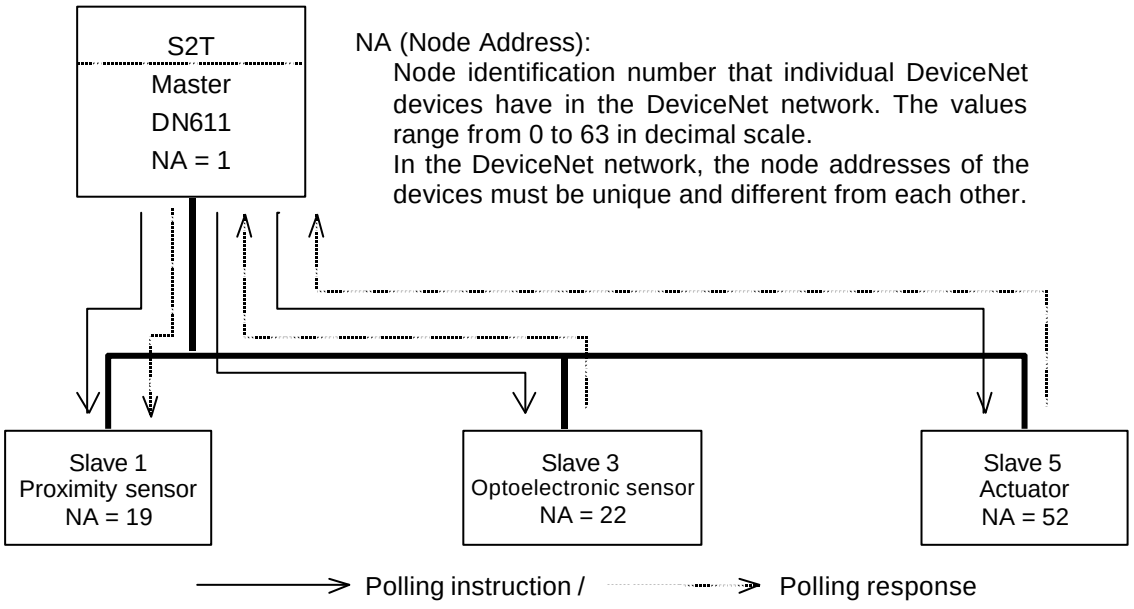



**Figure 1.8 Example of Polling Instruction/Response Mode**

#### (2) The Polling Response

A slave device which received a polling instruction transmits an arbitrary size of response data to the master device. The content of response data varies depending on the specification of the slave device. The mechanism the S2T reads polling response data from the DN611 is explained in"5. Communication with Slave Devices."

### 1.4.2 The Bit Strobe Instruction/Response Mode

The bit strobe instruction/response mode is used for exchanging a small size of data between the master device ⇔ slave devices. In the bit strobe instruction, based on the information obtained from the scan list, the master device broadcasts 1-bit output data to individual slave devices.

These individual devices transmit data (0–8 bytes) in response to the bit strobe instruction to the master device (bit strobe response).

It depends on the specification of a slave device how the salve device interprets a bit strobe instruction and what data the slave device transmits to the bit strobe response.

For this communication function, it is prerequisite that the slave device supports the bit strobe instruction/response mode.

#### (1) The Bit Strobe Instruction

Broadcasts data to bit strobe instruction/response mode supporting slave devices on the network. The bit strobe instruction contains 64–bit output data, and each of the 64 bits is assigned to individual node addresses on the network (Figure 1. 9).

The example in Figure 1.9 indicates the DN611 is inputting sensor information by the bit strobe mode and trying to send output control data to the actuator. The way of writing output data in bit strobe from the S2T to the DN611 is explained in "5. Communication with Salve Devices."

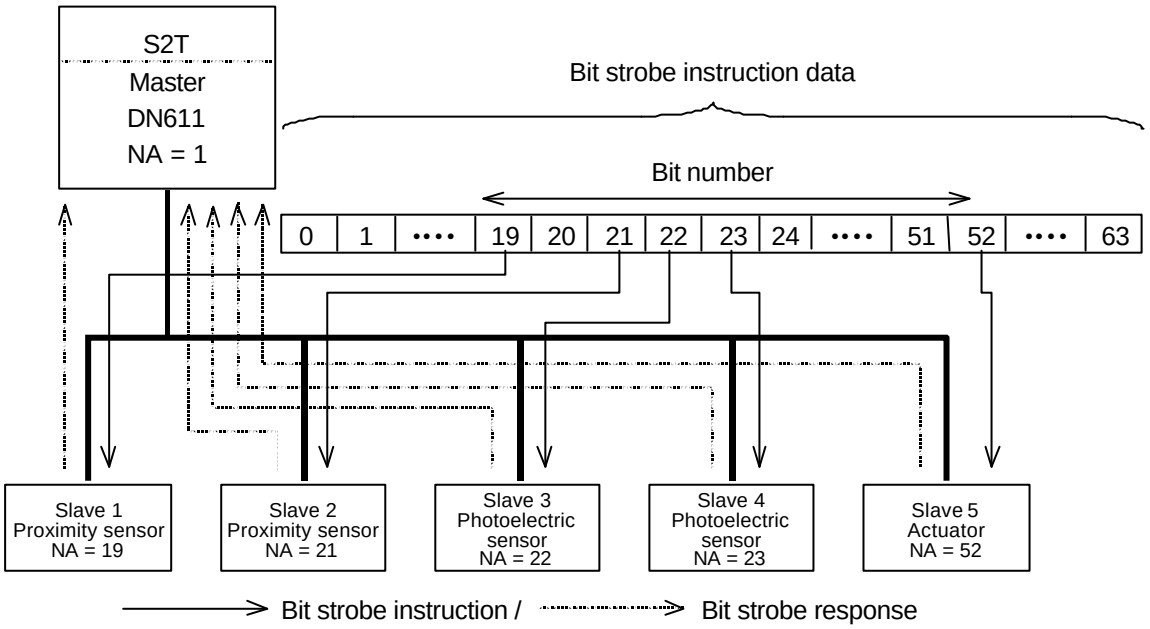



**Figure 1.9 Example of the Bit Strobe Instruction/Response Mode**

#### (2) The Bit Strobe Response

A slave device which received the bit strobe instruction transmits 0 to 8 byte response data to the master device. The contents of response data varies depending on the specification of the slave device. The way the S2T reads bit-strobe response data from the DN611 is described in "5. Communication with Slave Devices."

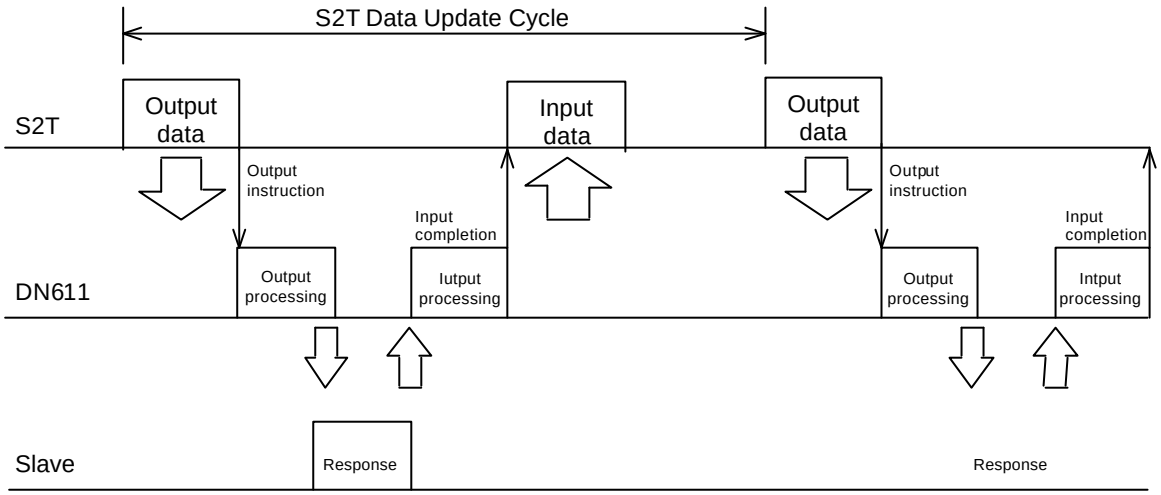
### 1.4.3 Synchronization/Asynchronous Mode and Data Update Cycle

As explained in the preceding section, the communication function between the DN611 and slave devices has the polling instruction/response mode and the bit strobe instruction/response mode. Data can be exchanged between the S2T and the DN611 in synchronous mode or asynchronous mode. This section describes the synchronous mode/asynchronous mode.

#### (1) The synchronous mode

At output: The S2T writes output data to slave devices into the DN611 beforehand, and activates a polling instruction/bit strobe instruction. When the polling instruction/bit strobe instruction is activated, the DN611 sends the output data to slave devices.

At input: The DN611 receives data from slave devices by a polling response/bit strobe response. After having received data from all slave devices, the DN611 arranges input data before notifying the input completion to the S2T. If the S2T is reading input data, it will check for the input completion by the DN611 before reading the input data.

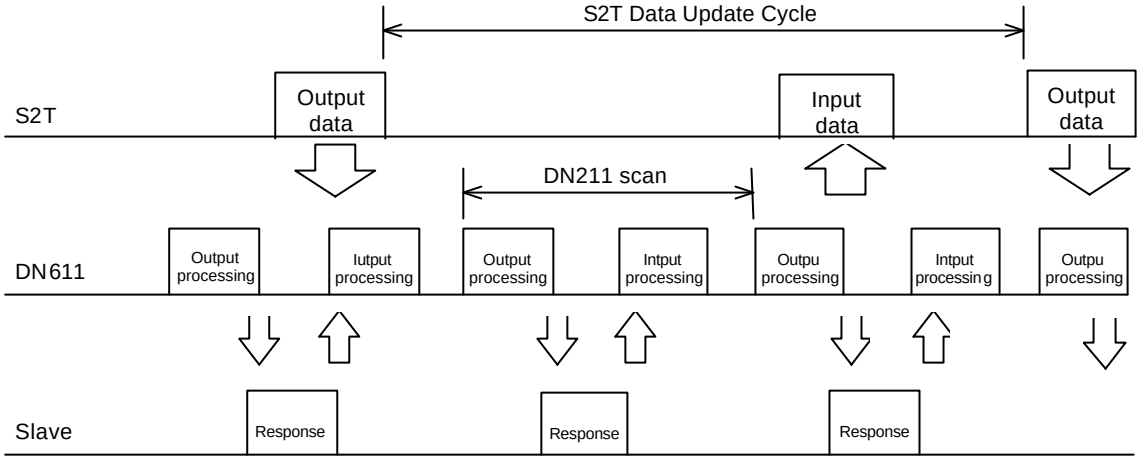



Output data and input data exchanged between the S2T ⇔ the DN611 are synchronizing with the output/input cycles of the S2T side program. For this reason, the size of synchronous data value is equal to one-time output/input data to all slave devices.

### (2) The asynchronous mode

At output: The S2T writes output data to slave devices into the DN611. Disregarding the timing of the S2T's output data writing, the DN611 sends, by the scanning cycle at the local station, written output data to a slave device. Unless output data is updated by the S2T, the DN611 sends the same data to slave devices.

At input: The DN611 receives data from slave devices by a polling response/bit strobe response. After having received data from all slave devices, the DN611 updates input data. The DN611 doesn't notify the completion of the data reception to the S2T. Disregarding the timing of input data update by the DN611, the S2T reads input data.




Transfer of output data and input data between the S2T ⇔ the DN611 and the transfer between the DN611 ⇔ slave devices are asynchronous. Transfer between the S2T ⇔ the DN611 are synchronizes with the scan cycle by the S2T side, while the transfer between the DN611 ⇔ slave devices are synchronizes with the scan cycle in the DN611.

Although data are secured by the byte (8 bits), the sequence program is simplified for data transfer processing, compared with the synchronous mode. When the scan cycle by the DN611 side is shorter than the scan cycle by the S2T, delay of data update time between the S2T ⇔ slave devices becomes smaller.

The scan time by the DN611 varies depending on the number of slave devices being connected, size of transmission data by the slave device, and the performances of the slave device being connected.

# 1.5 The DN611 Specification

## 1.5.1 The Function Specification

Table 1.4 lists the function specification of the DN611. The general specification of the DN611 conforms with the S2T main unit.

**Table 1.4 Function Specification**

| Item | | Specification | | |
|---|---|---|---|---|
| Module form (pet name) | | DN611 | | |
| Transmission specification | | Conformed with the DeviceNet | | |
| | Media access system | CSMA/NBA system (note) | | |
| | Modulation | Baseband | | |
| | Transmission path | Bus topology | | |
| | Data rate | 125 kbps | 250 kbps | 500 kbps |
| | Max. network length | 500 m | 250 m | 100 m |
| | Max. number of nodes | 64 units/network (1 master device, 63 slave devices) | | |
| | Connector | MSTBP 2.5/5-STF-5.08 AB GY AU SO<br>TMSTBP 2.5/5-STF-5.08 AB GY AU<br>Phoenix Contact Corporation | | |
| | Connection cable | DeviceNet THICK cable (thick cable)<br>DeviceNet THIN cable (thin cable) | | |
| Communication function | | 1. Polling instruction/response mode (synchronous/asynchronous)<br>2. Bit strobe instruction/response mode (synchronous/asynchronous) | | |
| RAS function | | 1. Self-check when the power is ON<br>ROM, RAM, and CAN controllers<br>DN611 communication memory for S2T<br>2. RAS information on the S2T interface buffer memory<br>3. Information by reading RAS information<br>• Event trace<br>• CAN controller (circuit) information<br>4. Time setting function<br>5. Displaying the module status/network status on the 7-segment LED on the front panel | | |
| Current consumption [mA] | | S2T side (DC5V): 500 mA<br>Network side (DC 24 V): 90 mA | | |
| Outer dimensions [mm] | | 32.5 (W) × 138 (H) × 102.1 (D) | | |
| Weight [g] | | 200 | | |
| Board specification | | One slot (slot width) | | |
| Mounting | | S2T base unit (basic/extension)<br>I/O slot | | |
| Number of modules | | See "1.5.2 Number of Mounting Modules." | | |
| Access | | READ/WRITE instruction (module control, data input/output) | | |

Note: CSMA/NBA : Carrier Sense Multiple Access with Non-destructive Bitwise Arbitration

### 1.5.2 Number of Mounting Modules

This section describes the number of the DN611 units available on the S2T and the instruction execution time when accessing the DN611 from the S2T.

#### (1) Number of DN611 Units Available

The number of the DN611 units available on the S2T system varies depending on the power capacity of the S2T power module and the current consumption of the entire S2T system.

**Table 1.5 5Vdc Power/Current consumption**

| | |
|---|---|
| Power module (PS692) | 5 Vdc power 5000 mA |
| S2T CPU module (PU672T) | 5 Vdc current consumption 1200 mA |
| S2T CPU module (PU662T) | 5 Vdc current consumption 1200 mA |
| Expansion I/F module (IF661) | 5 Vdc current consumption (basic unit) : 150 mA<br>5 Vdc current consumption (extended unit) : 500 mA |
| DN611 | 5 Vdc current consumption 500 mA |

For the PU672T/PU662T:

Number of mounting basic base units: (5000-150-1200) ÷ 500 = 7.3 → 7 units
Number of extended base units: (5000-500) ÷ 500 = 9 → 8 units

The maximum configuration of the PU672T is equal to basic base unit × 1 unit + extended base unit × 3 unit; thus, the number of mounting DN611 units available reaches 31 units.

**The maximum number of the DN611 units available on your system varies depending on the number of non-DN611 modules mounted.**

### (2) Instruction execution time when accessing the DN611 from the S2T

When outputting data to slave devices from the S2T through the DN611, the WRITE instruction writes the output data in the DN611 from the S2T. When inputting data from slave devices through the DN611, the READ instruction reads from the DN611.

Table 1.6 lists the instruction execution times of the S2T.

The DN611 has 128 words for the output data area (area where output data to slave devices are stored) and 128 words for the input data area (area where input data from slave devices are stored).

Table 1.7 lists the execution times for the WRITE/READ instructions by the S2T when accessing 128 words. When input/output data with slave devices is smaller than 128 words, the instruction execution time becomes shorter.

Conversely, when accessing the output data area/input data area several times, the sum of instruction execution times increases depending on the number of accessed times (the output data area/input data area is explained in "4.2 The Input/Output Data Area.")

**Table 1.6 READ/WRITE Instruction Execution Time (µs)**

| | Basic base unit | Extended base unit |
|---|---|---|
| READ instruction | 123.8 + 5.00 × N | 127.8 + 5.38 × N |
| WRITE instruction | 127.8 + 5.00 × N | 127.8 + 5.27 × N |

N: Number of transfer words

**Table 1.7 Maximum Execution Time for DN611 Access (ms) (128 words for input/output)**

| | Basic base unit | Extended base unit |
|---|---|---|
| READ instruction | 0.764 | 0.817 |
| WRITE instruction | 0.768 | 0.803 |
| Total | 1.532 | 1.620 |

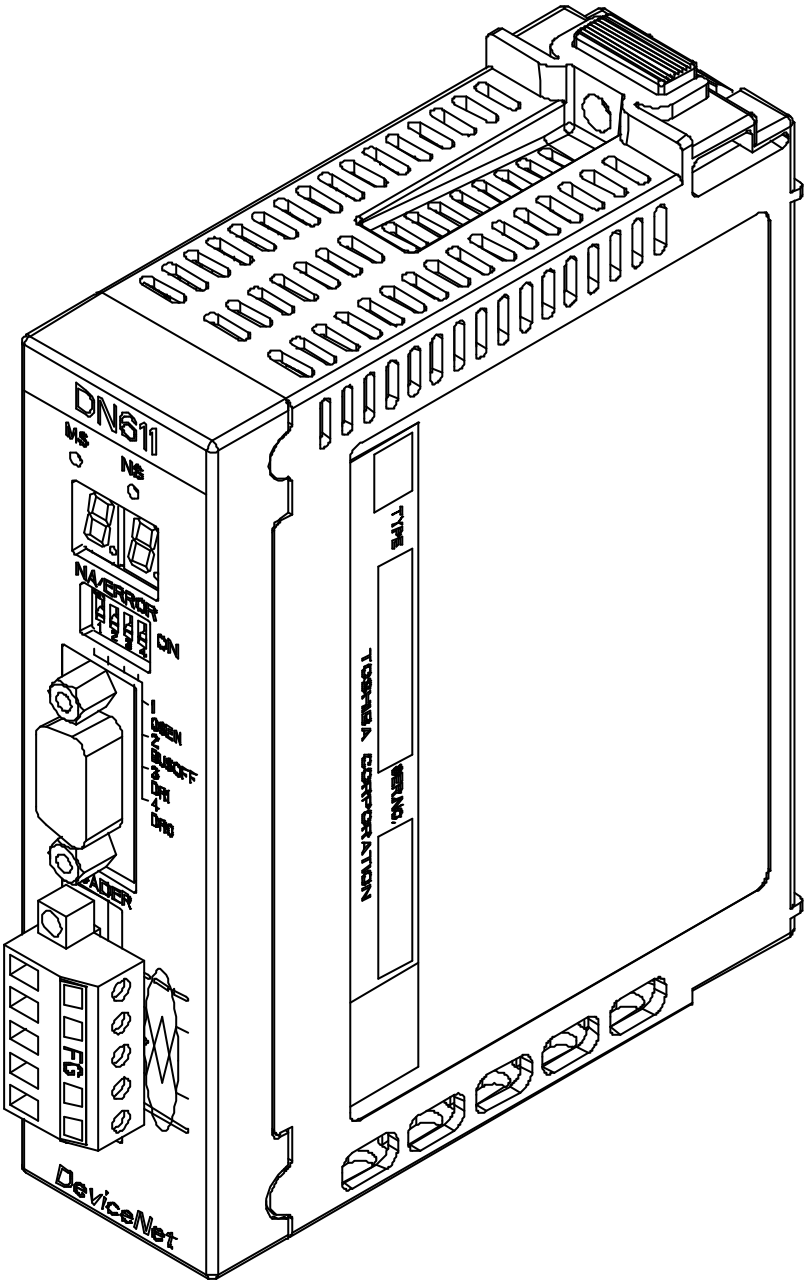
The values in Table 1.7 indicate times for accessing the DN611. When you are mounting more than one DN611 unit, **calculate and total the instruction execution times to access individual DN611 units.**

**One unit of S2T cannot cover the entire DN611 units being mounted when the total of the sum times necessary for the S2T's accessing the DN611 units and the sum time necessary for input, output, and internal processing except for accessing the DN611 units are larger than the response time that your system requires.**
**In this case, divide your S2T to mount DN611 units, depending on your system configuration.**

# 2. Names and Functions of DN611 Parts

This chapter explains the names and functions of DN611 parts.

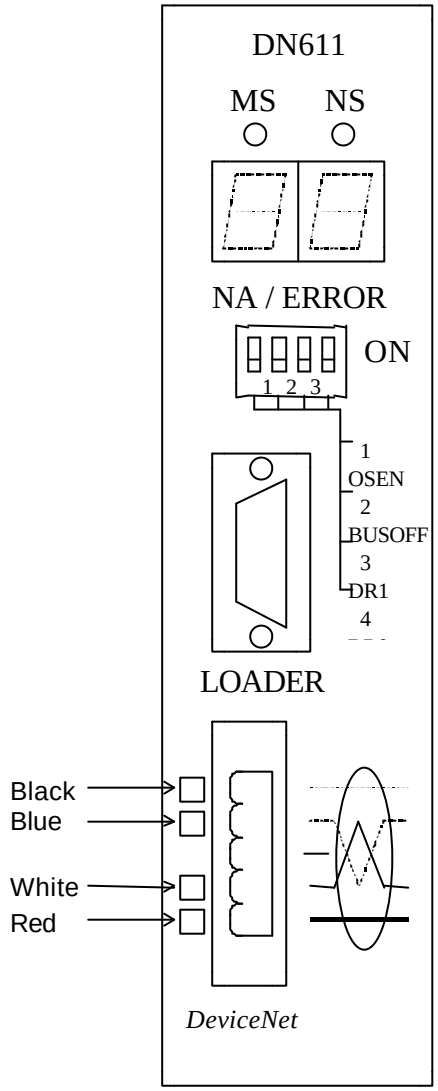
## 2.1 Outer Dimensions and Sizes




Width: 35mm, Height: 137mm, Depth: 125mm

**Figure 2.1 Outer Dimensions and Sizes (unit: mm)**

## 2.2 Names of DN611 Parts




LED for module status / network status indication

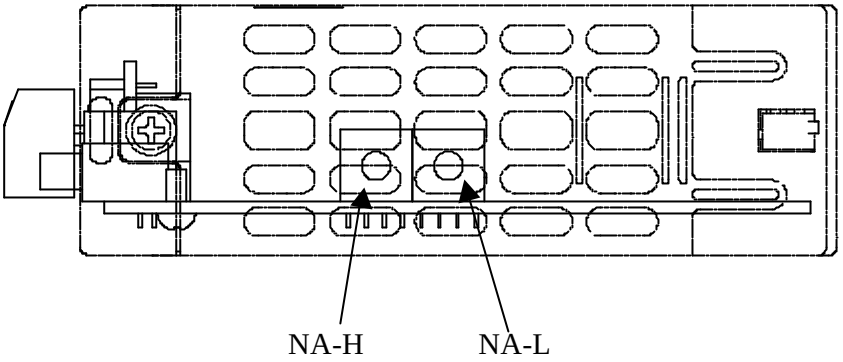
7-segment LED for node address / error code indication

DIP switch for operation mode / communication rate setting

Test connector (D-Sub, 9-pin)

Device side connector (connecting the DeviceNet)

**Figure 2.2 Appearance (front panel)**




Rotary switch for setting node addresses

**Figure 2.3 Appearance (side view)**

## 2.3 Functions of DN611 Parts

### (1) LED for module status/network status indication (MS/NS)

This LED can light green/red. By making a distinction between green and red and lighting and blinking, the DN611's module status (MS) and network status (NS) are indicated.

| LED | Indication status | Meaning of the indication (main trouble) |
|---|---|---|
| MS | Not lit | • No power is supplied to the DN611.<br>• Though the power is supplied to the DN611, the module doesn't become run mode (* 1). |
| | | When the 7-segment LED for node address/error code indicates the local station node address, the power is supplied. |
| | Green lighting | • The DN611 is operating normally. |
| | Green blinking | • The DN611 is reading switch settings. |
| | Red blinking | • The DN611 is encountering a recoverable trouble.<br>→ Switch setting abnormal (DIP switch/rotary switch), etc. |
| | Red lighting | • The DN611 is encountering a non-recoverable trouble (down status).<br>You may need to replace the module. |
| NS | Not lit | • No power is supplied to the DN611 (check MS).<br>• Though the power is supplied to the DN611, the module doesn't become run mode ( * 1); check MS.<br>• The DN611 is encountering a non-recoverable trouble (down status); check MS.<br>• No network power is supplied to the DN611. |
| | Green lighting | • The DN611 is normally communicating with slave devices. |
| | Green blinking | • No communication between the DN611 and slave devices is established.<br>• No slave devices are registered in the DN611. |
| | Red blinking | • No communication is established with more than one slave devices. |
| | Red lighting | • The DN611 communication is stopped due to busoff (* 2).<br>• Communication is stopped due to the node address duplicated. |

(* 1) See "4.6 Requests to the DN611" for the run mode.

(* 2) Busoff: Individual nodes on the DeviceNet check for abnormal transmission paths; when the local node is judged to be the cause of the abnormal transmission path, the local node is separated from the transmission path. This state is called busoff.

### (2) 7-Segment LED for Node Address/Error Code Indication (NA/ERROR)

While the DN611 is normally transmitting data with slave devices the local station node address is displayed.

| | |
|---|---|
| Node address: | A node identification number that the DeviceNet devices (nodes) linked to the network have. The values range within 0 to 63 in decimal scale. In a DeviceNet, the node address of a node linked to the network must be unique. |

In the following cases, module or network status is displayed in combination of this LED and the LED for module status/network status indication.

- A trouble occur on the DN611 or on the network.
- An error occurs when the S2T requests.
  (Parameter setting and operation mode controlling, etc. are performed by the request from the S2T.)
- The DN611 is downed.

See "6.2 Indications of the 7-Segment LED" for the combinations and meanings of this LED and the LED for module status/network status indication.

### (3) DIP switch for setting the operation mode/communication rate

This DIP switch is used for setting the operation mode at DN611 busoff and a communication rate on the network (500 kbps/250 kbps, 125 kbps).

"3.2 Switch Setting" explains the contents of the DIP switch and how to set it.

### (4) Rotary switch for node address setting (NA-H/NA-L)

Is used for setting node addresses in the network of the DeviceNet.

The DN611 can have a node address within 0 to 63 (decimal scale) unless the node address doesn't duplicate with another node address (slave device) in the network.

"3.2 Switch Setting" explains how to set the rotary switch.

### (5) The test connector

This connector is only for maintenance. You may not use it.

### (6) The device side connector (for DeviceNet connection)

This connector is for connecting the DeviceNet cable to the DN611.

"3.4 Connection with the Network" explains how to connect cables.

# 3. Preparation for Operation (hardware)

## 3.1 DN611 Setting Flowchart (hardware)

| ⚠ DANGER |
|---|
| 1. Configure an emergency-stop circuit, interlock circuit, and/or other similar safety circuits outside the PC and DN611.<br>If the PC or DN611 gets failed or malfunctioned, it can cause an accident which will lead to bodily injury and/or mechanical damage. |

| ⚠ CAUTION |
|---|
| 2. Secure the safe environment before executing program modification, forcible output, RUN, or HALT instruction during operation. An operational mistake can cause mechanical damage or accident |

The following flowchart shows the DN611 setting.

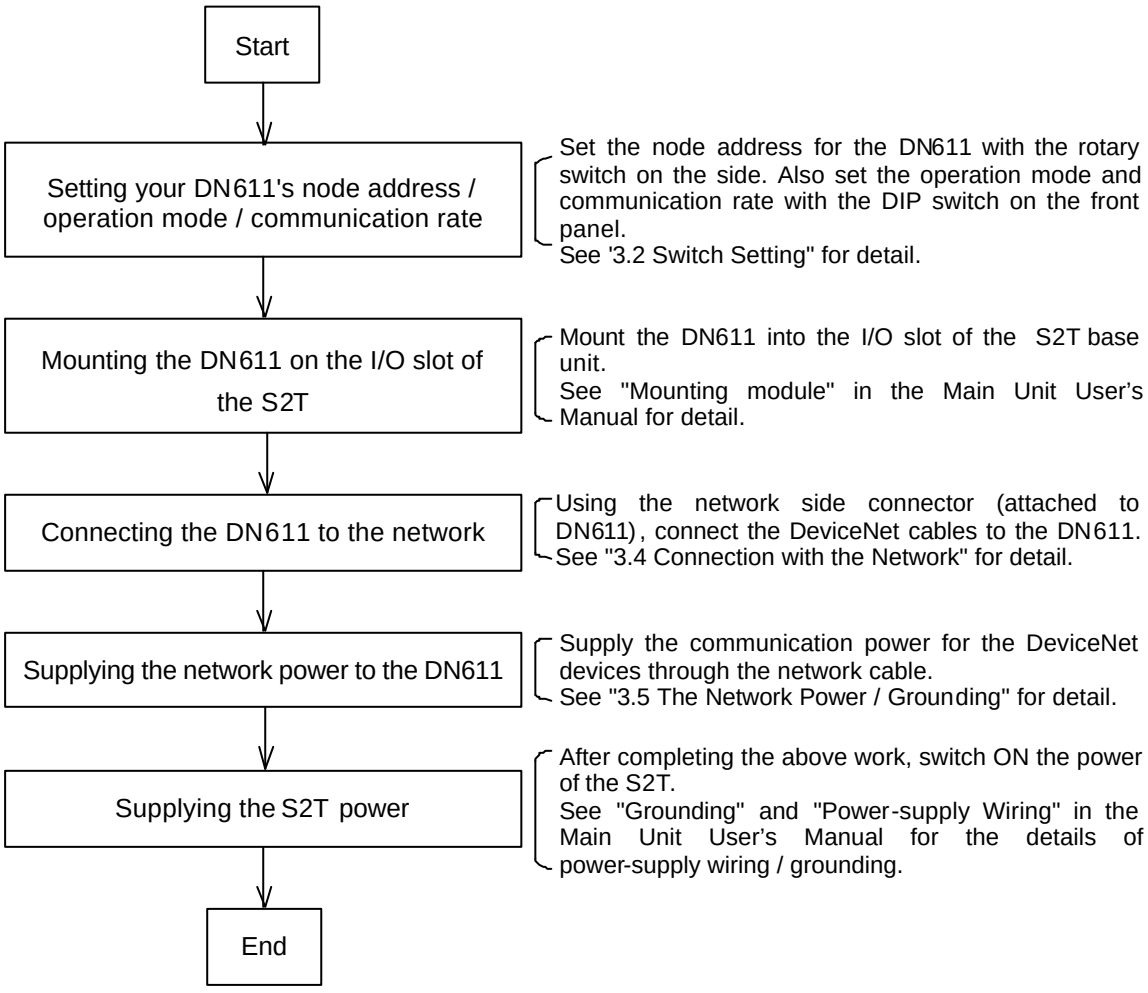
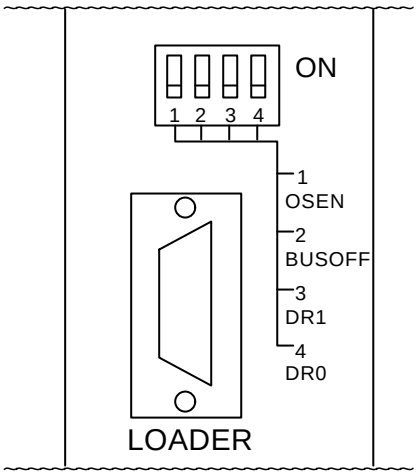



**Figure 3.1 DN611 Setting Flowchart**

## 3.2 Switch Setting

The DN611 has a DIP switch on the front panel and a rotary switch on the side. These switches are used for setting the operation mode, communication rate, and node address of the DN611.

### 3.2.1 DIP Switch for Setting the Operation Mode/Communication Rate




← DIP switch for setting the operation mode/communication rate

Factory setting: OFF

**Figure 3.2 DIP Switch for Setting the Operation Mode/Communication Rate**

**Table 3.1 DIP Switch Setting**

| DIP Switch Name | | Function |
|---|---|---|
| 1 | OSEN | Is reserved for the system. Set to OFF and keep it. |
| 2 | BUSOFF | Specifies the operation mode when the DN611 turns busoff (*1).<br>ON: When turned busoff, the DN611 initializes the internal network controller to become standby mode. After solving the cause of the busoff state, resume transmission with the instruction from the S2T.<br>OFF: When turned busoff, the DN611 initializes the internal network controller before resuming transmission (factory setting). |
| 3<br>4 | DR1<br>DR0 | Sets the communication rate. Refer to Table 3.2. |

(*1) Busoff: Individual nodes on the DeviceNet check for abnormal transmission paths; when the local node is judged to be the cause of abnormal transmission path, the local node is separated from the transmission path. This state is called busoff.

**Table 3.2 Communication Rate Setting**

| Communication Rate | DR1 | DR0 | |
|---|---|---|---|
| 125 kbps | OFF | OFF | ← Factory setting |
| 250 kbps | OFF | ON | |
| 500 kbps | ON | OFF | |
| Setting disabled | ON | ON | |

## ⚠ CAUTION

1. Set and keep "OSEN" on the DIP switch to OFF. Setting it to ON can get failed or malfunctioned.
2. When you set "BUSOFF" on the DIP switch to OFF, transmission will restart automatically even when busoff occurs. Unless the cause of the DN611's busoff (cause of communication error) is solved, however, busoff may get repeated.
3. When you set both of communication rate DR0 and DR1 to ON and turn on the power of the S2T, "Communication Rate Setting Failed" will appear with the following indications:
   - The "MS" LED is blinking red.
   - "F7" and the local station node address are being displayed alternately on the 7-segment LED.

   To clear these indications, set DR0 and DR1 correctly and, issue a reset request or turn OFF and ON the power.
4. Set the communication rates of your nodes being connected to the network, to the same communication rate. **Setting different communication rates on your different nodes will cause slave devices or the DN611 to get malfunctioned, resulting in no communication started.**

   Read the relevant manuals and descriptions to set the communication rate of your slave devices.
5. Don't change over the communication rates while your S2T is rising just after the turning on the power. In particular, never change the communication rate while communicating with slave devices. Failing to do so will cause "Communication Rate Setting Failed" to appear.

   To clear this indication, set the DIP switch to the correct setting and, issue a reset request or turn OFF and ON the power.

## Usage Recommendation

1. Use a small minus screwdriver for changing the value of the DIP switch.

### 3.2.2 Rotary Switch for Node Address Setting

The DN611 board has a rotary switch for node address (0 to 63 in decimal scale) setting (Figure 3.3). NA-H is used for setting a 10-order figure while NA-L is used for setting a 1-order figure. Since both of NA-H and NA-L can set a value from 0 to 9, the value can range within 0 to 99. When a value within 64 to 99 is set, however, a "Node Address Setting Abnormal" error occurs with the DN611 when the S2T power is switched ON.

To clear the error, set the correct node address and, issue a reset request or switch OFF and ON the power. In the DeviceNet, each of the node address values in the network must be unique.When the DN611's node address duplicates with another node address, a "Node Address Duplicated" error occurs with the DN611 when it turns run status. To clear the error, allocate the correct node address and, issue a reset request or switch OFF and ON the power.

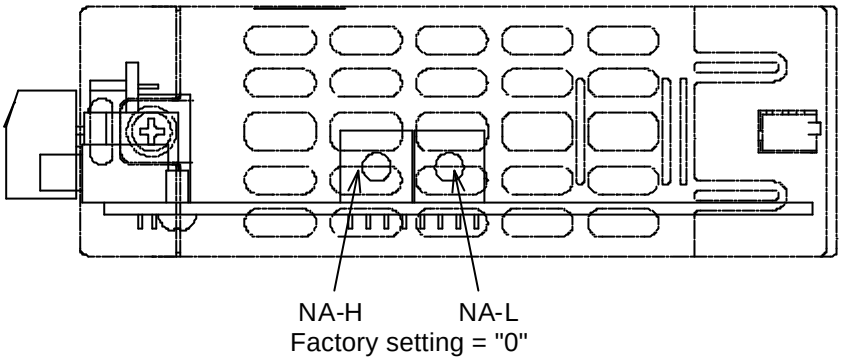



**Figure 3.3 Rotary Switch for Node Address Setting**

**⚠ CAUTION**

1. When you set a value within 64 to 99 to the node address of your DN611 and turn ON the power of your S2T, "Node Address Setting Failed" will appear with the following indications:
   - The "MS" LED is blinking red.
   - "F6" and the local station node address are being displayed alternately on the 7-segment LED.

   To clear these indications, set the correct value to the node address and, issue a reset request or turn OFF and ON the power.
2. If your DN611 node address has the same value with another node and when the DN611 comes into run state, "Node Address Duplicated" will appear with the following indications:
   - The "MS" LED is lighting red and/or the "NS" LED is lighting red.
   - "70" and the local station node address are being displayed alternately on the 7-segment LED.

   To clear these indications, set the correct value to the node address and, issue a reset request or turn OFF and ON the power.

**Usage Recommendation**

1. Use a small minus screwdriver for changing values of the rotary switch.

## 3.3 Mounting in the Base Unit

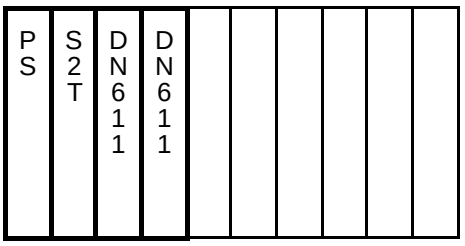
Mount your DN611 in the I/O slot of the base unit for the S2T and lock the master device. See "Mounting/Removing the Module" in the Main Unit User's Manual for detail.

**⚠ CAUTION**

1. Since the DN611 is designed for Toshiba's S2T, be sure to mount your DN611 in the base unit, instead of using it in stand-alone; don't use it for other applications. Unauthorized applications can cause electric shock, bodily injury, and/or mechanical malfunction.
2. Be sure to turn OFF the power (on the S2T side and network side) before attaching or detaching the DN611 and/or the terminal block. Failing to do so will cause electric shock, malfunction, and/or failure.
3. Keep the DN611 free from foreign matter such as electric-wire waste. Failing to do so could cause fire, failure, and/or malfunction.
4. Check the connectors, cables, and base unit of the DN611, for their firm connection and mounting using stoppers and screws. Note loose connection or mounting can be shaky or easily disconnected off, resulting in failure or malfunction of the DN611.

More than one unit of DN611 can be mounted for one unit of the S2T, as explained in "1.5.2 Number of Mounting Modules." The DN611 can be mounted in the basic base unit and an extended base unit.

Since the DN611 falls in a low-voltage I/O unit, place it at the left side of the unit, whereas arrange high-voltage I/O units at the right side of the unit. Separate low-voltage units from high-voltage units when wiring them ("8.4 Network Installation" explains network cables wiring).




Using the Basic Base Unit BU648E

**Figure 3.4 Example of Mounting on the Base Unit**

The current consumption of the S2T side power of the DN611 (DC5V) is 0.5 A. To examination the power capacity, refer to "Examining the Power Capacity" of the S2T User's Manual, besides "1.5.2 Number of Mounting Modules."

## 3.4 Connection with the Network

This section describes how to connect the DeviceNet cable to the DN611.

**⚠ CAUTION**

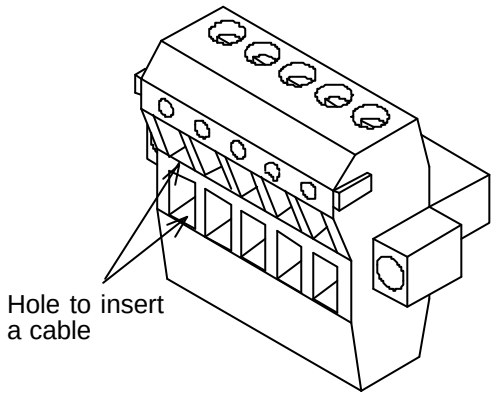
1. Do not engage in attaching or detaching the DeviceNet cable with network side connector during network operation. Failing to do so can cause reverse connection or short circuit of the network power, resulting in no communication with other nodes.
2. When you connect the DeviceNet cable with the network side connector, be sure not to make the wrong connection. Failing to do so can cause short circuit of the network power, resulting in no communication with other nodes.
3. Neither attach nor detach the network side connector with the device side connector on the DN611 front panel while the S2T is rising just after the power is turned ON. Failing to do so can cause the DN611 to fail or malfunction.
4. Attaching the opposite end of the network side connector with/from a device side connector is not possible because of the specific form. Trying connecting the wrong end by excessive force can damage both the network side connector and the device side connector.
5. Be sure not to wire the cable in too tightly stretched state or in bent state.Also, don't put heavy stuff on the cable. Otherwise, the cable could break.
6. Ask the qualified expert for the installation work of the DeviceNet cables because it requires sufficient safety and noise-suppression measures.
   Refer to DeviceNet Volume I, Release 1.3, for the standard installation.
   Also see "8.4 Network Installation" in this manual.

The DN611 supports the plug connection connector(open type). It has two types of network side connectors attached, as shown in Figure 3.5. Follow the order stated below to connect the DeviceNet cable to the DN611.

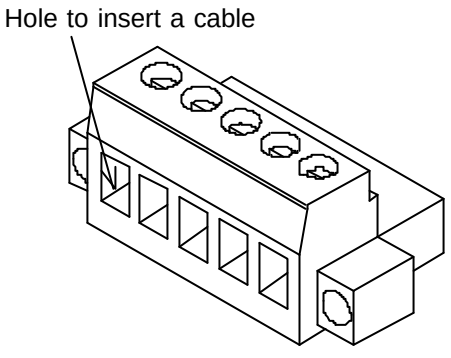
1) Connect the Devicenet cable to the network side connector and fix it.
2) Insert the network side connector into the device side connector on the front panel of the DN611.

The connector at the left-side figure below has the upper and lower rows with holes for cables so that the DN611 can be connected in the middle of the network daisy chain.

Meanwhile, the connector at the right-side figure below has a row with holes for cables so that the DN611 can be connected at the network end. Select either of the connectors after discussing the point you are going to connect your DN611 in the network.




Phoenix Contact
TMSTBP2.5/5-STF-5.08 AB GY AU



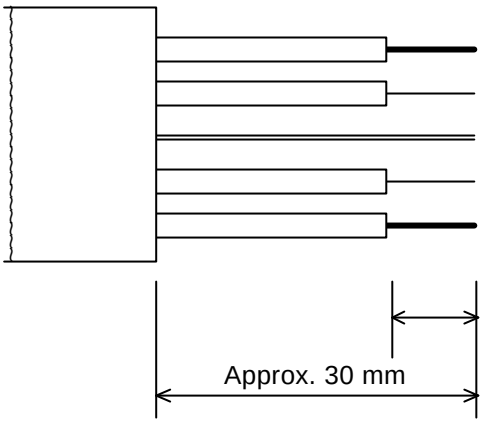

Phoenix Contact
MSTBP2.5/5-STF-5.08 AB GY AU SO

**Figure 3.5 Network Side Connectors Attached to the DN611**

### 3.4.1 Connecting DeviceNet Cables to Network Side Connector

#### (1) Preparing DeviceNet Cables

Use an open-type cable end (2 power cables, 2 signal cables, and 1 drain cable in discrete state) for DeviceNet cables, which will be connected with the network side connector of the DN611. Or purchase such an open-type cable end in the commercial market.




| Color of cable coating | Description |
|---|---|
| Black | Power cable (V –) |
| Blue | Signal cable (CAN_L) |
| – | Shield/Drain |
| White | Signal cable (CAN_H) |
| Red | Power cable (V +) |

**Figure 3.6 Processing of the DeviceNet Cable End**

#### (2) Connecting DevicNet cables to the network side connector

This section describes how to connect DeviceNet cables to network side connectors by using Figure 3.5 at the left side (upper and lower rows with holes for inserting cables) on the preceding page. As shown in Figure 3.7, loosen screws on the cable connectors beforehand. Match the colors of the cable coatings with those of the network side connector before inserting the cables into the connectors. Tighten the screws for fixing cables.

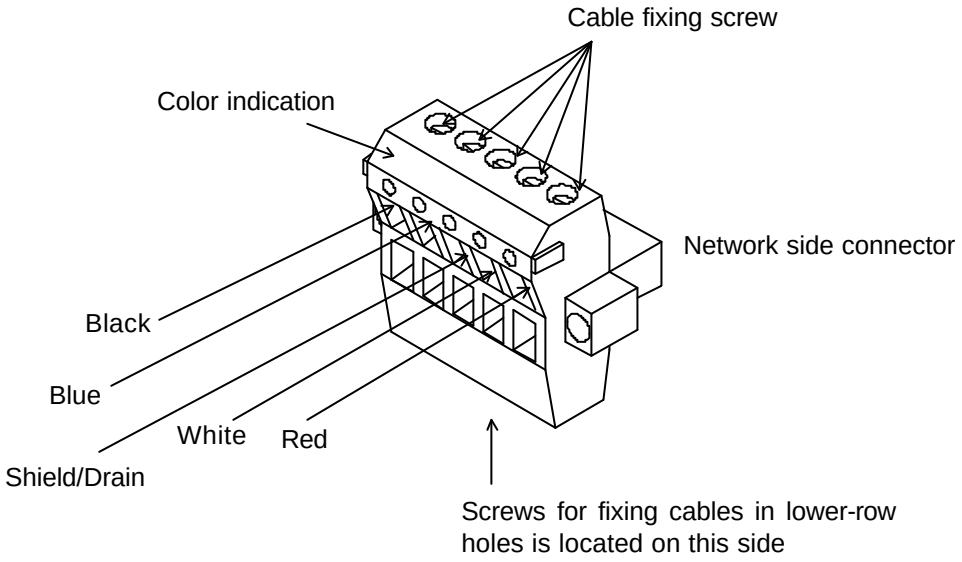



**Figure 3.7 Connecting Cables with Network Side Connector**

### 3.4.2 Connecting the Network Side Connector to the DN611

Insert the network side connector into the device side connector on front panel of the DN611. Note the network side connector cannot be attached upside down due to the specific form; don't try to connect these connectors by force. Tighten the screws for fixing the network side connector on the DN611.

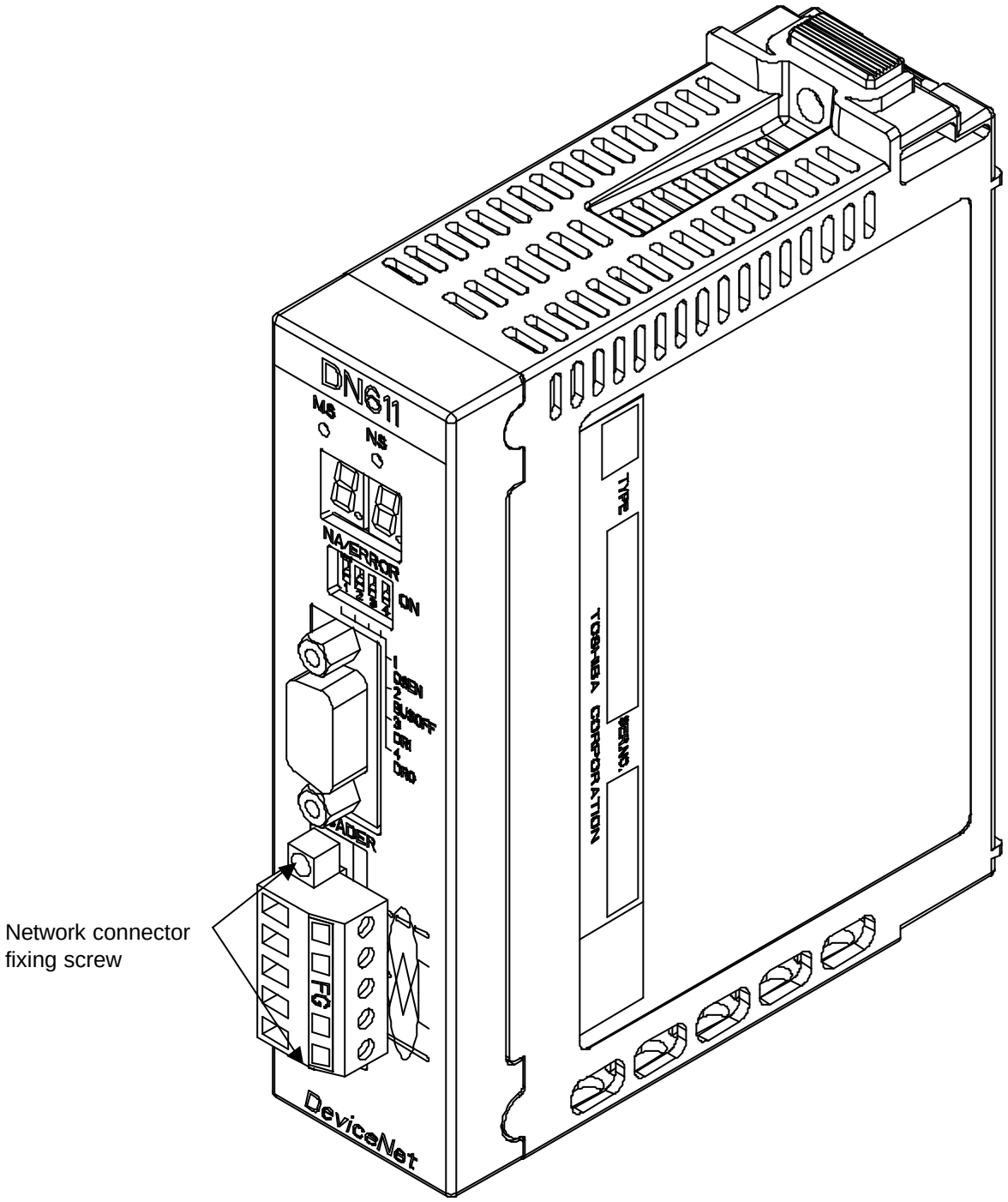



**Figure 3.8 Mounting the Network Side Connector**

## Usage Recommendation

1. Loosen the cable fixing screw on the connector before inserting cables into the network side connector. The cable cannot be fixed when the screws are kept tightened.
2. Colors corresponding to cable colors are printed by the device side connector of the DN611. Match the cable colors with the printed colors to have correct wiring.
3. The DN611 and the DN311 (DeviceNet module for the T3/T3H) have different directions for attaching the network side connector.
4. DeviceNet cables, power tap, and device tap (connecting the trunk line with drop lines) are necessary when constructing a system using a DeviceNet. Refer to "3.6 The Network Components" for detail.

Some of the network components must be prepared by the user.

5. When you use the network side connector that has the upper and lower rows with holes for cables (at the left-side Figure 3.5), the connector protrudes from the left-side DN611 about 5mm. When you attach or detach the left-side module of DN611, you must detach the connector from DN611.

## 3.5 The Network Power/Grounding

In the DeviceNet, the power for communication (24 Vdc) is supplied from the power cables (V+/V−) for the DeviceNet cables via the network side connector. This section describes how to supply the network power to the DeviceNet cables and how to configure network power units. Grounding the network is also explained.

### 3.5.1 The Network Power Mechanism

In order to supply the network power (24 Vdc) to the DeviceNet cables, the power tap (Figure 3.9) specified in the DeviceNet must to be used. The power tap is an apparatus for connecting a 24 Vdc power unit to the trunk cable. It has the following functions:

1) When more than one 24 Vdc power unit are connected to one network, the power tap prevents adverse current flow to power units by potential differences.
2) The power tap supports a maximum of 16 A from a power unit directly connected to the tap.
3) The protective circuit (fuse or circuit breaker) restricts the current flow from the power tap to the cables within 8 A.
4) Provides terminals for grounding the network.

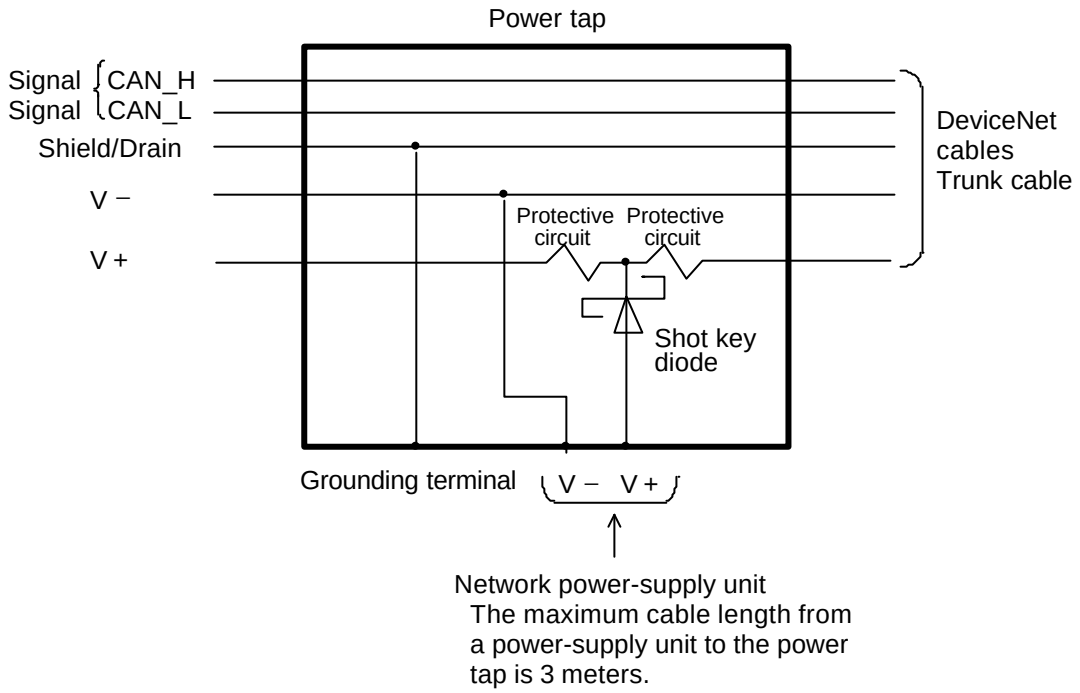



**Figure 3.9 Power Tap Configuration**

The following power tap products, specified in the DeviceNet, are available.

| **Model name** | **1485T–P2T5–T5 (PowerTap)** |
|---|---|
| Manufacturer | Rockwell Automation |

### 3.5.2 How to Configure Network Power Units

This section describes selecting and disposing power units for supplying the network power to individual nodes of the DeviceNet.

#### (1) Maximum Current on the DeviceNet cable

The network power of the DeviceNet is set to rated 24 Vdc. The current which can be passed on the network cable is as follows:

- Trunk line of thick cable: 8 A

| Cable length | 0m | 25m | 50m | 100m | 150m | 200m | 250m | 300m | 350m | 400m | 450m | 500m |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Max. 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 |

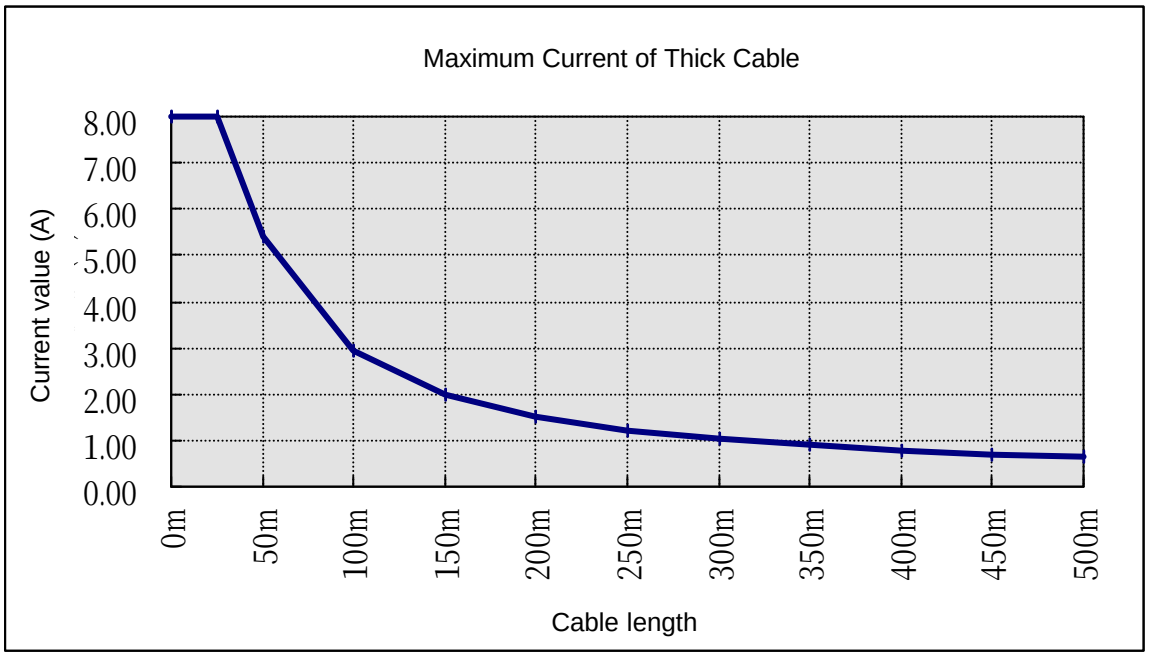



**Figure 3.10 Current of the Trunk Line (thick cable)**

- Trunk line of thin cable: 3 A (up to 100 m)

| Cable length | 0m | 10m | 20m | 30m | 40m | 50m | 60m | 70m | 80m | 90m | 100m |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Max. current (A) | 3.00 | 3.00 | 3.00 | 2.06 | 1.57 | 1.26 | 1.06 | 0.91 | 0.80 | 0.71 | 0.64 |

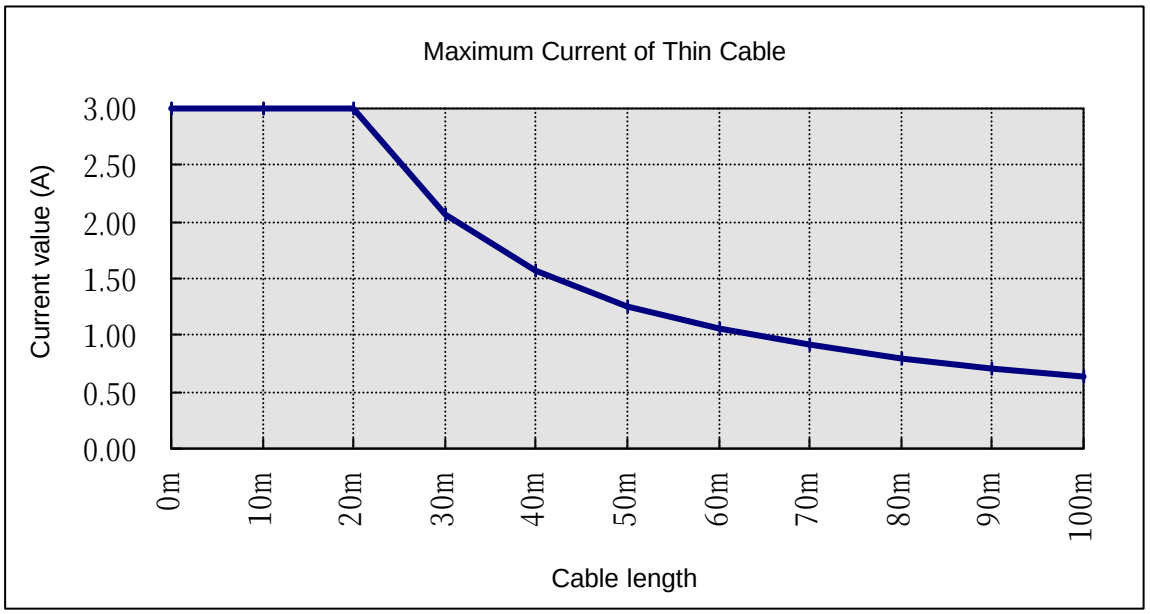



**Figure 3.11 Current of the Trunk Line (thin cable)**

- For drop line: 0.75 to 3.0 A

Formula: $I = 4.57/L$ (however, $I < 3$ A)

I : Max. current of drop line (A)

L : Drop line length (0 to 6 m)

| Usage Recommendation |
|---|
| 1. Consider not only current capacity of the trunk line but also current capacity of a drop line when you install a node on the drop line. |
| 2. In particular, when you are connecting nodes in daisy chain on a drop line, be careful not to have insufficient current capacity. |

### (2) How to Know the Optimal Arrangement of Network Power Units

Use the following procedure to know optimal arrangement of network power units.

a) Obtain the sum of the network currents consumed by individual nodes on the network. For the nodes which use the network power to operate, uses the sum of both currents.

b) Measure the full length of the network.

c) Based on the cable type (thick cable, thin cable) used for the trunk line and the full length of the network obtained through procedure b), get the maximum current value available on the cable by using Figure 3.10 and Figure 3.11

d) When the sum of the currents consumed on the network (procedure a) is smaller than the maximum current available on the cable (procedure c), a network power unit installed at the network end can be used to supply the power to all nodes ( = single power unit terminal connection).

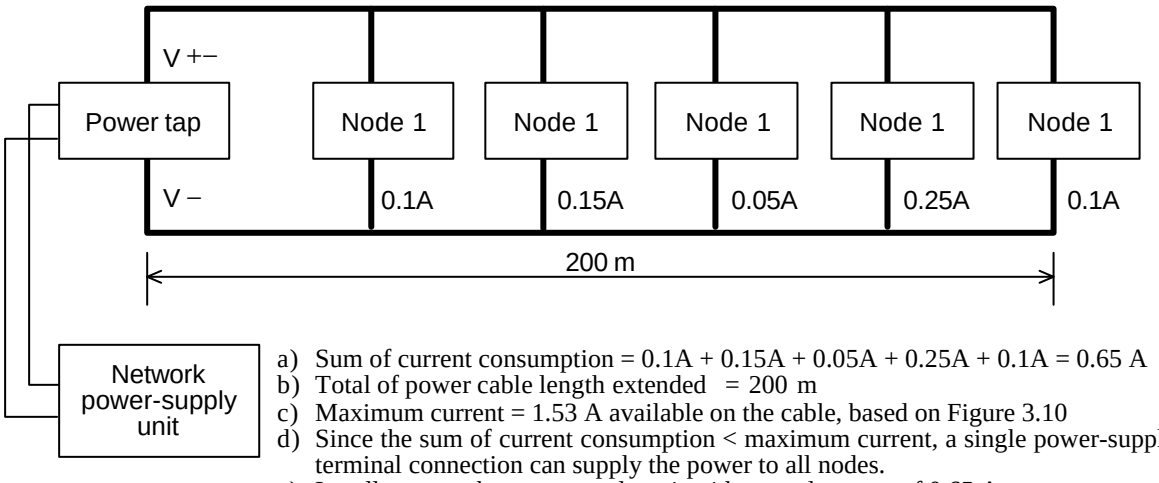
e) When the sum of the currents consumed on the network (procedure a) is larger than the maximum current available on the cable (procedure c), install a network power unit near the center of the network and examine whether it can supply the power to all nodes (= single power unit central connection).

f) If the single power central connection is insufficient to supply the network power to all nodes, install additional network power units.

| Usage Recommendation |
|---|
| 3. Use a network power whose capacity is much larger than the total current consumption necessary for the network. |

### (3) Single Power Unit Terminal Connection

Below is an example of a network power unit installed at the end of the trunk line (thick cable) with a total extension of 200 meters. The current consumption by the node is shown below.




a) Sum of current consumption = 0.1A + 0.15A + 0.05A + 0.25A + 0.1A = 0.65 A
b) Total of power cable length extended = 200 m
c) Maximum current = 1.53 A available on the cable, based on Figure 3.10
d) Since the sum of current consumption < maximum current, a single power-supply terminal connection can supply the power to all nodes.
e) Install a network power-supply unit with a rated current of 0.65 A or more. (Select one with ample current in considering usage conditions.)

**3.12 Example of Single Power Terminal Connection**

### (4) Single Power Unit Central Connection

This section describes an example of installing a network power unit at the center of the trunk line (Thick cable) with a total extension of 240 meters. The current consumption by the node is shown below. Since the network power unit is installed at the center, the maximum current can be supplied to all directions of the network.

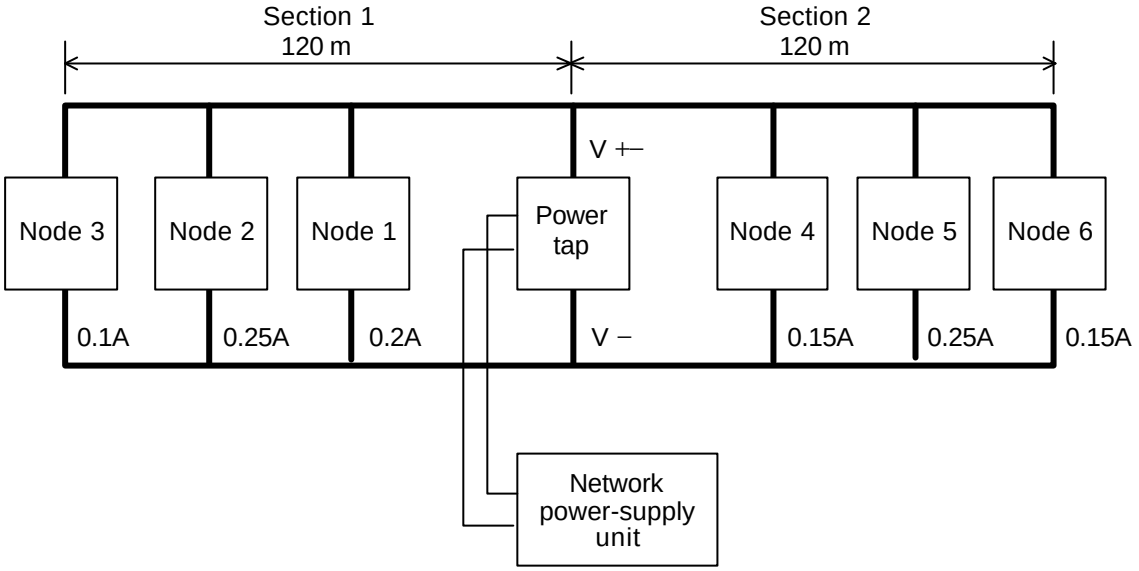



**Figure 3.13 Example of Single Power Unit Central Connection**

a) Sum of current consumption in section 1 = 0.1A + 0.25A + 0.2A = 0.55A

a') Sum of current consumption in section 2 = 0.15A + 0.25A + 0.15A = 0.55A

b) Total length extended in section 1 = Total length extended in Section 2 = 120 m

c) Maximum current available on the cable based on Figure 3.10 = approx. 2.56 A
(Obtain the approximate value between 100 to 150 meter straight cable.)

d) Since the sum of current consumption < maximum current, a single power unit central connection can supply the power to all nodes.

e) Install a network power unit with a rated current of 1.1A or more.
(Select one with ample current in considering usage conditions.)

When the current consumption by the section exceeds the maximum current available for the cable in single power unit central connection, take measures in the table below. Figure 3.14 indicates an example of an overloaded single power unit central connection.

| **Cable section where the current is applied beyond the maximum current** | **Countermeasure** |
|---|---|
| **Only one** of the two section | Move a node in the overloaded section to the other section. |
| | Move the power tap closer to the section overloaded. |
| Both sections | Use two power taps. |

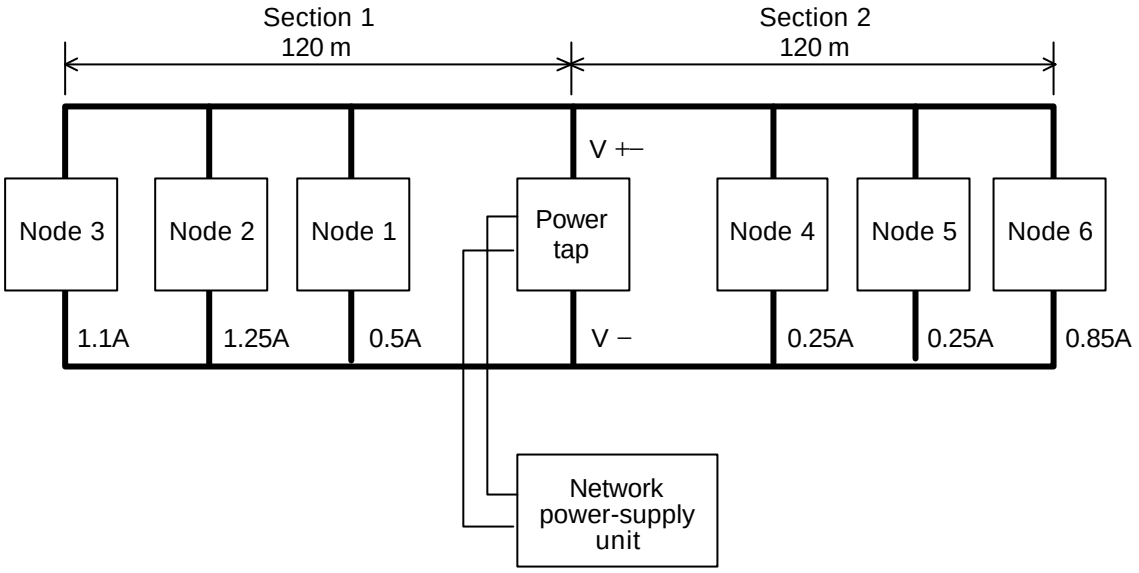



**Figure 3.14 Example of Overloaded Single Power Unit Central Connection**

a) Sum of current consumption in section 1 = 1.1A + 1.25A + 0.5A = 2.85A

a') Sum of current consumption in section 2 = 0.25A + 0.25A + 0.85A = 1.35A

b) Total length extended in section 1 = Total length extended in Section 2 = 120 m

c) Maximum current available on the cable based on Figure 3.10 = approx. 2.56A (Obtain the approximate value between 100 to 150 meter straight cable.)

d) Since the sum of current consumption in section 1 > maximum current, the current is overloaded.

Solution: Move the power tap to the overcurrent section. See Figure 3. 15.

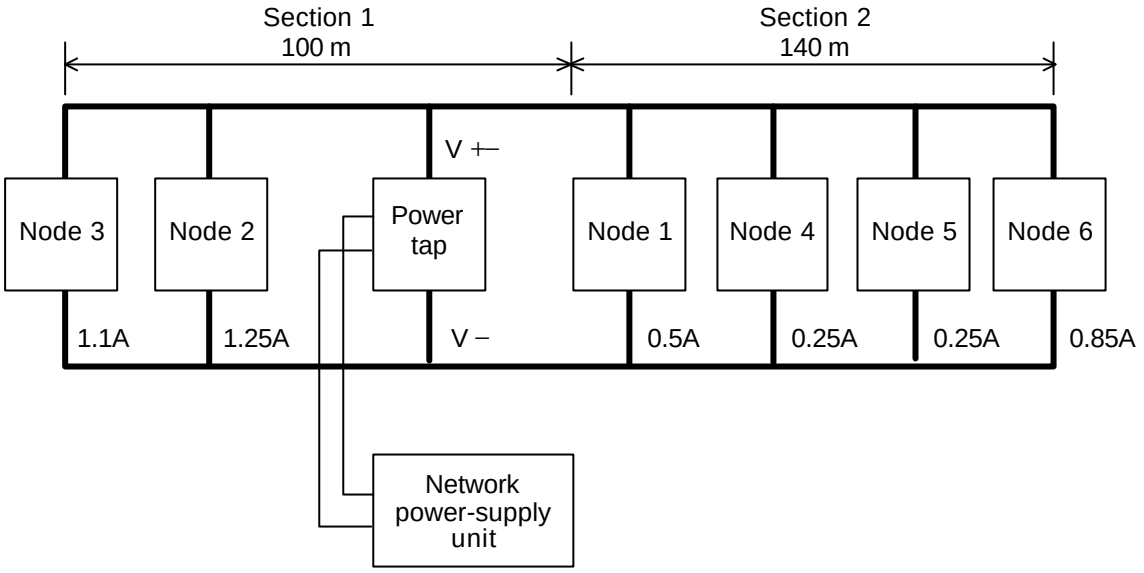



**Figure 3.15 Example of Solving the Overload**

a) Sum of current consumption in section 1 = 1.1A + 1.25A = 2.35A

a') Sum of current consumption in section 2 = 0.5A + 0.25A + 0.25A + 0.895A = 1.85A

b) Total length extended in section 1 = 100 m

b') Total length extended in section 2 = 140 m

c) Maximum current available on the cable in section 1, based on Figure 3.10 = approx. 2.19A
(Obtain the approximate value between 100 to 150 meter straight cable.)

d) Since both of the sums of current consumption in section 1/2 < maximum current, a single power unit central connection can supply the power to all nodes.

e) Install a network power unit with a rated current of 4.2A or more.
(Select one with ample current in considering usage conditions.)

### 3.5.3 The Network Power Unit (24 Vdc)

The network power unit is not attached to the DN611; you have to buy such a unit in the commercial market. Your network power unit must conform with the following specifications:

| Item | Specification |
|---|---|
| Output voltage | 24Vdc ± 1% |
| Output current | 16A or less |
| Input fluctuation | Max. 0.3 % |
| Load fluctuation | Max. 0.3 % |
| Effects by the ambient temperature | Max. 0.03 % / °C |
| Input Voltage | 120V ± 10 %<br>230V ± 10 % (if necessary) or<br>Automatic changeover within 95 to 250V |
| Input frequency | 47 to 62 Hz |
| Output ripple | 250 mVp - p |
| Output side capacity | Max. 7000 μF |
| Ambient temperature | During operation: 0 to 66°C ∗<br>When stored: –40 to 85°C<br>∗ : Rated output derating at 60°C is allowed. |
| Instantaenious max. output current | less than 65A (at peek) |
| Protection against overvoltage | Yes (No value specified) |
| Protection against overcurrent | Yes (Max. current: 125 %) |
| Startup time | 250 ms by the 5% value of the max. output voltage |
| Overshoot on startup | Max. 0.2% |
| Stability | 0 to 100% load (for all conditions) |
| Insulation | Between output - AC power unit; between output - case grounding |
| Conformity | Required: UL<br>Recommended: FCC Class B, CSA, TUV, VDE |
| Ambiant humidity | 20 to 90% (no dew) |
| Surge current capacity | 10% of reserve capacity |

| Usage Recommendation |
|---|
| 1. Use a network power whose capacity is much larger than the total current consumption necessary for the network. |

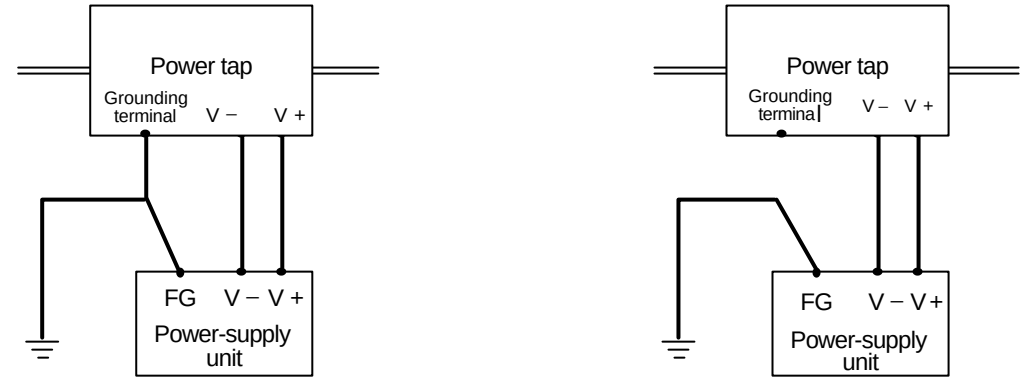
### 3.5.4 The Network Grounding

For the DeviceNet, use 1-point grounding (**class-3 grounding for control device only**) for the network grounding. If more than one point are grounded, the ground can loop. Conversely, the network without being grounded is likely to malfunction due to external noises.

Use the power tap as the point for 1-point grounding. Connect the ground terminal of the power tap with the FG terminal of the power unit before applying class-3 grounding for control device only as shown in Figure 3.16. (Install a power tap near the center of the network and ground from it).

When more than one power units are used in the network, apply grounding to a power tap near the center of the network.

Use a grounding line with a maximum of 3 meters (#8AWG power line).




Power tap grounded

Power tap not grounded

**Figure 3.16 How to Install Your Network**

### 3.5.5 Procedure for Switching-ON/Shutting-OFF the Power

This section describes the order of switching on the slave devices power, the network power, and the S2T side power before starting up the DN611. Check all device wiring and settings are completed before switching ON in the following order.

#### (1) When Starting up the System

a) The network power

b) The slave device power

c) The S2T side power

d) Activating the DN611 communication

The DN611 doesn't yet start communication when the S2T side power is switched ON. Set the parameters of the local nodes and register the parameters of the slave devices in the scanning list before engaging in communication start processing. See "5.2 Module Setting Procedure" for detailed procedures.

**⚠ CAUTION**

1. Be sure to turn ON the network power before turning ON the power of the DeviceNet devices.

   Some nodes of the slave devices use the network power as the operation power while other slave devices indicate an error when their work power is not supplied. Therefore, be sure to switch ON the network power. Also note unless the network power is switched ON, your DN611 cannot start communication with slave devices.
2. Be sure the network power is supplied to all the nodes being connected with the network. The node to which no network power is supplied could cause communication obstacle to other nodes.
3. Make sure the power of all slave devices is switched ON before the DN611 begins communication.

   When the DN611 begins communication while the power of a slave device is not switched ON, the DN611 will display an error message of no response from that device.

#### (2) When Deactivating the System

a) The slave devices power

b) The network power

c) (HALT the operation mode of the S2T.)

d) The S2T side power

**⚠ CAUTION**

4. While network communications are operating, don't shut OFF the network power. Failing to do so will cause the entire network communications to stop and, one of the nodes become busoff state.
5. Switch OFF the S2T side power at last after the DN611 begins communication. This helps the master device (DN611) to be recognized from the network and prevents slave devices from malfunctioning.

## 3.6 The Network Components

This section explains the network components of the DeviceNet other than the master/slave devices (Figure 3.17). Since peripheral devices are recommended on the following pages, which are available in the commercial market, buy some of them when you need.

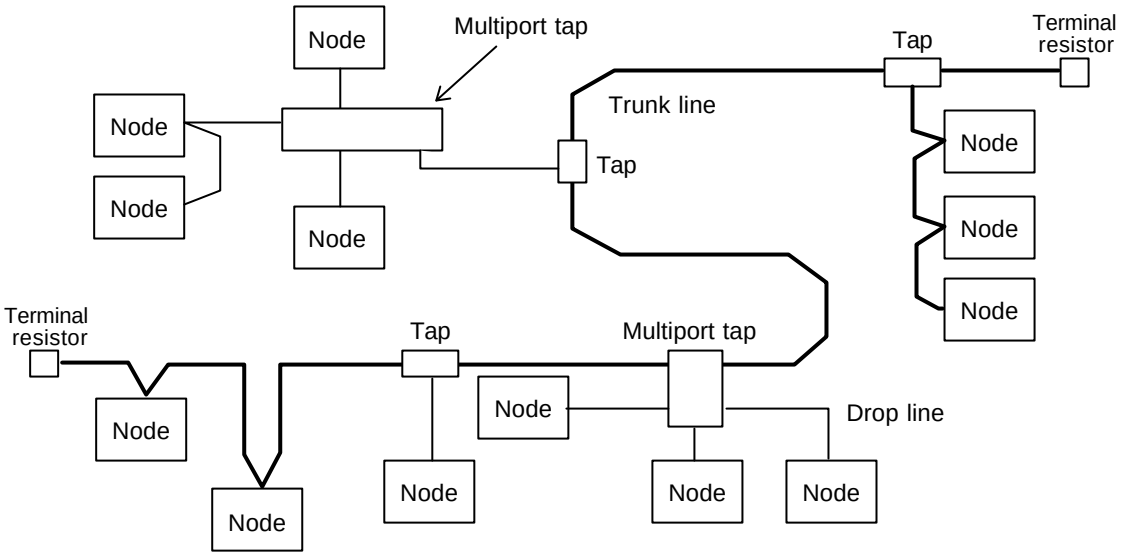



**Figure 3.17 Example of DeviceNet Network Configuration**

### (1) Thick Cable (for trunk line)

Manufacturer: Rockwell Automation

| Item name | Catalog No. | Remarks |
|---|---|---|
| 1 m with connectors | 1485C-P1N5-M5 | Shieldded mini-connectors (male, female) attached |
| 2 m with connectors | 1485C-P2N5-M5 | |
| 3 m with connectors | 1485C-P3N5-M5 | |
| 5 m with connectors | 1485C-P5N5-M5 | |
| 10 m with connectors | 1485C-P10N5-M5 | |
| 50 m with no connector | 1485C-P1-A50 | Shielded mini-connectors 871A-TS5-NM3 (male) and 871A-Ts5-N3 (female) for fixing |
| 150 m with no connectors | 1485C-P1-A150 | |
| 300 m with no connectors | 1485C-P1-A300 | |

### (2) Thin Cable (for trunk line and drop line)

Manufacturer: Rockwell Automation

| Item name | Catalog No. | Remarks |
|---|---|---|
| 1 m with connectors | 1485R-P1M5-C | Discrete shielded mini-connector (male) and open-type connector |
| 2 m with connectors | 1485R-P2M5-C | |
| 3 m with connectors | 1485R-P3M5-C | |
| 150 m with no connector | 1485C-P1-C150 | Used for linking an open-type connector to an open-type connector in daisy chain. Used when connecting the DeviceBox Tap with an open-type connector |
| 300 m with no connectors | 1485C-P1-C300 | |
| 600 m with no connectors | 1485C-P1-C600 | |

### (3) Tap/Multiport Tap

Manufacturer: Rockwell Automation

| Item name | Catalog No. | Remarks |
|---|---|---|
| T-Port Tap | 1485P-P1N5-MN5R1 | T-branch (one drop line from the trunk line)<br>Both the trunk line and drop line use a cable with shielded mini-connectors. |
| DeviceBox Tap (2 ports)<br>DeviceBox Tap (4 ports)<br>DeviceBox Tap (8 ports) | 1485P-P2T5-T5<br>1485P-P4T5-T5<br>1485P-P8T5-T5 | 2 drop lines from the trunk line<br>4 drop lines from the trunk line<br>8 drop lines from the trunk line<br>The trunk line cable and drop line cable, connected with a DeviceBox Tap, are open-type and discrete. |

### (4) Others

Manufacturer: Rockwell Automation

| Item name | Catalog No. | Remarks |
|---|---|---|
| Power Tap | 1485T-P2T5-T5 | Tap power capacity for the trunk line: 7.5 A<br>The trunk line connected with a PowerTap with overcurrent protection uses a discrete open-type connector (no shielded mini-connector). |
| Terminator (male)<br>Terminator (female) | 1485A-T1M5<br>1485A-T1N5 | Terminates the trunk line.<br>These are used for a Thick Cable with mini-connectors or T-Port Tap. |

# 4. How to Handle Your DN611 (software)

This chapter describes the subjects necessary for using various functions of the DN611 in ladder programs for the S2T. More specifically, the following subjects are explained in this chapter.

- Configuration and functions of the DN611 communication memory seeing from the S2T
- Functions and usage of various request instructions for operating the DN611
- DN611's response code to various request instructions (completion status)

Based on the subjects discussed in this chapter, Chapter 5 describes the procedures in the DN611 for setting parameters, activating transmission, inputting/outputting data with slave devices, and reading RAS information including event history, and introduces sample programs.

**⚠ CAUTION**

1. Chapter 4 describes the subjects necessary for using diverse functions of the DN611 from the S2T. Chapter 5 describes, based on the subjects explained in Chapter 4, setting the DN611 parameters, activating transmission, inputting/outputting data with slave devices, and the procedure for reading RAS information including event history, and sample programs.

   Write programs after understanding the contents. As sample programs are basic, you need to examine your programs from beginning to end before applying them to actual systems.

**Usage Recommendation**

1. When your DN611 is going to be I/O registered in the S2T, leave blank for the slot where the DN611 is installed.
   After automatic allocation is performed, the DN611-installed slot is left blank.

## 4.1 Configuration of the DN611 Communication Memory

Indicated below is the configuration of the DN611 communication memory seeing from the S2T.(Word address)

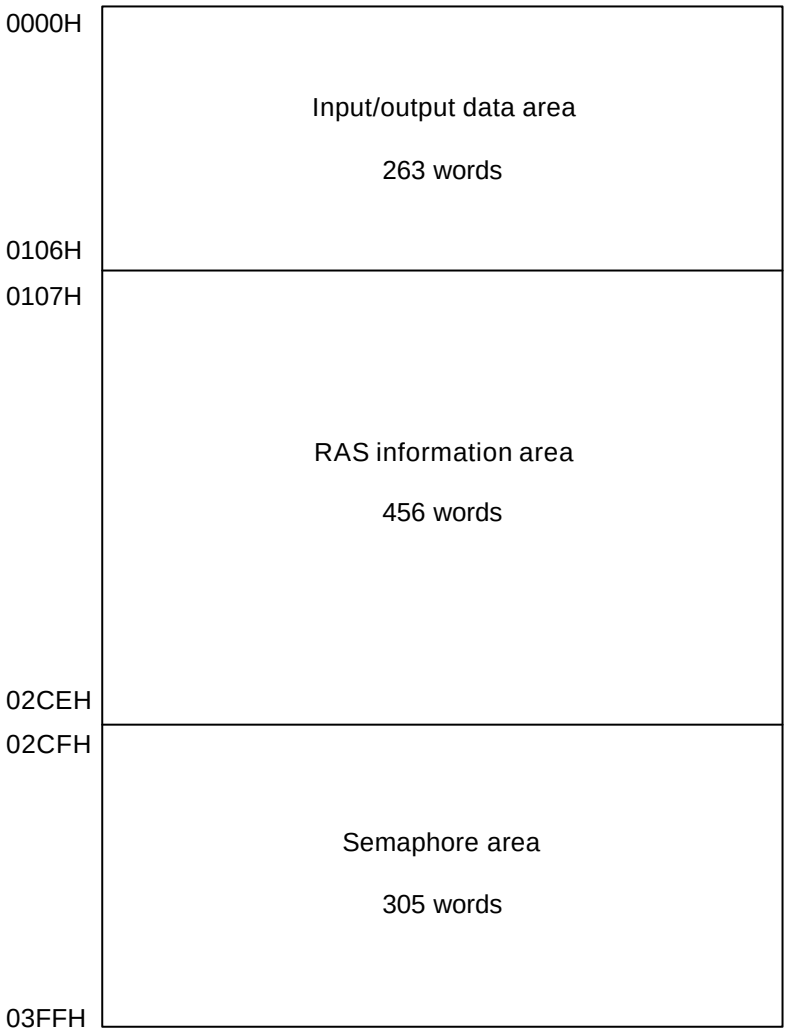



**Figure 4.1 DN611 Communication Memory Map**

### (1) The Semaphore Area

This area is used for issuing requests from the S2T to operate the DN611 and for reading the DN611 responses.

### (2) The RAS information Area

This area of the DN611 displays the DN611's module status, communication status with network and slave devices.

### (3) The Input/Output Data Area

This area stores data to be exchanged between the DN611 and slave devices.

Output data from the S2T is written in this area, while input data is read from this area. This area also have the output and input semaphore registers used for synchronous communications between the DN611 and slave devices.

## 4.2 The Input/Output Data Area

This area stores data to be exchanged between the DN611 and slave devices. Output data from the S2T is written in this area, while input data is read from this area.

This area also have the output and input semaphore registers used for synchronous communications between the DN611 and slave devices. The addresses in Figure 4.2 indicate the word addresses seen from the S2T.

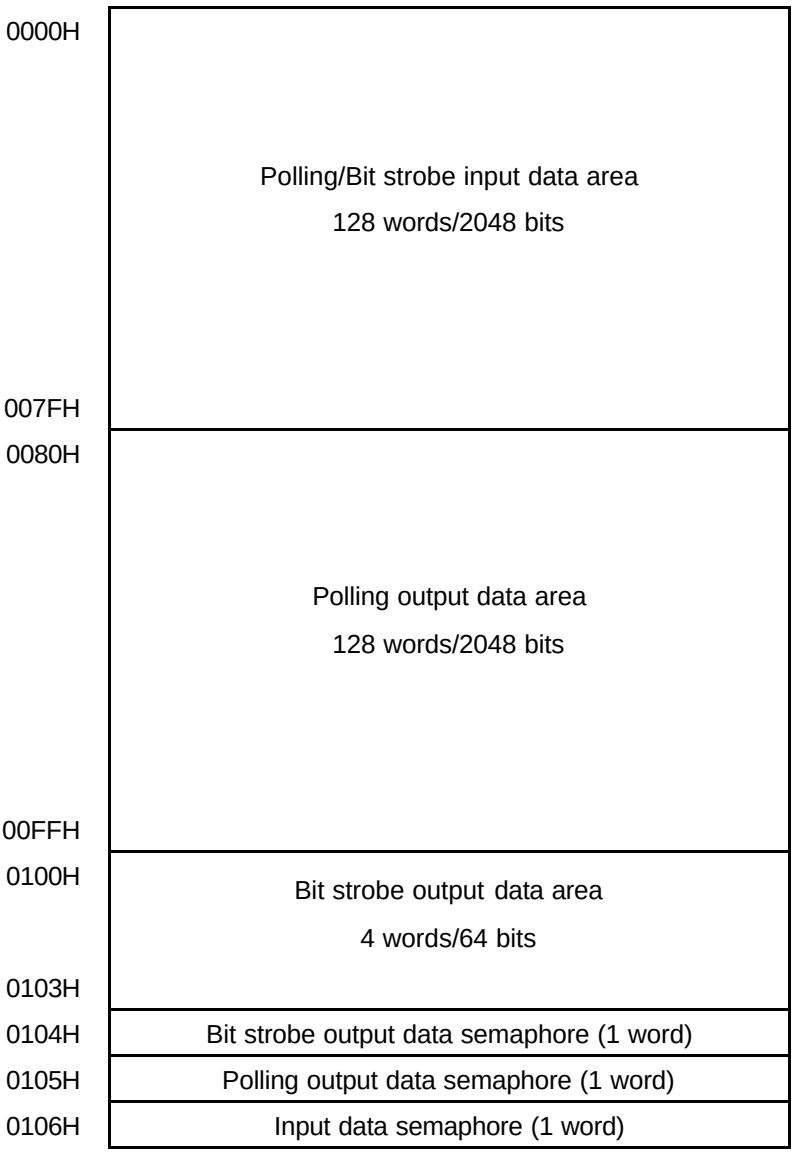



**Figure 4.2 Input/Output Data Area Configuration**

### (1) Input Data Semaphore Register (0106H: 1 word)

This semaphore register is used when inputting data into the S2T from the DN611 (effective only for synchronous transmission mode). The register is used both in the polling mode / bit strobe mode.

- DN611 side operation

  The DN611 writes data, collected from the slave devices in the polling mode or the bit strobe mode, into "polling / bit strobe input data area" before setting "1" to this register.

- S2T ladder program operation

  The ladder program for the S2T monitors this register. When detecting "1" is written into this register, the ladder program reads data from the "polling / bit strobe input data area" and then writes "0" in the register before notifying the DN611 of read completion.

  **Write the value "0" only in this semaphore register.**

### (2) Polling Output Data Semaphore Register (0105H: 1 word)

This semaphore register is used when outputting polling data to the DN611 from the S2T (effective only for synchronous transmission mode).

- S2T ladder program operation

  The ladder program writes data, to be outputted to the "polling output data area," to slave device in the polling mode before writing "1" in this register, and then instructs the DN611 to start output.

  **Write the value "1" only in this semaphore register.**

- DN611 side operation

  The DN611 monitors this register in the "scan interval wait time" cycle specified from the S2T. When detecting "1" is set to this register, the DN611 outputs output data in the "polling output data area" to slave devices. When the output is completed, "0" is set to the register. The "scan interval wait time" is explained in "4.6.3 Parameter Setting Request (local node)."

### (3) Bit Strobe Output Data Semaphore Register (0104H: 1 word)

This semaphore register is used when outputting bit strobe data to the DN611 from the S2T (effective only for synchronous transmission mode).

- S2T ladder program operation

  The ladder program writes data, to be outputted to slave devices in the bit strobe mode, into the "bit strobe output data area" before writing "1" into this register, and then instructs the DN611 to start output.

  **Write the value "1" only in this semaphore register.**

- DN611 side operation

  The DN611 monitors this register in the "scan interval wait time" cycle specified from the S2T. When detecting "1" is set to this register, the DN611 outputs output data in the "bit strobe output data area" to slave devices. When the output is completed, "0" is set to the register. The "scan interval wait time" is explained in "4.6.3 Parameter Setting Request (local node)."

### (4) The Bit Strobe Output Data Area (0100H – 0103H: 4 words)

Stores data that the DN611 outputs to slave devices in the bit strobe mode.

The ladder program for the S2T writes output data in this area. The transmitting data in the bit strobe mode is fixed at 8 bytes (64 bits).

The corresponding relation of the bits in this area and the node addresses of the slave devices is indicated below.

**Table 4.1 Bit Strobe Output Data Area Configuration**

| | F | E | D | C | B | A | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0100H | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| 0101H | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 |
| 0102H | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 |
| 0103H | 63 | 62 | 61 | 60 | 59 | 58 | 57 | 56 | 55 | 54 | 53 | 52 | 51 | 50 | 49 | 48 |

### (5) The Polling Output Data Area (0080H – 00FFH: 128 words)

Stores data that the DN611 will output to slave devices in the polling mode.

The ladder program for the S2T writes output data in this area. The area has 128 words (2048 bits) in size; unless the data size that the DN611 sends to salve devices doesn't exceed this limit, up to 63 slave devices are connectable with one DN611.

How to allocate output data to slave devices from this area is explained in "4.4 Allocating Slave Data to the Input/Output Data Area"

### (6) The Polling/Bit Strobe Input Data Area (0000H – 007FH: 128 words)

Stores data collected by the DN611 from the slave devices in the polling mode and bit strobe mode. The ladder program for the S2T read data from this area. The area has 128 words (2048 bits) in size; unless the data size that slave devices send to the DN611 doesn't exceed this limit, up to 63 slave devices are connectable with one DN611.

How to allocate input data from slave devices to this area is explained in "4.4 Allocating Slave Data to Input/Output Data Area"

Figure 4.3. shows an overview of the output data area/input data area.

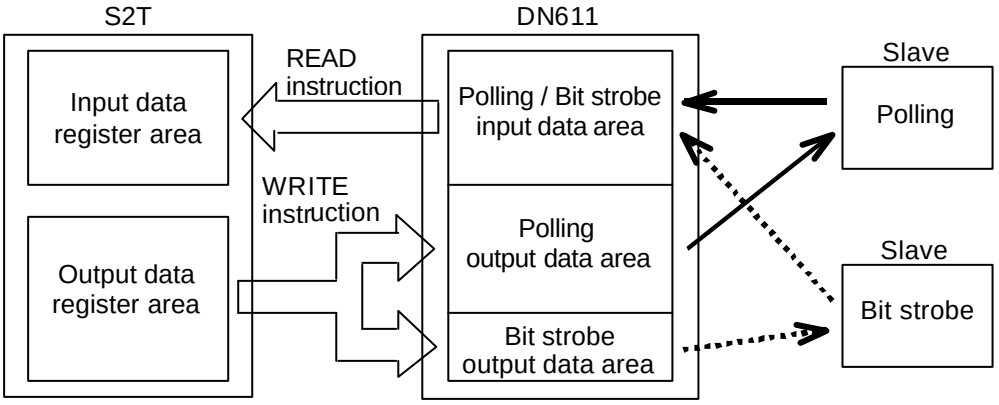



**Figure 4.3 Overview of Input/Output Data Area**

### (7) The usage of Output/Input Data Semaphore (for synchronous transmission mode alone)

Figure 4.4 indicates the relation between output data semaphore (polling / bit strobe) and input data semaphore. Oblique lines parts indicate each of the semaphore values is set to the "1".

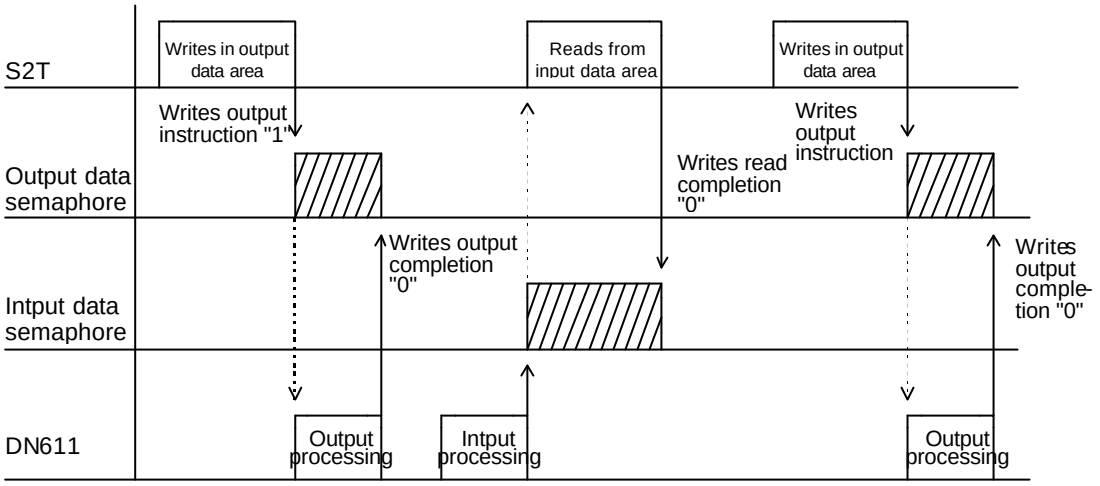



**Figure 4.4 Use of Semaphores in Synchronous Mode**

### (8) Cautions in Using the Input/Output Data Area

- **The input data semaphore register is used both for the polling mode and the bit strobe mode. Therefore, when some slave devices use the polling mode while other slave devices use the bit strobe mode, set data input/output processing in the alternative way like :**

  **polling mode processing completion ® bit strobe mode processing completion ® polling mode processing completion ® bit strobe mode ® ¼**

- **Don't allow the WRITE instruction to execute in the input data area/input data semaphore register. Otherwise, input data could be destroyed.**
- **When you write data in the polling output data area/bit strobe output data area with the WRITE instruction, be careful of the top address of the area and the data size to be written. Otherwise, data could destroy those in another area, causing the DN611 and/or slave devices to get malfunctioned.**

## 4.3 The RAS Information Area

This area indicates the DN611's module status and the communication status of the network and slave devices. Don't write data into this area. Otherwise, the correct data may not be read. The addresses in Figure 4.5 indicate the word addresses seen from the S2T.

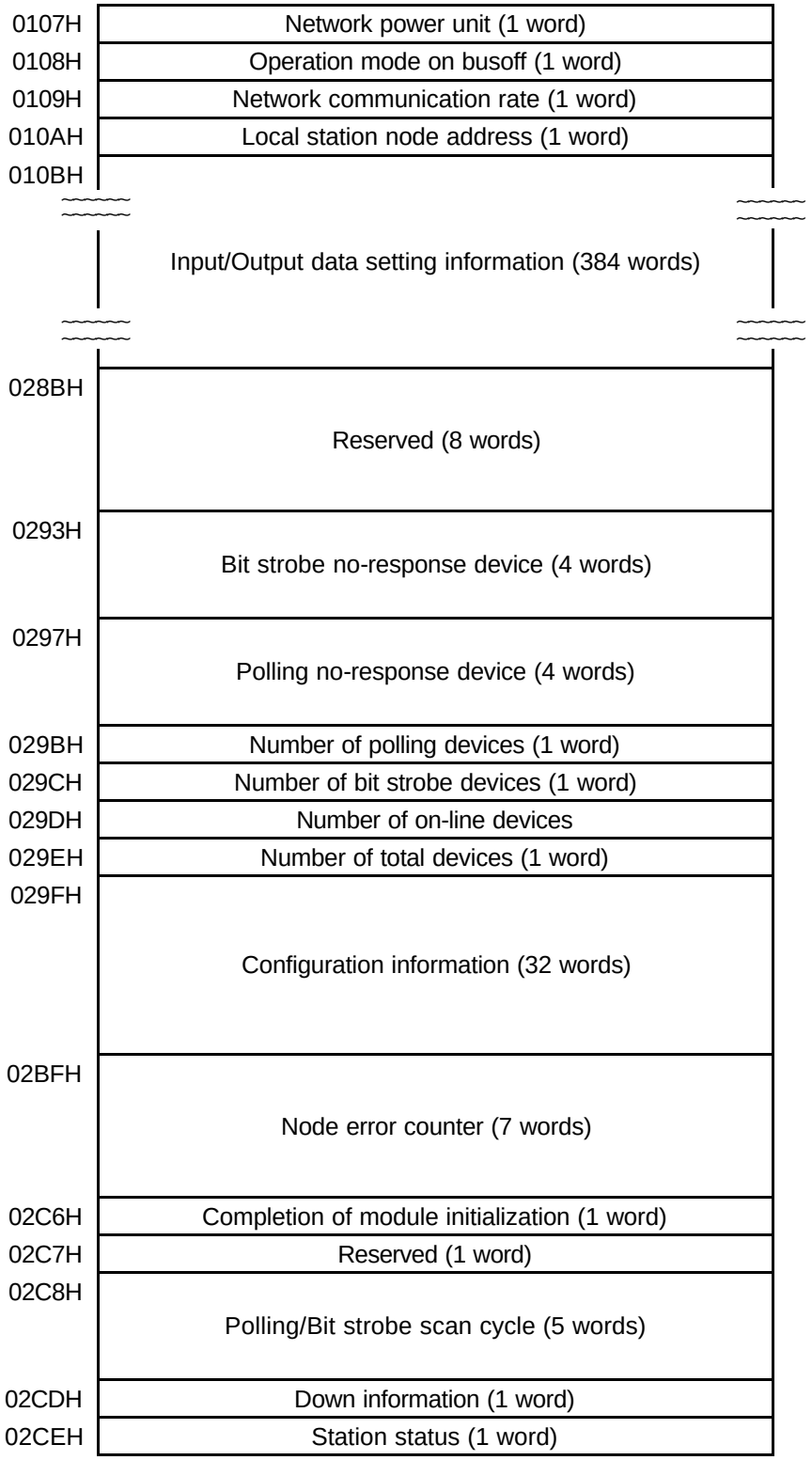



**Figure 4.5 RAS Information Area Configuration**

Indicated below is detailed information that can be checked in the RAS information area.

### (1) Station Status (02CEH: 1 word)

This register indicates the DN611's status with bit flags. Each bit has meaning when "1" is set.

Format

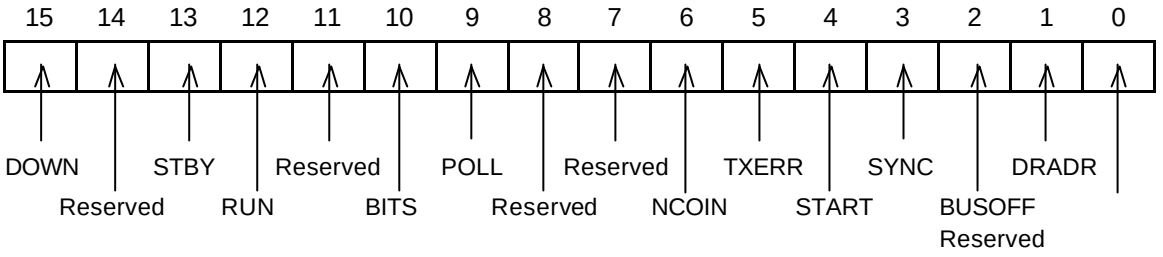



**Figure 4.6 Configuration of Station Status Bits**

**Table 4.2 Meaning of Individual Bits of Station Status**

| Bit | Name | Meaning |
|---|---|---|
| 15 | DOWN | DN611 is set to the down mode. |
| 14 | | Reserved |
| 13 | STBY | DN611 is set to standby mode. |
| 12 | RUN | DN611 is set to run mode. |
| 11 | | Reserved |
| 10 | BITS | Bit strobe mode transmission is operating. |
| 9 | POLL | Poling mode transmission is operating. |
| 8 | | Reserved |
| 7 | | Reserved |
| 6 | NCOIN | No slave device is registered in the DN611. |
| 5 | TXERR | Some of the salve devices registered do not respond. |
| 4 | START | DN611 is executing transmission. |
| 3 | SYNC | DN611 is operating in synchronous mode. |
| 2 | BUSOFF | DN611 is set to busoff status. |
| 1 | DPADR | DN611 detected an duplicated node address when starting transmission. |
| 0 | | Reserved |

Table 4.3 on the next page indicates the configuration of the station status bits of the DN611 in different modes.

**Table 4.3 DN611's Modes and Station statuses**

| | DN611's mode | Bit "1" | Station status |
|---|---|---|---|
| a | Down mode | DOWN | 8000H |
| b | After switching ON the power or after issuing a reset request from the S2T | STBY | 2000H |
| c | No slave device is registered (or deleted) in the DN611 in mode b). | STBY<br>NCOIN | 2040H |
| d | When a slave device is registered in mode c) by a parameter setting request | STBY | 2000H |
| e | When "standby" is requested by a module control request from the S2T | STBY | 2000H |
| f | When "transmission enabled, polling mode transmission, asynchronous mode" is requested by a module control request from the S2T and transmitted normally | RUN<br>START<br>POLL | 1210H |
| g | When "transmission enabled, bit strobe mode transmission, asynchronous mode" is requested by a module control request from the S2T and transmitted normally | RUN<br>START<br>BITS | 1410H |
| h | When "transmission enabled, polling mode and bit strobe mode transmissions, asynchronous mode" is requested by a module control request from the S2T and transmitted normally | RUN<br>START<br>POLL<br>BITS | 1610H |
| I | When asynchronous mode is requested in a mode within f) to h) | Bits from f) to h), followed by SYNC | 1218H<br>1418H<br>1618H |
| j | While transmitting with a slave device in a mode within f) to i), the slave device stopped responses. | The bits from f) to i), followed by TXERR | 1230H<br>1430H<br>1630H<br>1238H<br>1438H<br>1638H |
| k | When busoff occurs, the DIP switch of the DN611 (BUSOFF) remains OFF (when the DN611 has control of restarting transmission) | Station status bits before busoff occurring, followed by :BUSOFF | |
| l | When busoff occurs, the DIP switch of the DN611 (BUSOFF) remains ON (changing to standby mode when busoff occurring) | STBY<br>BUSOFF | 2004H |
| m | An overlapped node address is detected when starting transmission | STBY<br>DPADR | 2002H |

### (2) Down Information (02CDH: 1 word)

This register stores the cause of becoming the down mode when the DN611 turns down mode. When this happens, some of the following down codes are displayed in the 7-segment LED on the front panel.

**Table 4.4 Down Information**

| Down information (hex.) | Cause of down mode occurred |
|---|---|
| F0H | Watchdog timeout occurred |
| F1H | Memory bus abnormal occurred |
| F2H | TRAP occurred |
| F3H | ROM's BCC check error occurred (on DN611 startup) |
| F4H | RAM's read/write error occurred (on DN611 startup) |
| F5H | Read/Write error occurred for the DN611 communication memory (on DN611 startup) |
| F6H | DN611 node address setting abnormal |
| F7H | DN611 network communication rate setting abnormal |
| F8H | Configuration data EEPROM read error occurred |

### (3) Polling / Bit Strobe Scan Cycle (02C8H - 02CCH: 5 words)

This area stores the DN611's scan time in milliseconds for the polling mode or bit strobe mode transmission.

When in asynchronous mode: The "scan cycle" means the time that the DN611 starts carrying out data input/output with all slave devices until starting the next input/output.

- Only for the slave devices with the polling mode, the "scan cycle" means the time from starting polling input/output until starting the next polling input/output.
- Only for the slave device with the bit strobe mode, the "scan cycle" means the time from starting bit strobe input/output until starting the next bit strobe input/output.
- For the salve devices where the polling mode and bit strobe mode are intermingled, the "scan cycle" means the time from starting bit strobe input/output, followed by performing polling input/output, until starting the next bit strobe input/output.

When in synchronous mode: The "scan completion time" means the time from the S2T's writing "1" in the "bit strobe output data semaphore/polling output data semaphore" until the DN611's writing "1" in the "input data semaphore."

**Table 4.5 Scan Cycle Configuration**

| | |
|---|---|
| 02C8H | Scan cycle/Scan completion time |
| 02C9H | Asynchronous mode: Min. scan cycle value |
| 02CAH | Asynchronous mode: Max. scan cycle value |
| 02CBH | Synchronous mode: Min. scan cycle time value |
| 02CCH | Synchronous mode: Max. scan cycle time value |

### (4) Completion of module initialization (02C6H:1 word)

This register indicates the completion of initialization processing by switching ON the power or by requesting resetting.

"1": Completion of initialization

"Value other than 1": Under initialization

### (5) The Node Error Counter (02BFH to 02C5H: 7 words)

The CAN controller used in the DN611 has a function of notifying error state changes of the local station error state (error active ⇔ error passive ⇔ busoff) based on the number of transmission errors occurring.

The CAN controller also has a function of notifying the DN611 of "overrun error" if the DN611 fails to take the data sent from slave devices.

The DN611 maintains the current error state and a history of error state changes since communication was activated. This register indicates a history of error state changes since communication was activated and the total number of transmission times and reception times.

**Table 4.6 Node Error Counter Configuration**

| | |
|---|---|
| 02BFH | Current error state (hexadecimal scale) |
| 02C0H | Number of transmission times since communication was activated |
| 02C1H | Number of reception times since communication was activated |
| 02C2H | Number of error active occurrence times |
| 02C3H | Number of error passive occurrence times |
| 02C4H | Number of busoff occurrence times |
| 02C5H | Number of overrun error occurrence times |

| Current error state | Error code (hexadecimal scale) |
|---|---|
| Initial mode | 00H |
| Error active state | 01H |
| Error passive state | 02H |
| Busoff state | 03H |
| Overrun error occurrence | 04H |
| Reserved | Other |

### (6) Slave Device Configuration Information (029FH – 02BEH: 32 words)

This area indicates scan type information for slave devices, which is set in the DN611(stored in the non-volatile memory).

**Table 4.7 Slave Device Configuration Information**

| Address | F 8 | 7 0 |
|---|---|---|
| 029FH | Node address : 1 | Node address : 0 |
| 02A0H | Node address : 3 | Node address : 2 |
| 02A1H | Node address : 5 | Node address : 4 |
| 02A2H | Node address : 7 | Node address : 6 |
| 02A3H | Node address : 9 | Node address : 8 |
| 02A4H | Node address : 11 | Node address : 10 |
| 02A5H | Node address : 13 | Node address : 12 |
| 02A6H | Node address : 15 | Node address : 14 |
| 02A7H | Node address : 17 | Node address : 16 |
| 02A8H | Node address : 19 | Node address : 18 |
| 02A9H | Node address : 21 | Node address : 20 |
| 02AAH | Node address : 23 | Node address : 22 |
| 02ABH | Node address : 25 | Node address : 24 |
| 02ACH | Node address : 27 | Node address : 26 |
| 02ADH | Node address : 29 | Node address : 28 |
| 02AEH | Node address : 31 | Node address : 30 |
| 02AFH | Node address : 33 | Node address : 32 |
| 02B0H | Node address : 35 | Node address : 34 |
| 02B1H | Node address : 37 | Node address : 36 |
| 02B2H | Node address : 39 | Node address : 38 |
| 02B3H | Node address : 41 | Node address : 40 |
| 02B4H | Node address : 43 | Node address : 42 |
| 02B5H | Node address : 45 | Node address : 44 |
| 02B6H | Node address : 47 | Node address : 46 |
| 02B7H | Node address : 49 | Node address : 48 |
| 02B8H | Node address : 51 | Node address : 50 |
| 02B9H | Node address : 53 | Node address : 52 |
| 02BAH | Node address : 55 | Node address : 54 |
| 02BBH | Node address : 57 | Node address : 56 |
| 02BCH | Node address : 59 | Node address : 58 |
| 02BDH | Node address : 61 | Node address : 60 |
| 02BEH | Node address : 63 | Node address : 62 |

| Scan type | Code (hexadecimal) |
|---|---|
| Unassigned | 00H |
| Bit strobe mode | 01H |
| Polling mode | 02H |
| Polling & strobe | 03H |
| Reserved | Other |

### (7) The Number of Total Devices (029EH: 1 word)

Indicates the number of the slave devices, operable on the network, specified by a parameter setting request from the S2T (setting information)

### (8) The Number of Online Devices (029DH: 1 word)

Indicates the number of the slave devices which are performing data input/output with the DN611 (execution information).

### (9) The Number of Bit Strobe Devices (029CH: 1 word)

Indicates the number of the bit strobe mode slave devices, operable on the network, specified by a parameter setting request from the S2T (setting information).

### (10) The Number of Polling Devices (029BH: 1 word)

Indicates the number of the polling mode slave devices, operable on the network, specified by a parameter setting request from the S2T (setting information).

Note: For the slave devices which support both the polling mode and bit strobe mode, both of the bit strobe devices and polling devices are counted.

### (11) The Polling No-Response Device Map (0297H – 029AH: 4 words)

Indicates, per bit, the individual polling–mode devices not responding to the transmission from the DN611.The value in each frame in Table 4.8 indicates the node address of a slave device.
When a slave device becomes not responding, the corresponding bit turns ON. The bit for the normal slave device is set to OFF. The corresponding bit for the slave device not selected is also set to OFF.

| | F | E | D | C | B | A | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0297H | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| 0298H | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 |
| 0299H | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 |
| 029AH | 63 | 62 | 61 | 60 | 59 | 58 | 57 | 56 | 55 | 54 | 53 | 52 | 51 | 50 | 49 | 48 |

**Table 4.8 Polling No-Response Slave Devices**

### (12) The Bit Strobe No-Response Device Map (0293H – 0296H: 4 words)

Indicates, per bit, the individual bit-strobe mode salve devices not responding to the transmission from the DN611. The value in each frame in Table 4.9 indicates the node address of a slave device. When a slave device becomes not responding, the corresponding bit turns ON. The bit for the normal slave device is set to OFF. The corresponding bit for the slave device not selected is also set to OFF.

| | F | E | D | C | B | A | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0293H | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| 0294H | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 |
| 0295H | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 |
| 0296H | 63 | 62 | 61 | 60 | 59 | 58 | 57 | 56 | 55 | 54 | 53 | 52 | 51 | 50 | 49 | 48 |

**Table 4.9 Bit Strobe No-Response Slave Devices**

### (13) Input/Output Data Setting Information (010BH - 028AH: 384 words)

Indicates , per slave device (node address: NA), the allocations of input/output data for slave devices in the input/output data area. The input/output data setting information has 6 words per 1 slave device.

Figure 4.7 indicates the top addresses of areas where individual node information is stored. Table 4.10 lists the meanings per slave device.

**After the slave device parameters are set, data will be input in these areas when the DN611 is set to run mode (transmission enabled status) by an operation mode control request.**

"0" is set to the areas where no slave device is found.

| | | | | | |
|---|---|---|---|---|---|
| 010BH | NA = 0 | 018FH | NA = 22 | 0213H | NA = 44 |
| 0111H | NA = 1 | 0195H | NA = 23 | 0219H | NA = 45 |
| 0117H | NA = 2 | 019BH | NA = 24 | 021FH | NA = 46 |
| 011DH | NA = 3 | 01A1H | NA = 25 | 0225H | NA = 47 |
| 0123H | NA = 4 | 01A7H | NA = 26 | 022BH | NA = 48 |
| 0129H | NA = 5 | 01ADH | NA = 27 | 0231H | NA = 49 |
| 012FH | NA = 6 | 01B3H | NA = 28 | 0237H | NA = 50 |
| 0135H | NA = 7 | 01B9H | NA = 29 | 023DH | NA = 51 |
| 013BH | NA = 8 | 01BFH | NA = 30 | 0243H | NA = 52 |
| 0141H | NA = 9 | 01C5H | NA = 31 | 0249H | NA = 53 |
| 0147H | NA = 10 | 01CBH | NA = 32 | 024FH | NA = 54 |
| 014DH | NA = 11 | 01D1H | NA = 33 | 0255H | NA = 55 |
| 0153H | NA = 12 | 01D7H | NA = 34 | 025BH | NA = 56 |
| 0159H | NA = 13 | 01DDH | NA = 35 | 0261H | NA = 57 |
| 015FH | NA = 14 | 01E3H | NA = 36 | 0267H | NA = 58 |
| 0165H | NA = 15 | 01E9H | NA = 37 | 026DH | NA = 59 |
| 016BH | NA = 16 | 01EFH | NA = 38 | 0273H | NA = 60 |
| 0171H | NA = 17 | 01F5H | NA = 39 | 0279H | NA = 61 |
| 0177H | NA = 18 | 01FBH | NA = 40 | 027FH | NA = 62 |
| 017DH | NA = 19 | 0201H | NA = 41 | 0285H | NA = 63 |
| 0183H | NA = 20 | 0207H | NA = 42 | | |
| 0189H | NA = 21 | 020DH | NA = 43 | | |

**Figure 4.7 Input/Output Data Setting Information Addresses**

Example) Input/output data setting information for node address = 1

- Input data offset indicates the offset address (in bytes) from the top (0000H) of input data area.
- Output data offset indicates the offset address (in bytes) from the top (0080H) of output data area.
- There are no items for the offset of bit strobe output data and for the number of bytes because of the bit strobe output data area.

**Table 4.10 Input/Output Data Setting Information for Node Address = 1**

| | |
|---|---|
| 0111H | Bit strobe input data offset |
| 0112H | Number of bit strobe input data bytes |
| 0113H | Polling input data offset |
| 0114H | Number of polling input data bytes |
| 0115H | Polling output data offset |
| 0116H | Number of polling output data bytes |

### (14) The Local Station Node Address (010AH:1 word)

The hexadecimal node address of the local station, specified with the rotary switch on the side face of the module, is stored (00H - 3FH).

### (15) The Network Communication Rate (0109H:1 word)

The network communication rate, set with the DIP switch on the front panel, is stored.

00H: Unassigned (setting disabled)

01H: 500kbps

02H: 250kbps

03H: 125kbps

### (16) The Operation Mode on Busoff Occurring (0108H:1 word)

The DN611's operation mode setting is stored when the DN611 detects busoff state of the local station.

00H: When busoff is detected, the module will be set to standby mode, followed by the initialization of the CAN controller.
The procedure for resuming transmission is the same for starting ordinary transmission. Chapter 5 describes the transmission start procedure.

01H: When busoff is detected, the operation mode of the module is left intact, and the CAN controller is initialized, followed by resuming communication, if possible.

### (17) Yes/No of Supplying the Network Power (0107H:1 word)

The supply mode of the network power is stored.

00H: Network power normal

01H: Network power abnormal

## 4.4 Allocating Slave Device Data to the Input/Output Data Area

Reception/transmission data of slave devices will be allocated to the input/output data area in the order from smaller to larger node addresses. For example, in Table 4.11, Slave Device Configuration, the input data area/output data area is allocated to the top and the subsequent addresses without skipping, as shown in Figure 4.8. Allocation will be executed when run mode (transmission state enabled) is set by an operation mode control request after setting slave device parameters.

**Table 4.11 Slave Device Configuration (sample)**

| Node address | Transmission size | Reception size |
|---|---|---|
| 10 | 2 bytes | 4 bytes |
| 11 | 4 bytes | 2 bytes |
| 12 | 6 bytes | 6 bytes |
| 20 | 3 bytes | 4 bytes |
| 30 | 4 bytes | 1 byte |
| 40 | 4 bytes | 6 bytes |

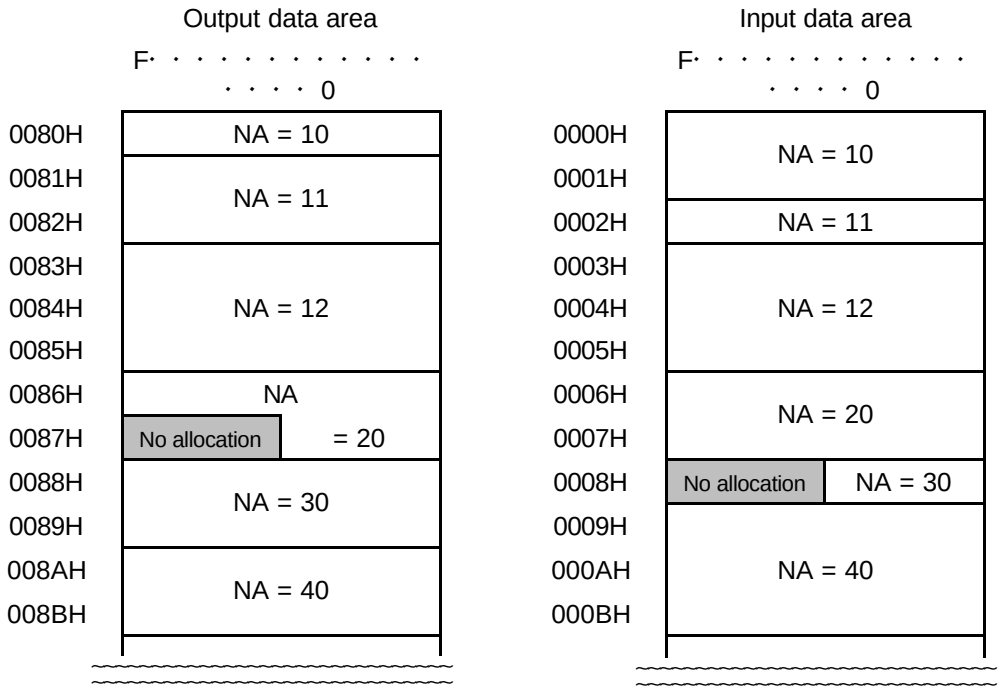



**Figure 4.8 Input/Output Data Area in Slave Device Configuration (sample)**

### ⚠ CAUTION

1. When a slave device has odd transmission/reception bytes in size, **the actual size plus 1 byte are allocated in the DN611 input/output area**.
2. When you add a new slave device, enter a new value larger than the node addresses of the present slave devices. For Figure 4.8, enter a value larger than "41"for the node address of a new slave. If the node address of a new slave device is set to "18", allocating data area of node addresses 20/30/40 will be shifted.
3. Don't change the input/output data size for slave devices (FLEX-I/O, etc.) which are flexible in data allocation size. If changed, the slave devices with a node address larger than that of the slave device changed data size will be shifted in their data allocation.

## 4.5 The Semaphore Area

This area is used for issuing a request from the S2T for operating the DN611, or for reading the DN611's response to a request. The addresses in Figure 4.9 indicate the word addresses seen from the S2T.

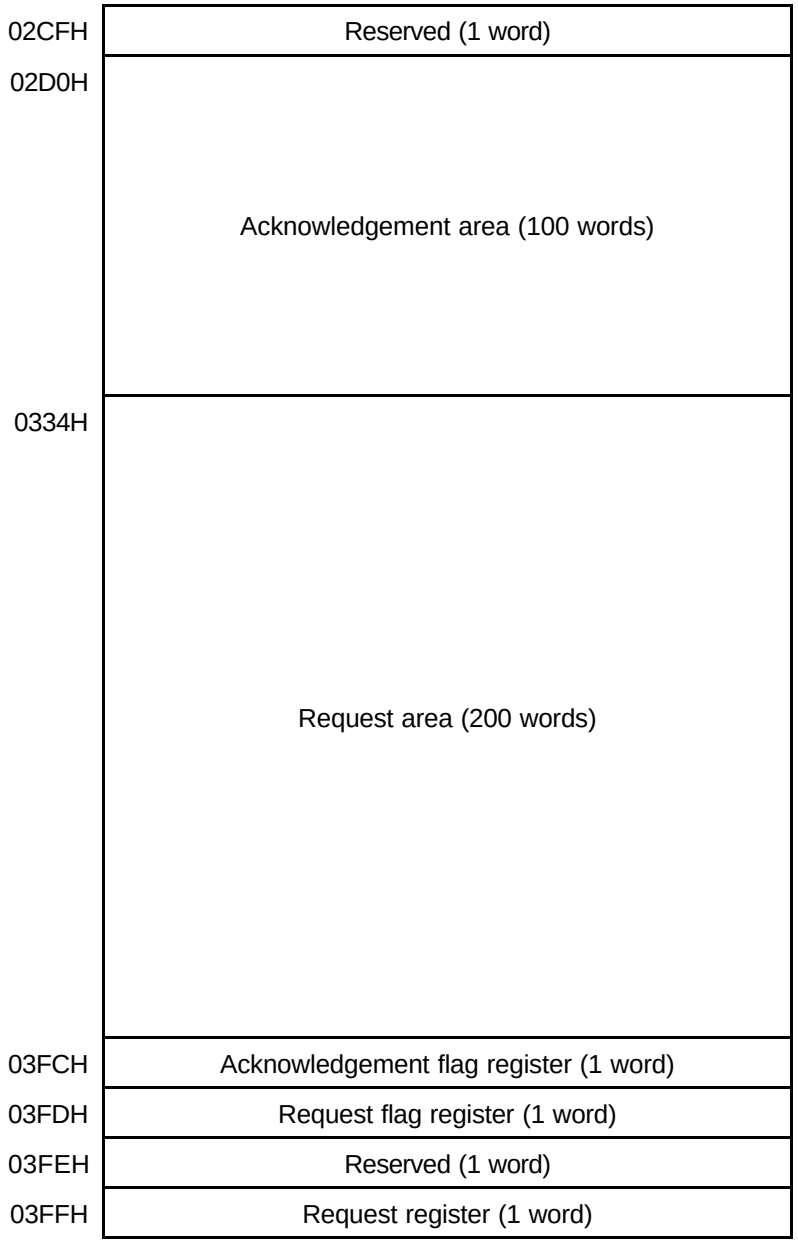



**Figure 4.9 The Semaphore Area Configuration**

### (1) The Request Register (03FFH: 1 word): S2T ® DN611

This register is used for notifying the DN611 of a request when the S2T issues the request to the DN611. After writing "1" in the "request flag register," the ladder program of the S2T writes "256 (0100H)" in this register.

"0": No notice.

"256": Noticed

After reading a request from the "request area," the DN611 sets this register to "0."

### (2) The Request Flag Register (03FDH: 1 word): S2T ® DN611

This register is used when the S2T issues a request to the DN611. After writing request data in the "request area," the ladder program of the S2T writes "1" in this register.

"0": No request.

"1": A request is issued from the S2T to the DN611

"Value other than 0 and 1": Reserved

The DN611 sets this register to "0" after reading a request in the "request area."

### (3) The Acknowledgement Flag Register (03FCH: 1 word): DN611 ® S2T

This register is used for notifying the S2T of the DN611's response after the S2T issues a request to the DN611. The ladder program of the S2T checks this register for "1" to be set after a request is issued to the DN611. When "1" is set to this register, the ladder program reads response data of the DN611 from the "acknowledgement area" before writing "0" in this register.

"0": No response.

"1": Responded to the S2T from the DN611

"Value other than 0 and 1": Reserved

### (4) The Request Area (0334H - 03FBH: 200 words): S2T ® DN611

Request data is written when the S2T issues a request to the DN611.

The data is written in the area beginning "0334 H" as the top address.

The S2T has the following six types of requests to the DN611.

- Reset request
- Parameter setting request (local node)
- Parameter setting request (slave device)
- DN611 operation mode control request
- RAS information read request
- Time setting request

Each of the six requests has a different composition of request data, which is described in "4.6 Requests to the DN611."

### (5) The Acknowledgement Area (02D0H - 0333H: 100 words): DN611 ® S2T

When the S2T issues a request to the DN611, the DN611 sets response data to the S2T to this acknowledgment area. The response data is set at the addresses beginning "02 D0H." The request data composition is described in "4.6 Requests to the DN611."

### (6) How to Use the Semaphore Area

Figure 4.10 illustrates the usage of the areas and registers discussed at (1) to (5).

The squares in oblique lines in the figure indicate that "1" has been set to the flag registers and that "256" has been set to the request register.

a) Use a READ instruction to the acknowledgement flag register to check for "0." If a value other than "0" is found, write "0" in this area (first time only)

b) Use a WRITE instruction to write request data to the DN611 in the request area (top address: 0334H).

c) Use a WRITE instruction to write "1" in the request flag register.

d) Use a WRITE instruction to write "256" in the request register.

e) Use a READ instruction to read the acknowledgement flag register and waits until "1" is set to the register.

f) Use a READ instruction to read response data of the DN611 from the acknowledgement area when "1" is found in the acknowledgement flag register. (top address: 02DOH).

g) Use a WRITE instruction to write "0" in the acknowledgement flag register. → Returns to b).

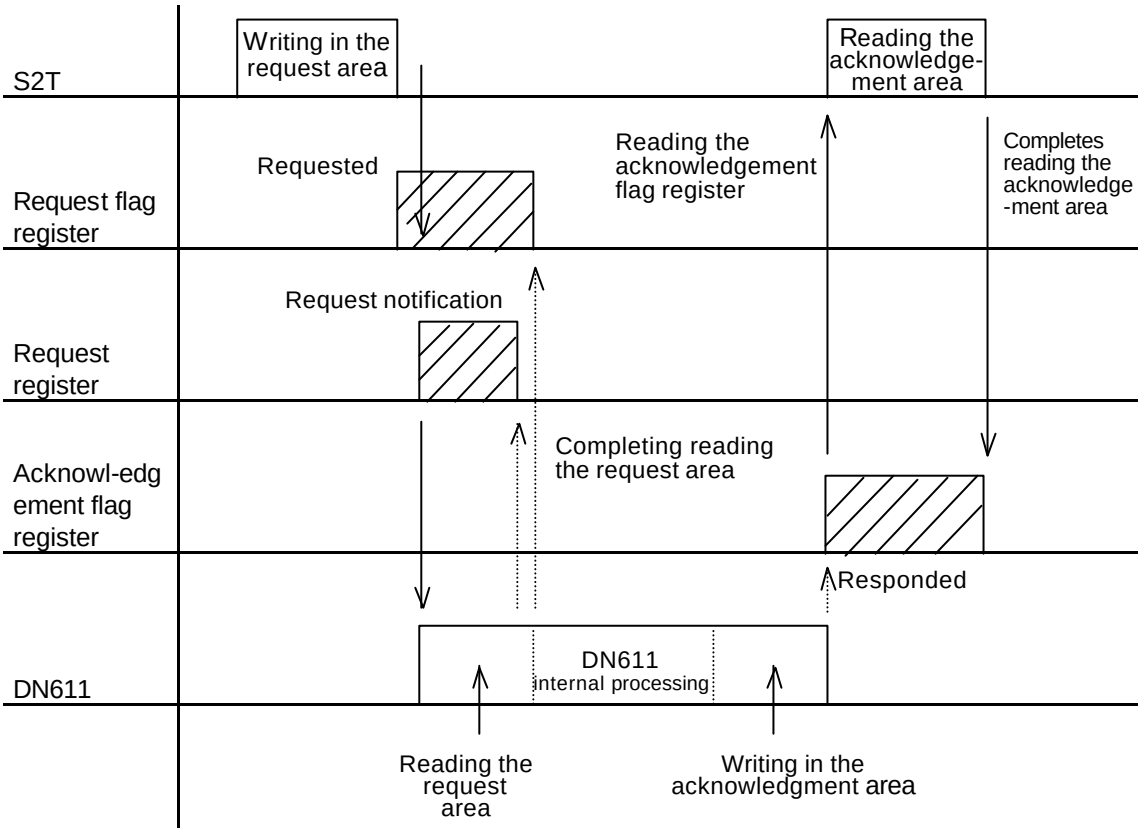



**Figure 4.10 How to Use the Semaphore Area on Requests**

### (7) Cautions When Using the Semaphore Area

**a) Since only a pair of request area and acknowledgment area is furnished, issue the next request after the DN611 returns the acknowledgement to a request from the S2T.**

**b) Don't write data (no WRITE instruction) in the acknowledgement area / acknowledgement flag register. Otherwise, data could be destroyed.**

**c) When a WRITE instruction writes data in the request area, be careful of the top address and the data size to be written. Failing to do so could lead to the destruction of other data, causing the DN611 to get malfunctioned.**

## 4.6 Requests to the DN611

This section describes different types of requests that the S2T issues to the DN611. There are six such types of requests that the S2T issues to the DN611.

The six types of requests are classified into those executable and those not executable, depending on the DN611's operation mode, which is explained in "4.6.1 The DN611 Operation Modes." Table 4.12 lists the relation between different types of requests and the operation modes.

The six types of requests are detailed in "4.6.2 Reset Request."

**Table 4.12 List of Requests**

| Operatin mode / Request name [request code] | Down mode (DOWN) | Initialization mode (INIT) | Standby mode (STBY) | | Run mode (RUN) |
|---|---|---|---|---|---|
| | | | Local node Parameters unassigned | Local node Parameters assigned | |
| Reset [0011H] | △ | × | ○ | ○ | ○ |
| Paremeter setting (local node)[0012H] | × | × | ○ | ○ | × |
| Parameter setting (slave device)[0012H] | × | × | ○ | ○ | × |
| Operation mode control [0013H] | × | × | × | ○ | ○ |
| RAS information reading [0015H] | ○ | × | ○ | ○ | ○ |
| Time setting [0018H] | × | × | ○ | ○ | ○ |

○ : Request enabled

△ : Though the request is enabled, an error could be responded depending on the down cause. See "Table 4.4 Down Information" for the possible down cause.

× : Request disabled ... When requested, an error is responded. The error codes are explained in "4.7 Completion Status."

### 4.6.1 The DN611 Operation Modes

The DN611 has the following operation modes:

1) Initialize Mode
   - The DN611 is in the process of resetting when the power is turned ON or reset is requested.
   - The reset processing turns "standby mode" when the reset processing is completed successfully.
   - The reset processing turns "down mode" when the reset processing fails to complete successfully (e.g, when an error occurs in self-testing).
   - Don't issue an instruction from the user program of the S2T side during "initialize mode."
2) Standby Mode
   - The DN611 turns this mode when the reset processing is completed successfully after you turn ON the power or request resetting.
   - An operation mode control request can changes run mode to standby mode.
   - Only this mode allows you to set the parameters of the local node/slave devices to the DN611.
   - Unless the parameters of the local node is set, "run mode" cannot be set from this mode.
3) Run Mode
   - After the parameters of the local node are set, an operation mode control request allows you to change to run mode.
   - This mode allows the DN611 to transmit to salve devices.
   - This mode allows you to select a transmission mode (polling mode/bit strobe mode) with slave devices.
   - This mode allows you to select a transfer mode (synchronous/asynchronous mode) between the S2T ⇔ DN611.
4) Down mode
   - Indicates that the DN611 has turned unrecoverable abnormal state.
   - A reset request can change to "standby mode." If such a reset request gets an error response, turn OFF and ON the power for recovery.
   - See "Table 4.4 Down Information" for the possible cause of the down mode.

Figure 4.11 illustrates transitions of the DN611 operation modes. Inside square frames indicates the operation mode of the DN611. The operation mode in thick squared frame is the one that the user program can control. The thick arrowheads indicate the request that the user program can specify.

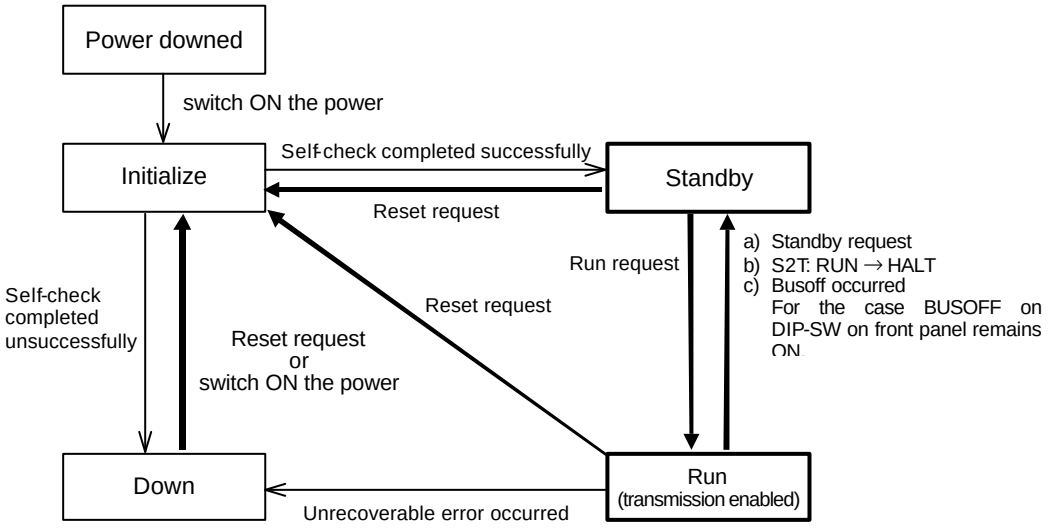



**Figure 4.11 The DN611 Operation Modes**

| ⚠ CAUTION |
|---|
| 1. If the S2T turns into HALT/ERROR mode, the DN611 in run mode becomes standby mode. |

### 4.6.2 Reset Request

#### (1) The Function

This request is used for resetting the DN611 from theS2T. When receiving a reset request, the DN611 executes initialization of the module. This request also can delete the scan list (parameters of the slave devices being linked to the network) saved in the internal non-volatile storage of the DN611.

**During normal operation:**
When a reset request is executed, the DN611 turns waiting for a parameter setting request (standby mode). No response will be made to the S2T when a reset request is completed successfully. To confirm successful completion of the reset request, check the station status (05D5H) for transiting from "initialize mode" to "standby mode."

**When in abnormal state:**
An error response (completion status) will be returned to the S2T when the request is not accepted.

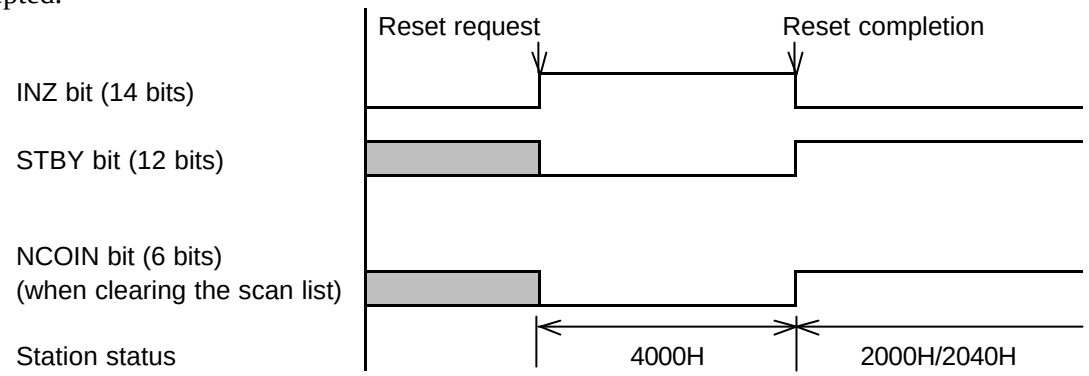



**Figure 4.12 Station Status Operation on Reset Request**

#### (2) The Data Part Format

a) Request

| | Request area | |
|---|---|---|
| 0334H | Request code (0011H) | |
| 0335H | Scan list clear | 0: Don't clear it / 1: Clear it |

b) Acknowledgement (only for abnormal state)

| | Acknowledgement area |
|---|---|
| 02D0H | Request code (0011H) |
| 02D1H | Completion status |

See "4.7 Completion Status" for the above completion status.

#### (3) Execution Time: Since the S2T writes "1" in the request register until the station status changes to "2000H/2040H" from "4000H"

- When the scan list is found in the non-volatile storage: Scan list is not cleared...Approx. 1 second
  Scan list is cleared ...Approx. 9 seconds
- When **no** scan list is found in the non-volatile storage: No scan list cleared ...Approx. 9 seconds
  Scan list is cleared ...Approx. 9 seconds

#### (4) Others

- The 7-segment LED goes out during initialization processing after a reset request is accepted.
- Startup time takes approx. 9 seconds after switching ON the power when no scan list is found in the non-volatile storage.

**⚠ CAUTION**

1. Neither issue a request from the S2T to DN611 while the DN611 is being reset nor execute data input/output. Otherwise, the instruction requested will be completed abnormal (error of station mode abnormal), or the module self-check will fail turning into down mode.

### 4.6.3 Parameter Setting Request (local node)

#### (1) The Function

This request is used for setting the "local node parameters" of the DN611. This request can be issued only when the DN611 is in standby mode.

After setting the "local node parameters" and "slave device parameters," set the DN611 to "run mode (transmission-enabled)" by following "4.6.5 Operation Mode Control Request." If the slave device parameters have already been set into the non-volatile storage of the DN611, set the DN611 to run mode by following "4.6.5 Operation Mode Control Request" after setting "local node parameters."

#### (2) Data Part Format

a) Request

| | Request area | |
|---|---|---|
| 0334H | Request code (0012H) | |
| 0335H | Request type = 0 | |
| 0336H | Port No. = 0 | |
| 0337H | Local station node address | Setting value : 0 to 63 |
| 0338H | Polling transmission mode | Setting value: 0, 1 |
| 0339H | Scan interval wait time | Setting value: 2 to 10,000 ms |
| 033AH | Background poll ratio | Setting value: 1 to 65535 |
| 033BH | Retransmission counter | Setting value: fixed at 1 |
| 033CH | Transmission timing | Setting value: in ms |

b) Acknowledgement

| | Acknowledgement area |
|---|---|
| 02D0H | Request code (0012H) |
| 02D1H | Completion status |

See "4.7 Completion Status" for the above completion status.

c) Local Station Parameters

**Table 4.13 Local Station Parameters (1/2)**

| Parameter | Description |
|---|---|
| Polling transmitting mode | 0: Makes a polling request to all slave devices and waits for the polling response in batch.<br>1: Waits for polling response after requesting polling by the slave device. |
| Scan interval wait time | Specifies the wait time until starting the next access after completing access to all slave devices.<br>Minimum value: 2 ms Maximum value: 10,000 ms |
| Background poll ratio | Accesses the devices to which background polling was specified (setting with slave parameters) at scan interval set to the poll ratio.<br>Example) When 5 is specified, access is made by 5 scans.<br>This parameter is effective both for polling mode devices 1 bit strobe mode devices. |
| Retransmission counter | Fixed at "1" |

**Table 4.14 Local Station Parameters (2/2)**

| Parameter | Description |
|---|---|
| Transmission timing | Is the value for slave devices to detect transmission timeout when the DN611 doesn't access for a certain interval or more.<br>Set a value larger than the scan cycle to slave devices(usually, 100 ms or more).<br>• When a slave device with background polling is installed, set a value of time longer than (scan cycle x poll ratio).<br>• For **synchronous mode communication**, an **interval time value longer than the transmission interval of the user program** must be specified. |

d) Supplement to the Polling Transmission Mode

The DN611 resolution varies when a slave device in polling mode results in no response after selecting the polling transmission mode.

◎ When the polling transmission mode = 0

- The master device performs polling requests asynchronously with the responses of slave devices in polling mode; the master device waits for the polling response from a slave device for 20 ms after executing a request. When the 20 ms exceeds, the next scan starts.
- As long as a no-responding slave device is found, the master device performs 20 ms of response wait time per scan.
- The real scan cycle, when a no-responding slave device is found, is expressed in the following formula:

  **Real scan cycle = Real scan cycle in normal operation + 20 ms**

◎ When the polling transmission mode = 1

- The master device checks for the response from a slave device in polling mode and sequentially executes polling requests to individual slave devices. When polling results in no response from a slave device, the master device waits for 20 ms before executing a polling request to the next slave device.
- When three consecutive timeouts occur for a no-responding slave device, the slave device is delisted from the scan list in the DN611. This will allow the DN611 to transmit with the remaining slave devices in normal operation, and no wait time for response takes place.
- Only the slave devices which have three consecutive timeouts of no response will be delisted from the scan list. When a slave device has two consecutive timeouts of no response but responds to the third polling, the number of timeouts of no response is cleared.
- The DN611 periodically checks for the response from the slave devices delisted from the scan list; if a delisted slave device responds, the device is re-registered in the scan list.
- When n units of slave devices results in no response at the same time, the real scan cycle for three consecutive timeouts is expressed in the following formula.

  **Real scan cycle = Real scan cycle in normal operation + n units x 20 ms**

e) When a slave device in bit-strobe mode results in no response
The master device executes bit-strobe requests disregarding the polling transmission mode selected; it waits for the bit-strobe response from a slave device for 20 ms after executing a request. After the 20 ms of response wait time passes, the next scan starts.

- As long as a no-responding slave device is found, the master device executes 20 ms of response wait time per scan.
- When a no-responding slave device is found, the real scan cycle is expressed in the following formula.

**Real scan cycle = Real scan cycle in normal operation + 20 ms**

| Usage Recommendation |
|---|
| 1. Set the node address of your DN611 to a value smaller than the node addresses of slave devices(because of the feature of CAN currently used in the DeviceNet). |

### 4.6.4 Parameter Setting Request (slave device)

#### (1) The Function

This request is used for setting "slave devices parameters" in the DN611. The request can be issued only when the DN611 is in standby mode.
**Up to 10 salve devices can be set per parameter setting request.**
As "slave devices parameters" setting is stored in the non-volatile memory of the DN611, no additional setting is required when switching ON the power as long as the current slave devices configuration is unchanged. When the slave devices parameters in the non-volatile memory are identical with the slave devices parameters newly requested, no writing is executed into the non-volatile memory.
When the slave devices configuration is changed, delete the slave devices parameters before registering new slave devices parameters.
**Up to 300 times of slave devices parameters setting are available in the non-volatile memory of the DN611.**

#### (2) Data Part Format

a) Request

| | Request area | |
|---|---|---|
| 0334H | Request code (0012H) | |
| 0335H | Request type = 1 | |
| 0336H | Number of request devices | Number of slave devices set by this request |
| 0337H | Port Number | Fixed at 0 |
| 0338H | Slave node address | Setting value: 0 to 63 |
| 0339H | Vendor ID | * 1 |
| 033AH | Product type | * 1 |
| 033BH | Product code | * 1 |
| 033CH | Scan type | Setting value: 0, 1, 2 |
| 033DH | Poll background | Setting value: 0, 1 |
| 033EH | Bit strobe reception size | * 1 |
| 033FH | Polling reception size | * 1 |
| 0340H | Reserved | Fixed at 0 |
| 0341H | Polling transmission size | * 1 |
| 0342H | Reserved | Fixed at 0 |
| 0343H | Major revision | * 1 |
| 0344H | Minor revision | * 1 |
| 0345H | Reserved | Fixed at 0 |
| 0346H | Reserved | Fixed at 0 |
| 0347H | Port number | |
| 0348H | Slave node address | |
| 0349H | Vendor ID | |
| : | | |

First slave device setting information

Second slave device setting information

* 1: Refer to the description of the slave device.

**Specify the polling transmission size/bit strobe reception size in bytes.**

b) Acknowledgement

| | Acknowledgement area |
|---|---|
| 02D0H | Request code (0012H) |
| 02D1H | Completion status |

See "4.7 Completion Status" for the above completion status.

c) Slave Device Parameters
For slave device parameters, refer to the description of the relevant slave devices except for the parameters listed in the following Table 4.15.

**Note the DN611 has the following restrictions in transmitting "0 byte" to a slave device.**

| Restrictions |
|---|
| **When a slave device fails to communicate with the DN611 due to some reason (power of the slave device side turned OFF, connector removed, etc.), the DN611 cannot identify the slave device being malfunctioned.** |
| **Even after the cause of the failure is solved, no communication between the slave device Û DN611 can be resumed.** |
| **Note:**<br>**Though the present DN611 has the above-mentioned restrictions, an upgraded version of the internal software will solve those restrictions.** |

**Table 4.15 Slave Device Parameters**

| Parameter | Description |
|---|---|
| San type | Specifies the transmission system of a slave device.<br>0: Bit strobe<br>1: Polling<br>2: 2: Bit strobe and polling<br>} No value other than 0, 1, or 2 can be specified (reserved). |
| Poll background polling | Specifies an access interval that the DN611 can have to a device.<br>00: Scan polling (accessing for every scan)<br>01: Background polling (accessing by the number of scan times specified by the poll ratio) |

### (3) Other

- **It takes about 4 seconds** to set the parameters of a slave device to the non-volatile storage of the DN611.
- While slave device parameters are being set, the local node address is **blinking** on the 7-segment LED.

**⚠ CAUTION**

1. The parameter setting request (slave device) sets the parameters of slave devices on to the non-volatile memory in the DN611. As long as the slave devices configuration is unchanged, you don't need to execute this request every time when the power is switched ON. In addition, when the parameters of the slave device requested and the parameters of the slave device in the non-volatile memory are same, this setting request is not executed.
2. When the slave devices configuration needs to be changed, delete the salve devices parameters using a reset request before setting new slave devices parameters.
3. The number of times available for setting slave devices parameters in the non-volatile memory of the DN611 is 300 times.
4. The DN611 has the following restriction for transmitting "0 byte" to a slave device from the DN611.
   - When a slave device comes into no communication state with the DN611 due to some reason (for example, the power of the slave device is OFF; the connector is disconnected, etc.), the DN611 cannot recognize the slave device is abnormal.
     Even after the cause of the failed communications is solved, the DN611 and the slave device cannot communicate with each other.

   Note: The above restriction of the present DN611 will be solved by a version-up of the internal software.

### 4.6.5 Operation Mode Control Request

#### (1) The Function

Specifies the operation mode of the DN611 module. When the DN611 is neither in down mode nor initialize mode, a request is enabled. Run mode (transmission enabled) is available only when the DN611 is in standby mode and the local node parameters are set. When the DN611 is set to run mode, slave device data will be allocated to the input/output data area.

#### (2) Data Part Format

a) Request

| | Request area |
|---|---|
| 0334H | Request code (0013H) |
| 0335H | Specified information |

Specified information: "1" has some meaning.

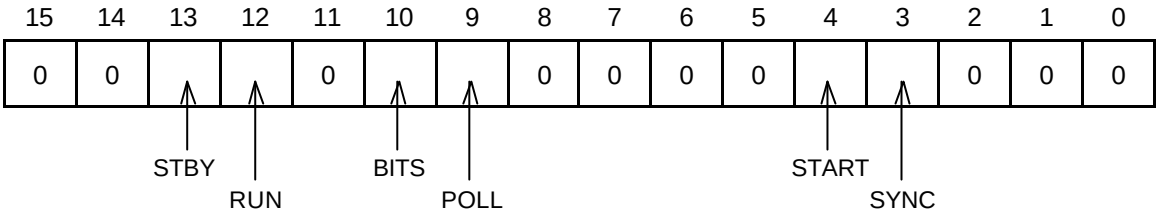



**Figure 4.13 Composition of Specified Information Bits**

**Table 4.16 Meaning of Specified Information Bits**

| BIT | Name | Description |
|---|---|---|
| 13 | STBY | Standby request: changes from run mode to standby mode. |
| 12 | RUN | Run request: changes standby mode to run mode. |
| 10 | BITS | Bit strobe mode transmission enabled |
| 9 | POLL | Polling mode transmission enabled |
| 4 | START | 1: Polling and bit strobe transmission start 0: Stop transmission |
| 3 | SYNC | S2T ⇔ DN611 transfer mode<br>…1: Synchronous 0: Asynchronous |

b) Acknowledgement

| | Acknowledgement area |
|---|---|
| 02D0H | Request code (0013H) |
| 02D1H | Completion status |

See "4.7 Completion Status" for above completion status.

#### (3) Others

- The following combinations of requests are forbidden..
  - ① standby request and run request are requested simultaneously.
  - ② The already running mode (standby/run) is requested
- See the station status for the actual mode change confirmation.
- When you are changing BIT 10, 9, 4, or 3, first change to standby mode before requesting a run request and a new setting.
- When BITs 10, 9, 4, and 3 are set to "1", no standby request is allowed.

### 4.6.6 RAS Information Read Request

#### (1) The Function

Reads the RAS information on the DN611 from the S2T. This RAS information includes RAS history counter, event history, and execution node information (execution information of the slave devices that DN611 has); these three types of information are different from those in the RAS information area.

Unless the DN611 is in initialize mode, these types of information can be read anytime.

The content of the RAS data read is explained in "6.3 RAS Information Reading Data."

#### (2) Data Part Format

a) Request

Request area

| | |
|---|---|
| 0334H | Request code (0015H) |
| 0335H | Request information type |
| 0336H | Start position |
| 0337H | Number of events to read |

The dotted line is valid only for event history.

A history of up to 10 events can be read.

Request type: 1…RAS history, 2…Event history, 3…Execution node information,
4…RAS information clear

Start position: Specifies from where to read event history.
0 specified: Newest event

b) Acknowledgement

Acknowledgement area

| | |
|---|---|
| 02D0H | Request code (0015H) |
| 02D1H | Completion status |
| 02D2H | Number of RAS information words |
| 02D3H | RAS information |
| : | |
| : | |

Number of RAS data words read

See "4.7 Completion Status" for the above completion status.

### 4.6.7 Time Setting Request

#### (1) The Function

Performs the time setting in the DN611. This time is used for event history data, which is read by "RAS information read request." When the DN611 is in down mode or initialize mode, this function cannot be used.

#### (2) Data Part Format

a) Request

Request area

| | | |
|---|---|---|
| 0334H | Request code (0018H) | |
| 0335H | Month | Year |
| 0336H | Hour | Day |
| 0337H | Second | Minute |

b) Acknowledgement

Acknowledgement area

| | |
|---|---|
| 02D0H | Request code (0018H) |
| 02D1H | Completion status |

See "4.7 Completion Status" for the above completion status.

#### (3) Other

- Use to the BCD codes to enter a year, month, day, hour, minute, and second.
- Enter the last two digits of the Western calendar in the year item. For the year 2000, enter 00. Example: 12:20:00, September 30, 1997

| | |
|---|---|
| 0334H | 0118H |
| 0335H | 0997H |
| 0336H | 1230H |
| 0337H | 0020H |

- Since the time set above will be updated by the timer in the DN611, it can be different from the time of the S2T. Daily adjustment of time is recommend .

## 4.7 Completion Status

Indicated below are the completion statuses that DN611 returns to the S2T.

Except for normal completion, an error code and the local node address are indicated alternatively on the 7-segment LED on the front panel of the DN611. The error code indication stops when the following request is completed successfully.

**Table 4.17 List of Completion Statuses**

| Completin status | Code | Description |
|---|---|---|
| Normal completion | 0001H | Indicates a request is completed successfully. |
| Local station failure | 00A0H | When a request for inhibited processing is requested in down mode |
| Serial number unregistered | 00A1H | When a serial number registered in the DN611 disappeared → Ask for repair because the DN611 needs resetting. |
| Local station parameters unassigned | 00A2H | A request for inhibited processing is issued when no local station parameters are set |
| Length abnormal | 00A3H | When the data size of a bit strobe output data write request is 8 bytes or more |
| Station mode abnormal | 00A4H | When a request for inhibited processing is issued during run mode time<br>When a request for inhibited processing is issued during standby mode time |
| | 00A5H | Reserved |
| Transmission inhibition status | 00A6H | When a request relating to transmission processing is issued in transmission inhibition state by the S2T |
| Format abnormal | 00B0H | When the requested processing code is not supported |
| | 00B1H | When requesting a status inhibited at request status for operation mode control request |
| | 00B2H | When the requested year is invalid at time setting |
| | 00B3H | When the requested month is invalid at time setting |
| | 00B4H | When the request day is invalid at time setting |
| | 00B5H | When the request hour is invalid at time setting |
| | 00B6H | When the request minute is invalid at time setting |
| | 00B7H | When the request second is invalid at time setting |
| | 00B8H | When the node address is invalid at parameter setting request and explicit message request (value other than 0 to 63) |
| Composition data abnormal | 00C0H | When invalid data is found in the composition data for parameter setting request (see trace information (Event history) for detail) |
| | 00C1H | Input/output data of a slave device cannot be allocated to the input/output data area (when operation mode control request "RUN" is issued). |
| Memory pool acquisition abnormal | 00C2H | When the OS in the DN611 fails to allocate memory, **turn OFF and ON the power to reset the module.** |
| Number of request devices abnormal | 00C3H | When the number of read devices is incorrect at input data request and output data write request |

# 5. Example of DN611 Applications

This chapter describes an example of operating the DN611 from the S2T and a sample ladder program.

| ⚠ CAUTION |
|---|
| 1. This chapter describes an example of operating the DN611's functions from the S2T and a sample ladder program. It also explains subjects necessary to use the DN611. Thus, try to understand the DN611 well before writing programs. Because the sample program is basic, ample discussion is needed before applying to real systems. |
| 2. When the S2T changes to the HALT/ERROR mode from the RUN mode, the DN611 in run mode will change to standby mode. |

## 5.1 The DN611 Operation Order

Figure 5.1 illustrates steps from switching ON the DN611 power, setting the module, writing output data, and to reading input data.

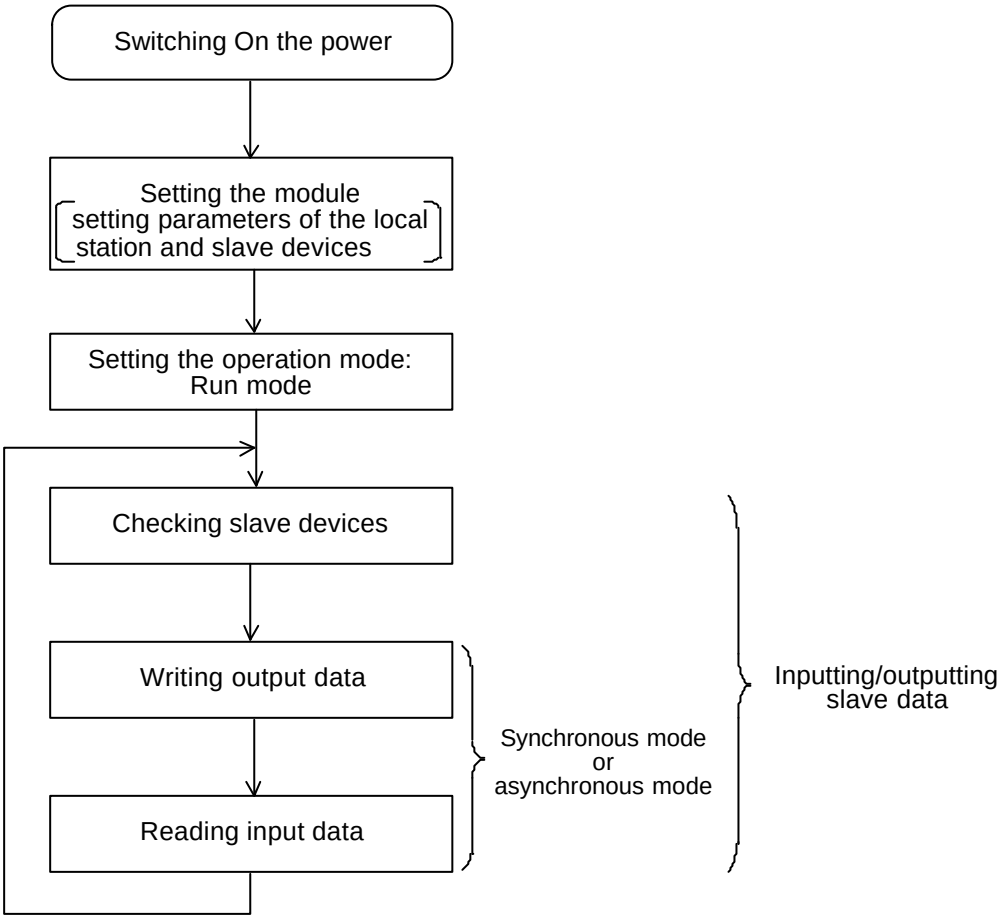



**Figure 5.1 The DN611 Operation Flow**

## 5.2 Module Setting Procedure

This section describes, based on the flowchart of Figure 5.2, the procedures for setting and starting up the DN611 module.

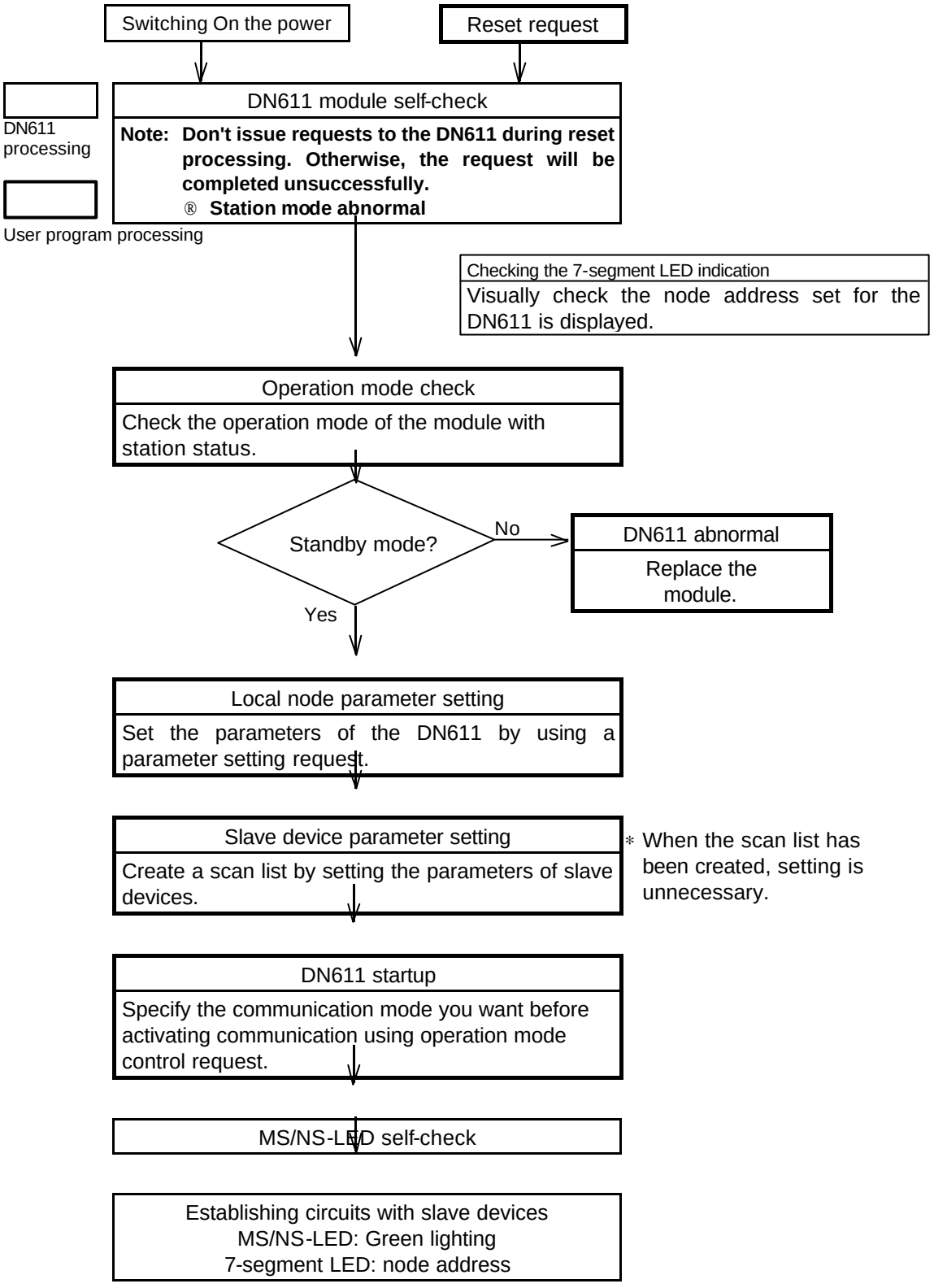



**Figure 5.2 Module Setting Procedure**

### 5.2.1 Accessing the DN611 in Module Setting

This section describes how to access the DN611 in module setting. The semaphore area of the DN611 is used for this accessing. It is the area used for issuing requests from the S2T for operating the DN611 or reading the response to a request from the DN611. See "4 .5 The Semaphore Area" for details of individual areas and registers in the semaphore area.

#### (1) How to Use the Semaphore Area

Figure 5.3 illustrates the usage of the areas and registers in the semaphore area.

The squares in oblique lines in the figure indicate that "1" has been set to the flag registers and that "256" has been set to the request register.

a) Use a READ instruction to read the acknowledgement flag register to check it is "0." If a value other than "0" is found, write "0" in the area (first time only)

b) Use a WRITE instruction to write request data to the DN611 in the request area (top address: 0334H).

c) Use a WRITE instruction to write "1" in the request flag register.

d) Use a WRITE instruction to write "256" in the request register.

e) Use a READ instruction to read the acknowledgement flag register and wait until "1" is set to the register.

f) Use a READ instruction to read the response data of the DN611 from the acknowledgement area when "1" is found in the acknowledgement flag register (top address: 02D0H).

g) Use a WRITE instruction to write "0" in the acknowledgement flag register. → Returns to b).

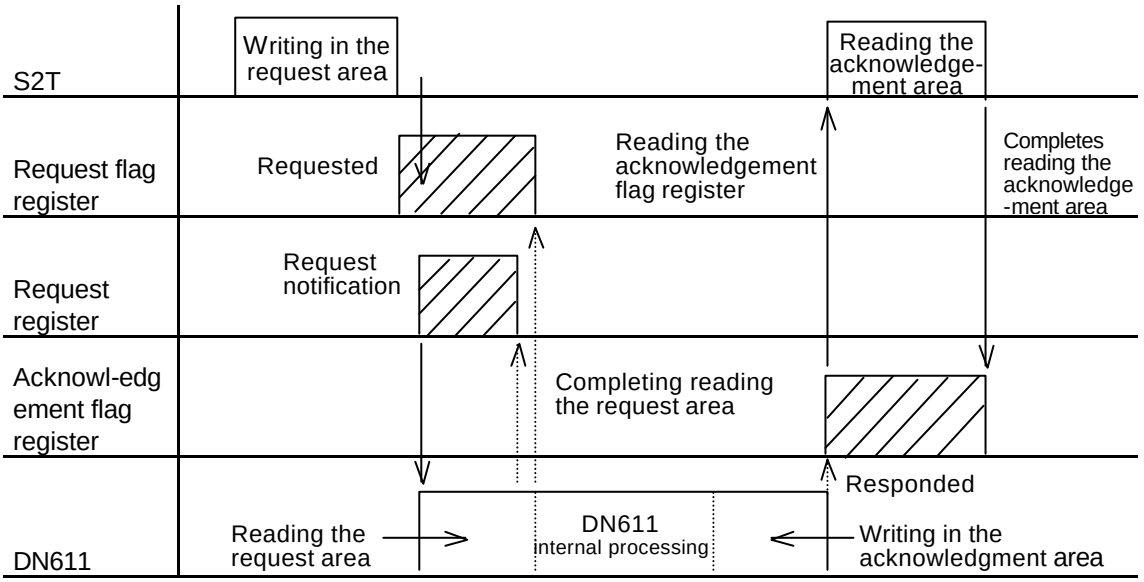



**Figure 5.3 How to Use the Semaphore Area on Requests**

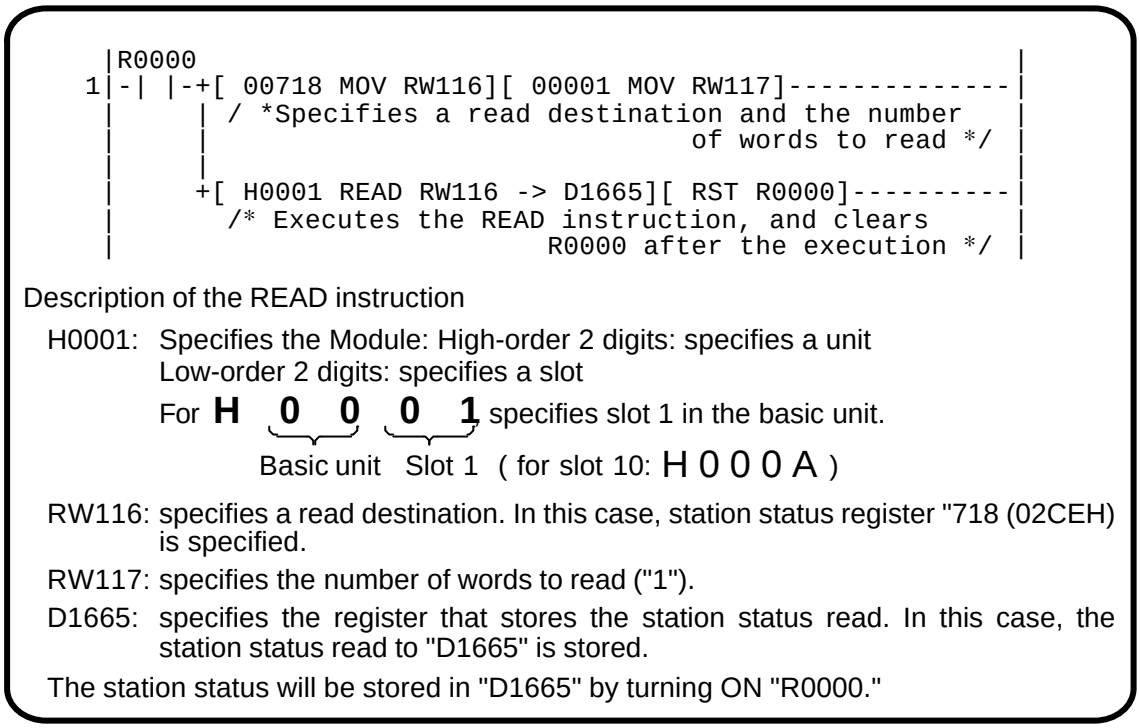
#### (2) Cautions When Using the Semaphore Area

**a) Since only a pair of request area and acknowledgment area is furnished, issue the next request after the DN611 returns the acknowledgement to a request from the S2T.**

**b) Don't write data (no WRITE instruction) in the acknowledgement area/acknowledge- ment flag register. Otherwise, response data could be destroyed.**

**c) When using a WRITE instruction to write data in the request area, be careful of the top address and the data size to be written. Failing to do so could lead to the destruction of other data, causing the DN611 to get malfunctioned.**

3) Example of Using the READ Instruction




Description of the READ instruction

H0001: Specifies the Module: High-order 2 digits: specifies a unit
Low-order 2 digits: specifies a slot

For **H 0 0 0 1**, specifies slot 1 in the basic unit.

Basic unit Slot 1 ( for slot 10: H 0 0 0 A )

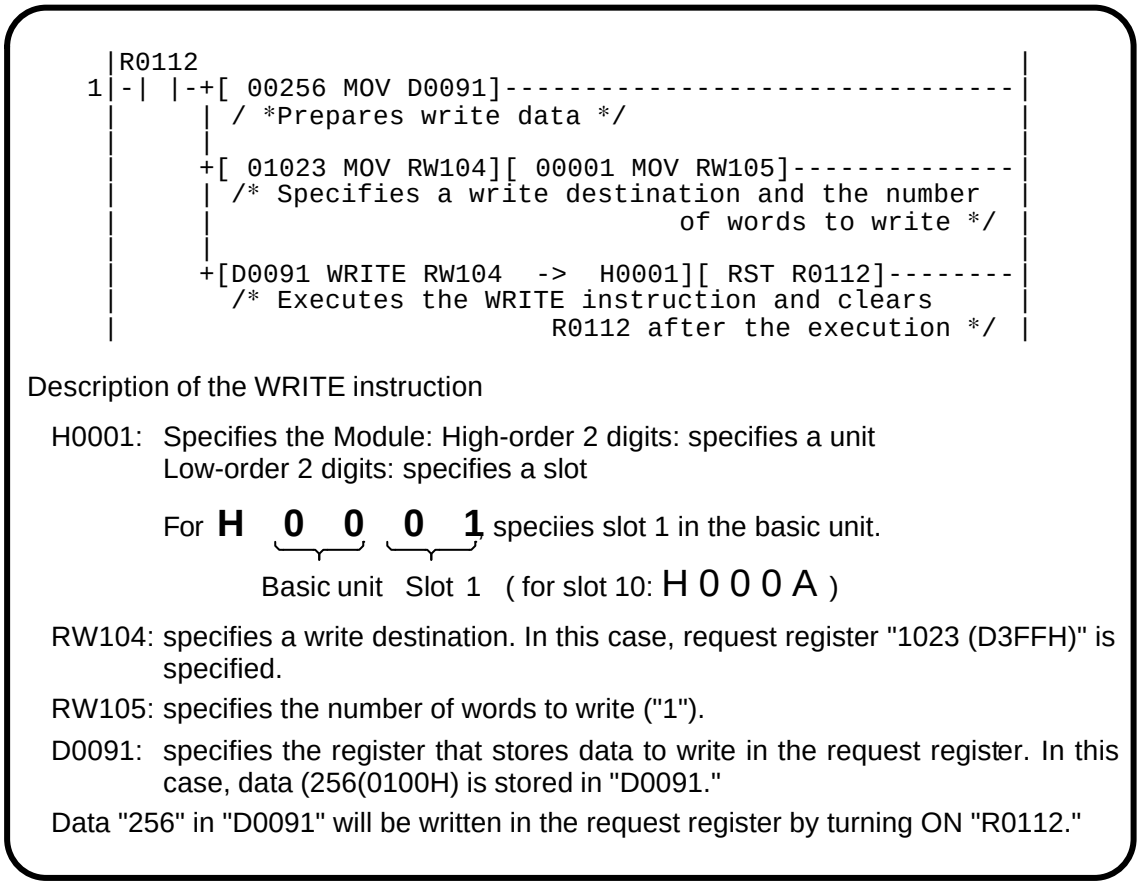
RW116: specifies a read destination. In this case, station status register "718 (02CEH) is specified.

RW117: specifies the number of words to read ("1").

D1665: specifies the register that stores the station status read. In this case, the station status read to "D1665" is stored.

The station status will be stored in "D1665" by turning ON "R0000."

4) How to Use the WRITE Instruction




Description of the WRITE instruction

H0001: Specifies the Module: High-order 2 digits: specifies a unit
Low-order 2 digits: specifies a slot

For **H 0 0 0 1**, speciies slot 1 in the basic unit.

Basic unit Slot 1 ( for slot 10: H 0 0 0 A )

RW104: specifies a write destination. In this case, request register "1023 (D3FFH)" is specified.

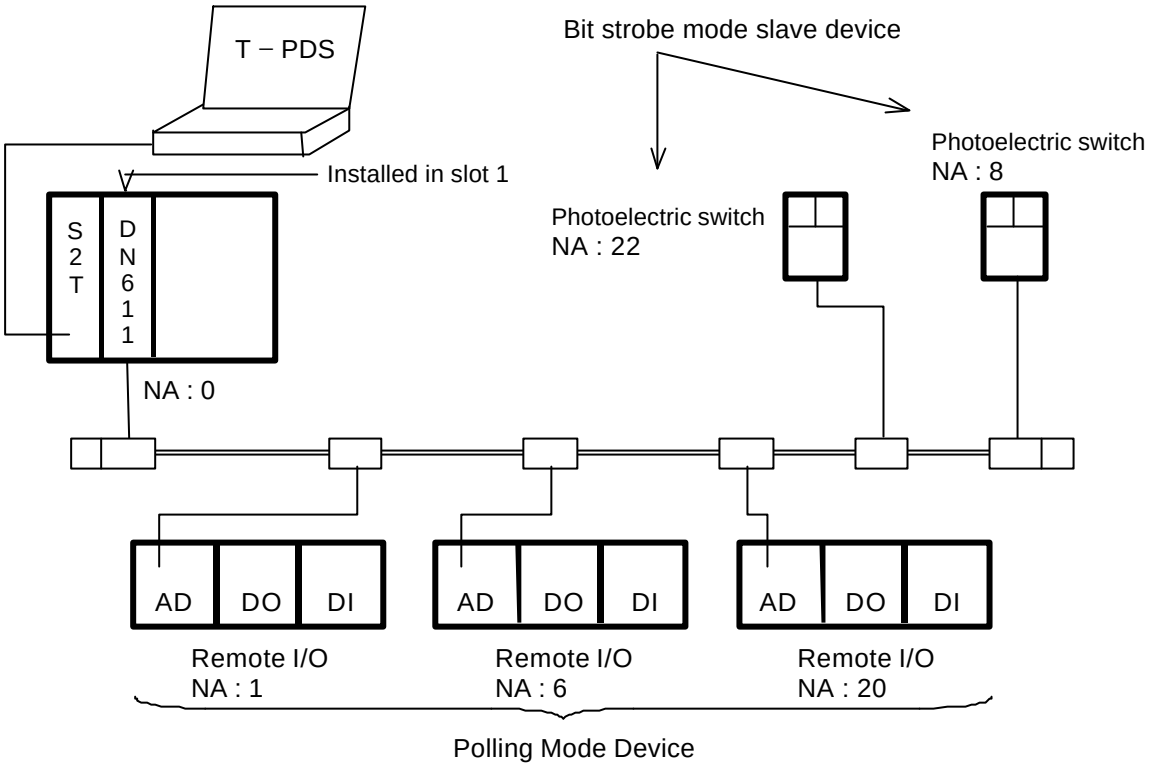
RW105: specifies the number of words to write ("1").

D0091: specifies the register that stores data to write in the request register. In this case, data (256(0100H) is stored in "D0091."

Data "256" in "D0091" will be written in the request register by turning ON "R0112."

### 5.2.2 Configuration of a Module Setting Sample Program

The figure below is the configuration of a module setting sample program.




Photoelectric switch: Series 9000 photoelectric sensor (Rockwell Automation)
Bit strobe mode slave device
Reception data size: 1 byte

Remote I/O: FLEX I/O (Rockwell Automation)
Polling mode slave device
AD: 1794-ADN...FLEX - I/O adapter module
DO: 1794-OB16...24 Vdc, 16-point DO module
DI: 1794-IB16...24 Vdc, 16-point DI module
Transmitting data size: 4 bytes (2 words)
Reception data size: 6 bytes (3 words)

| | Transmission data |
|---|---|
| A | Output data to DO |
| A + 1 | Output data to DI |

| | Reception data |
|---|---|
| B | Input data from AD |
| B + 1 | Input data from DO |
| B + 2 | Input data from DI |

* Refer to the instruction manual made by Rockwell Automation for details about Series 9000 photoelectric sensors and FLEX I/O.

### 5.2.3 Reset Request

See"4.6.2 Reset Request" for details.

Request area F (

| | | | Register allocation |
|---|---|---|---|
| 0334H | 0011H | Reset request code | D0100 |
| 0335H | 0001H | Scan request clear | D0101 |

Acknowledgement area

| | | | Register allocation |
|---|---|---|---|
| 02D0H | 0011H | Reset request code | D0300 |
| 02D1H | | Completion status (an abnormal response) | D0301 |
| | | | D0500 |
| | | | D0501 |

Semaphore register

| | | | Register allocation |
|---|---|---|---|
| 03FDH | | Request flag register | D0090 |
| 03FFH | | Request register | D0091 |
| 03FCH | | Acknowledgement flag register (read) | D0092 |
| 03FCH | | Acknowledgement flag register (write) | D0094 |

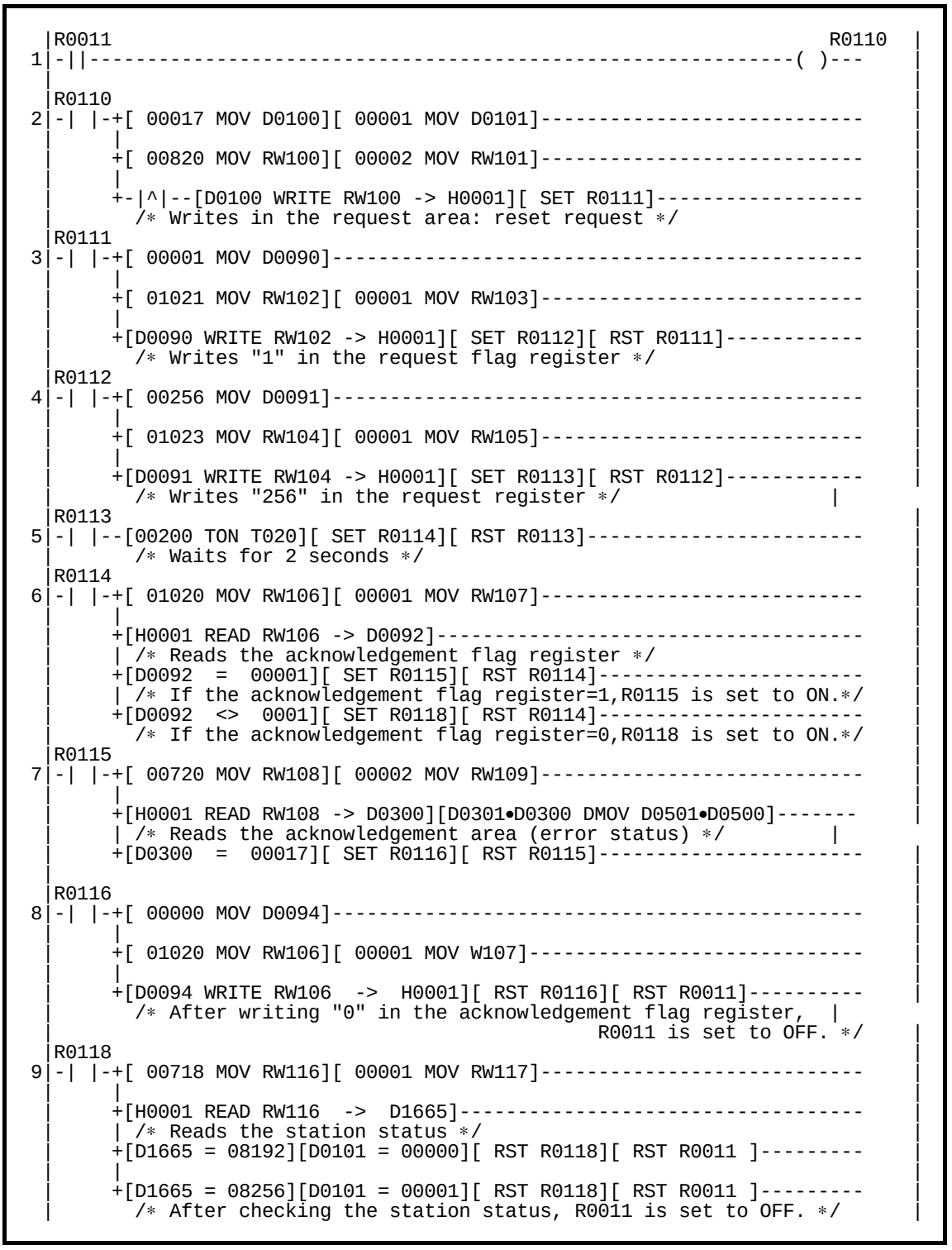
RAS information

| | | | Register allocation |
|---|---|---|---|
| 02CEH | | Station status | D1665 |

Work register

| | | Register allocation |
|---|---|---|
| Request area address store | 0334H | RW100 |
| Request data length store | 0002H | RW101 |
| Request flag register address store | 03FDH | RW102 |
| Request flag register length store | 0001H | RW103 |
| Request register address store | 03FFH | RW104 |
| Request register length store | 0001H | RW105 |
| Acknowledgement flag register address store | 03FCH | RW106 |
| Acknowledgement flag register length store | 0001H | RW107 |
| Acknowledgement area address store | 02D0H | RW108 |
| Acknowledgement data length store | 0002H | RW109 |
| RAS information read address store | 02CEH | RW116 |
| RAS information read data length store | 0001H | RW117 |

R0011 in the sample program on the following page indicates a reset request startup relay.


R0011
R0110
1
R0110
2
[ 00017 MOV D0100][ 00001 MOV D0101]
[ 00820 MOV RW100][ 00002 MOV RW101]
[D0100 WRITE RW100 -> H0001][ SET R0111]
/* Writes in the request area: reset request */
R0111
3
[ 00001 MOV D0090]
[ 01021 MOV RW102][ 00001 MOV RW103]
[D0090 WRITE RW102 -> H0001][ SET R0112][ RST R0111]
/* Writes "1" in the request flag register */
R0112
4
[ 00256 MOV D0091]
[ 01023 MOV RW104][ 00001 MOV RW105]
[D0091 WRITE RW104 -> H0001][ SET R0113][ RST R0112]
/* Writes "256" in the request register */
R0113
5
[00200 TON T020][ SET R0114][ RST R0113]
/* Waits for 2 seconds */
R0114
6
[ 01020 MOV RW106][ 00001 MOV RW107]
[H0001 READ RW106 -> D0092]
/* Reads the acknowledgement flag register */
[D0092 = 00001][ SET R0115][ RST R0114]
/* If the acknowledgement flag register=1,R0115 is set to ON.*/
[D0092 <> 0001][ SET R0118][ RST R0114]
/* If the acknowledgement flag register=0,R0118 is set to ON.*/
R0115
7
[ 00720 MOV RW108][ 00002 MOV RW109]
[H0001 READ RW108 -> D0300][D0301•D0300 DMOV D0501•D0500]
/* Reads the acknowledgement area (error status) */
[D0300 = 00017][ SET R0116][ RST R0115]
R0116
8
[ 00000 MOV D0094]
[ 01020 MOV RW106][ 00001 MOV W107]
[D0094 WRITE RW106 -> H0001][ RST R0116][ RST R0011]
/* After writing "0" in the acknowledgement flag register,
R0011 is set to OFF. */
R0118
9
[ 00718 MOV RW116][ 00001 MOV RW117]
[H0001 READ RW116 -> D1665]
/* Reads the station status */
[D1665 = 08192][D0101 = 00000][ RST R0118][ RST R0011 ]
[D1665 = 08256][D0101 = 00001][ RST R0118][ RST R0011 ]
/* After checking the station status, R0011 is set to OFF. */

### 5.2.4 Parameter Setting Request (local node)

See "4.6.3 Parameter Setting Request (local node)" for details.

| Request area F 0 | | | Register allocation |
|---|---|---|---|
| 0334H | 0012H | Parameter setting request code | D0100 |
| 0335H | 0000H | Local node parameter setting | D0101 |
| 0336H | 0000H | Fixed at "0" | D0102 |
| 0337H | 0000H | Node address (0) | D0103 |
| 0338H | 0000H | Polling transmission mode specify | D0104 |
| 0339H | 000AH | Scan interval wait time (10 ms) | D0105 |
| 033AH | 0001H | Background poll ratio | D0106 |
| 033BH | 0001H | Fixed at "1" | D0107 |
| 033CH | 0064H | Transmission timing (100 ms) | D0108 |

| Acknowledgement area | | | Register allocation |
|---|---|---|---|
| 02D0H | 0012H | Parameter setting request code | D0300 |
| 02D1H | | Completion status | D0301 |
| | | | D0505 |
| | | | D0506 |

| Semaphore register | | | Register allocation |
|---|---|---|---|
| 03FDH | | Request flag register | D0090 |
| 03FFH | | Request register | D0091 |
| 03FCH | | Acknowledgement flag register (read) | D0092 |
| 03FCH | | Acknowledgement flag register (write) | D0094 |

| Work register | | Register allocation |
|---|---|---|
| Request area address store | 0334H | RW100 |
| Request data length store | 0009H | RW101 |
| Request flag register address store | 03FDH | RW102 |
| Request flag register length store | 0001H | RW103 |
| Request register address store | 03FFH | RW104 |
| Request register length store | 0001H | RW105 |
| Acknowledgement flag register address store | 03FCH | RW106 |
| Acknowledgement flag register length store | 0001H | RW107 |
| Acknowledgement area address store | 02D0H | RW108 |
| Acknowledgement data length store | 0002H | RW109 |
| RAS information read address store | 02CEH | RW116 |
| RAS information read data length store | 0001H | RW117 |

### 5.2.5 Parameter Setting Request (slave device)

See"4.6.4 Parameter Setting Request "(slave device) for details.

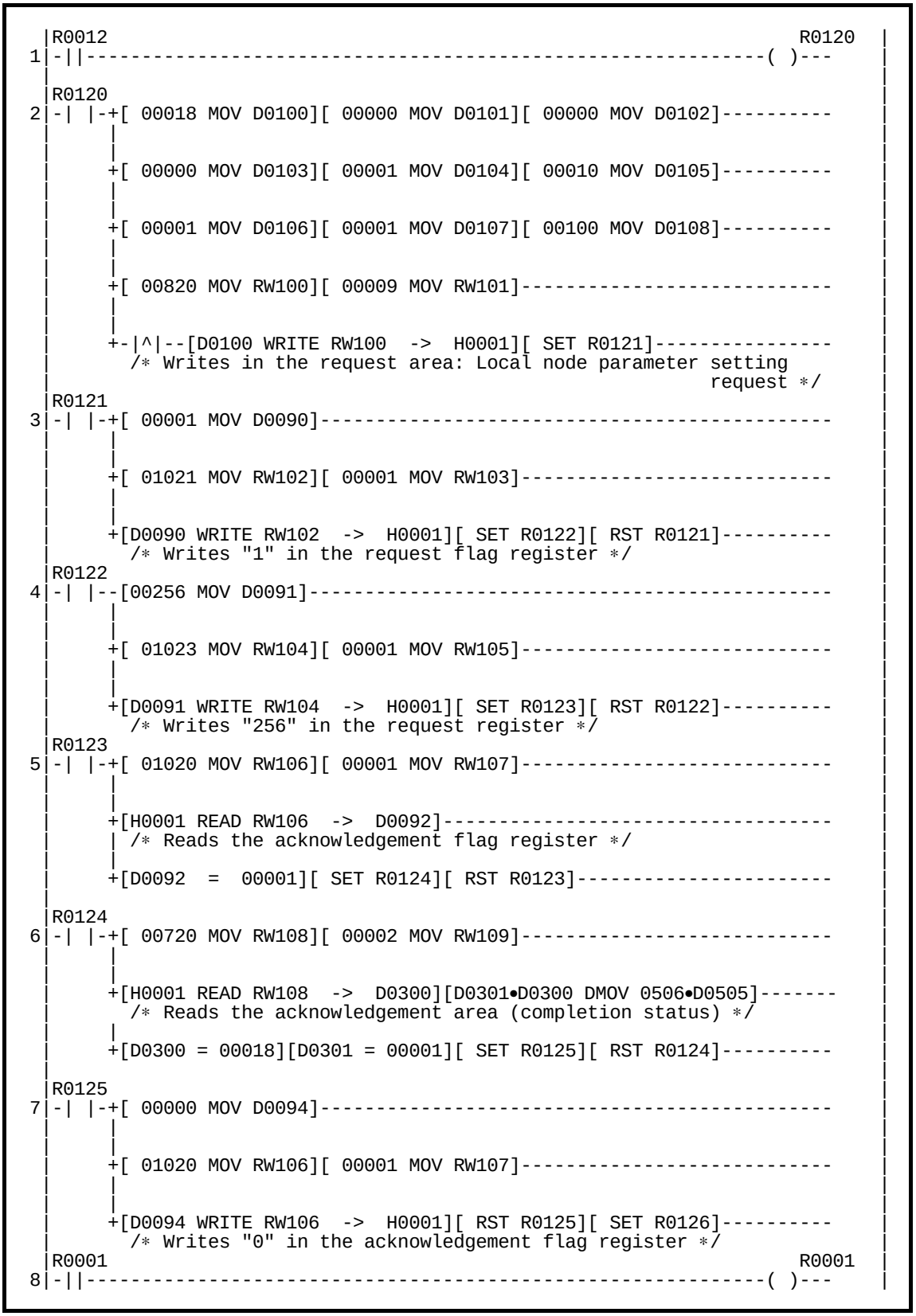
| Request area | F 0 | | Register allocation | |
|---|---|---|---|---|
| 0334H | 0012H | Parameter setting request code | D0100 | |
| 0335H | 0001H | Slave parameter setting | D0101 | |
| 0336H | 0005H | Number of slave devices (5) | D0102 | |
| 0337H | 0000H | Fixed at "0" | D0103 | |
| 0338H | 0001H | Node address (1) | D0104 | |
| 0339H | 0001H | Vendor ID (1) | D0105 | |
| 033AH | 000CH | Product type (12) | D0106 | |
| 033BH | 0001H | Product code (1) | D0107 | |
| 033CH | 0001H | Scan type: polling | D0108 | |
| 033DH | 0000H | Polling by the scan | D0109 | 1st unit |
| 033EH | 0000H | BS reception size (byte) | D0110 | |
| 033FH | 0006H | PL reception size (byte) | D0111 | |
| 0340H | 0000H | Fixed at "0" | D0112 | |
| 0341H | 0004H | PL transmitting size (byte) | D0113 | |
| 0342H | 0000H | Fixed at "0" | D0114 | |
| 0343H | 0001H | Major revision (1) | D0115 | |
| 0344H | 0004H | Minor revision (4) | D0116 | |
| 0345H | 0000H | Fixed at "0" | D0117 | |
| 0346H | 0000H | Fixed at "0" | D0118 | |
| 0347H | 0000H | Fixed at "0" | D0119 | |
| 0348H | 0006H | Node address (6) | D0120 | |
| 0349H | 0001H | Vendor ID (1) | D0121 | 2nd unit |
| 034AH | 000CH | Product type (12) | D0122 | |
| 034BH | 0001H | Product code(1) | D0123 | |
| 034CH | 0001H | Scan type: polling | D0124 | |
| 034DH | 0000H | Polling by the Scan | D0125 | |
| | | | | |

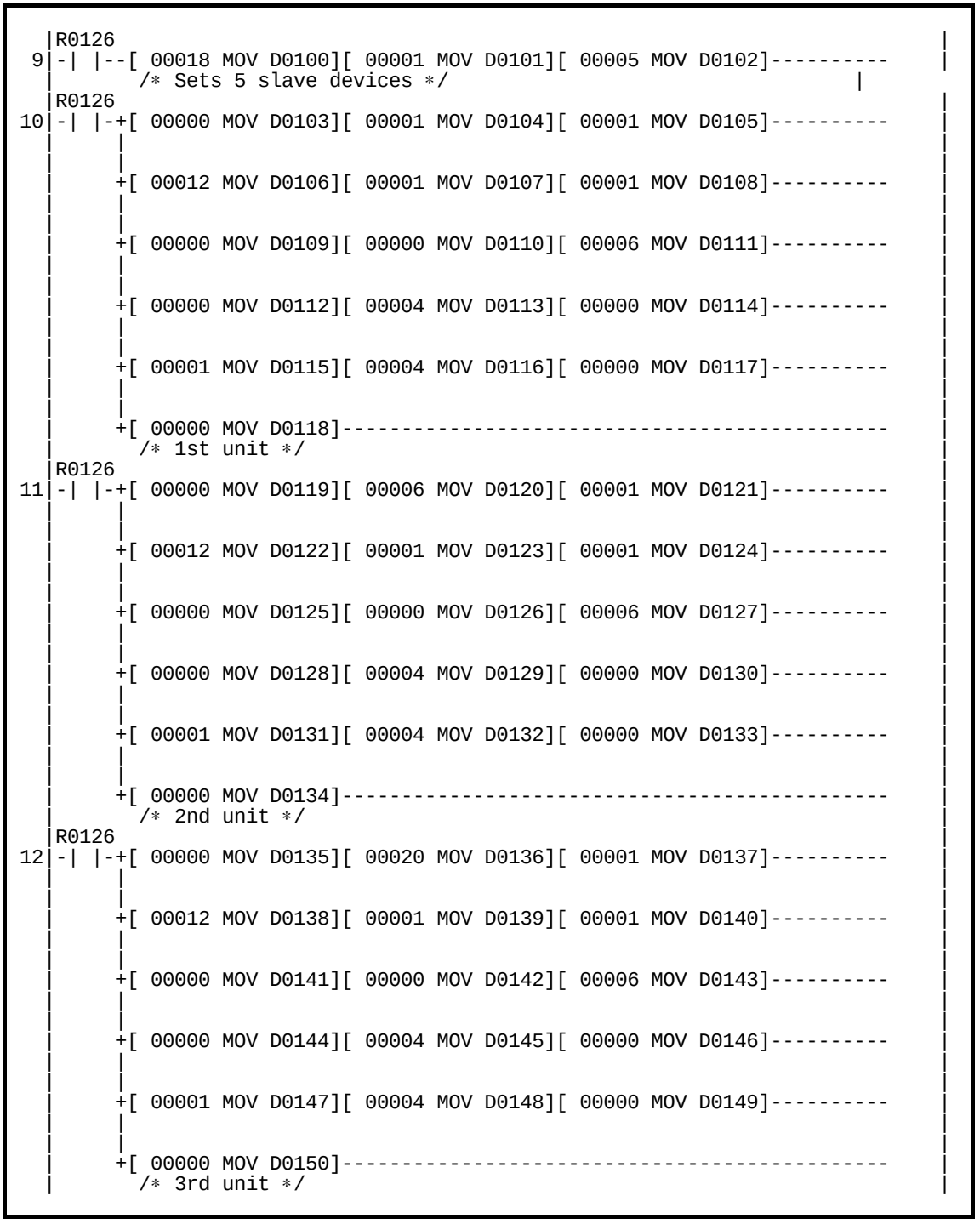
| Acknowledgement area | | | Register allocation |
|---|---|---|---|
| 02D0H | 0012H | Parameter setting request code | D0300 |
| 02D1H | | Completion statue | D0301 |
| | | | D0510 |
| | | | D0511 |

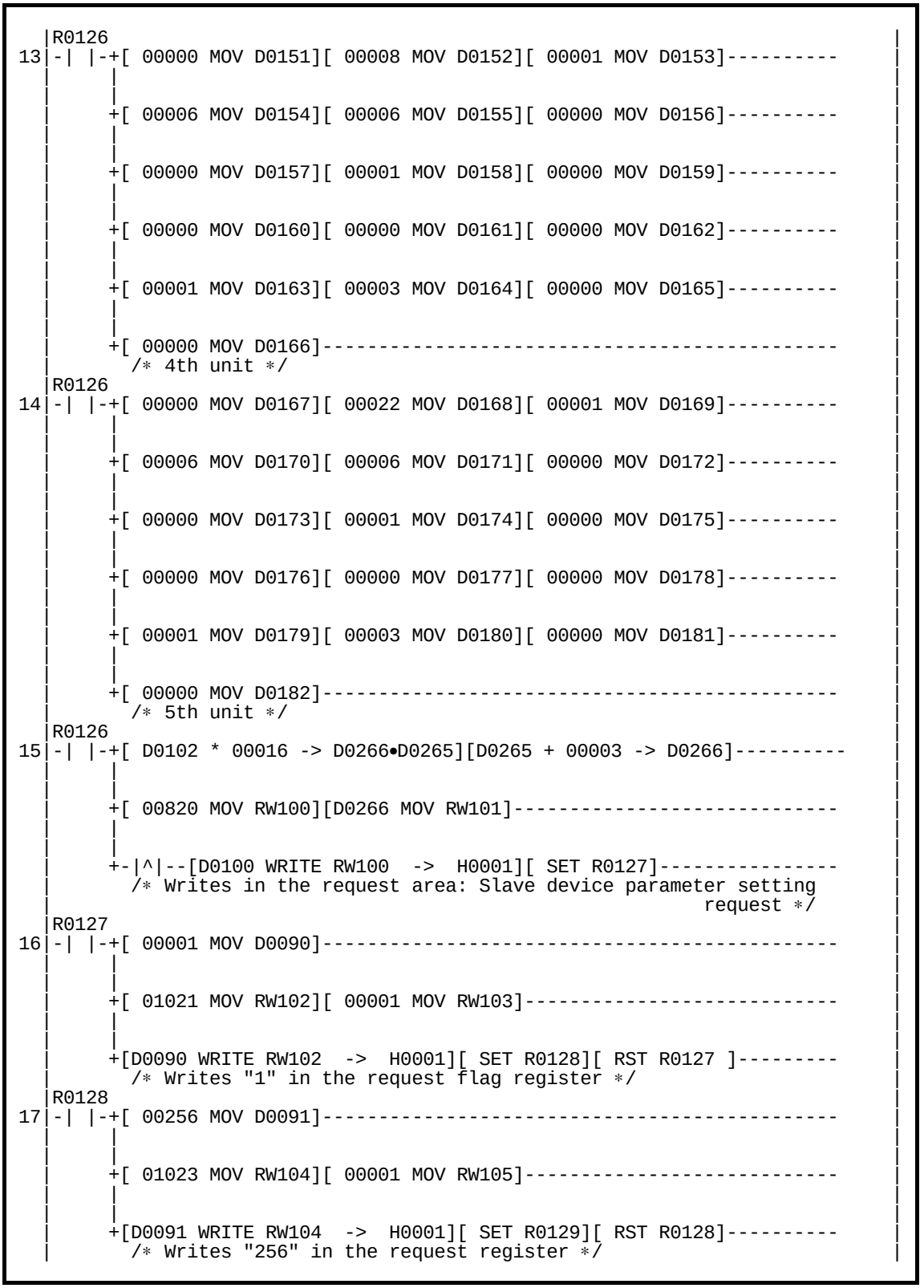
| Semaphore register | | | Register allocation |
|---|---|---|---|
| 03FDH | | Request flag register | D0090 |
| 03FFH | | Request register | D0091 |
| 03FCH | | Acknowledgement flag register (read) | D0093 |
| 03FCH | | Acknowledgement flag register (write) | D0094 |

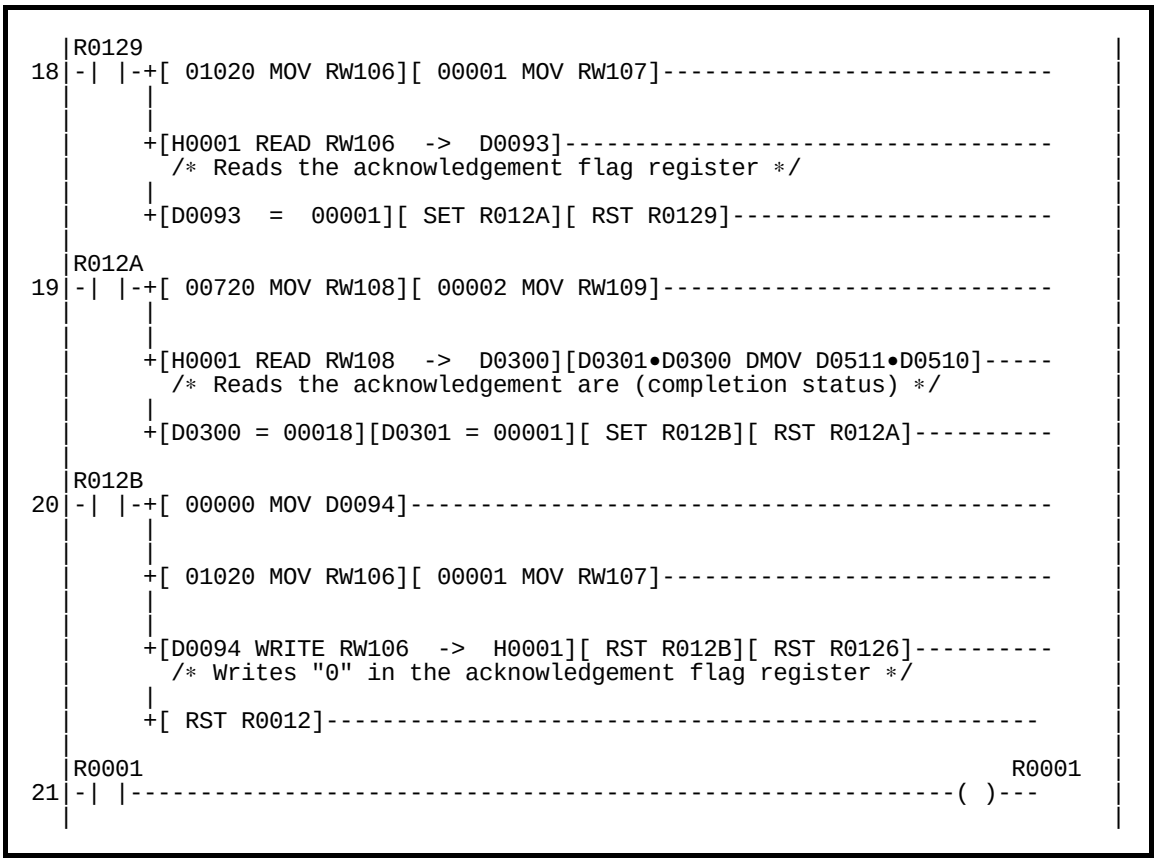
| Work register | | Register allocation |
|---|---|---|
| Request area address store | 0334H | RW100 |
| Request data length store | 0053H | RW101 |
| Request flag register address store | 03FDH | RW102 |
| Request flag register length store | 0001H | RW103 |
| Request register address store | 03FFH | RW104 |
| Request register length store | 0001H | RW105 |
| Acknowledgement flag register address store | 03FCH | RW106 |
| Acknowledgement flag register length store | 0001H | RW107 |
| Acknowledgement area address store | 02D0H | RW108 |
| Acknowledgement data length store | 0002H | RW109 |
| RAS information read address store | 02CEH | RW116 |
| RAS information read data length store | 0001H | RW117 |

R0012 in the sample program on the following page indicates the startup relay for the local node and slave device parameter setting request.


R0012
R0120
1
R0120
2
[ 00018 MOV D0100][ 00000 MOV D0101][ 00000 MOV D0102]
[ 00000 MOV D0103][ 00001 MOV D0104][ 00010 MOV D0105]
[ 00001 MOV D0106][ 00001 MOV D0107][ 00100 MOV D0108]
[ 00820 MOV RW100][ 00009 MOV RW101]
[D0100 WRITE RW100 -> H0001][ SET R0121]
/* Writes in the request area: Local node parameter setting request */
R0121
3
[ 00001 MOV D0090]
[ 01021 MOV RW102][ 00001 MOV RW103]
[D0090 WRITE RW102 -> H0001][ SET R0122][ RST R0121]
/* Writes "1" in the request flag register */
R0122
4
[00256 MOV D0091]
[ 01023 MOV RW104][ 00001 MOV RW105]
[D0091 WRITE RW104 -> H0001][ SET R0123][ RST R0122]
/* Writes "256" in the request register */
R0123
5
[ 01020 MOV RW106][ 00001 MOV RW107]
[H0001 READ RW106 -> D0092]
/* Reads the acknowledgement flag register */
[D0092 = 00001][ SET R0124][ RST R0123]
R0124
6
[ 00720 MOV RW108][ 00002 MOV RW109]
[H0001 READ RW108 -> D0300][D0301•D0300 DMOV 0506•D0505]
/* Reads the acknowledgement area (completion status) */
[D0300 = 00018][D0301 = 00001][ SET R0125][ RST R0124]
R0125
7
[ 00000 MOV D0094]
[ 01020 MOV RW106][ 00001 MOV RW107]
[D0094 WRITE RW106 -> H0001][ RST R0125][ SET R0126]
/* Writes "0" in the acknowledgement flag register */
R0001
R0001
8


R0126
9 -| |--[ 00018 MOV D0100][ 00001 MOV D0101][ 00005 MOV D0102]----------
/* Sets 5 slave devices */
R0126
10 -| |-+[ 00000 MOV D0103][ 00001 MOV D0104][ 00001 MOV D0105]----------
+[ 00012 MOV D0106][ 00001 MOV D0107][ 00001 MOV D0108]----------
+[ 00000 MOV D0109][ 00000 MOV D0110][ 00006 MOV D0111]----------
+[ 00000 MOV D0112][ 00004 MOV D0113][ 00000 MOV D0114]----------
+[ 00001 MOV D0115][ 00004 MOV D0116][ 00000 MOV D0117]----------
+[ 00000 MOV D0118]----------
/* 1st unit */
R0126
11 -| |-+[ 00000 MOV D0119][ 00006 MOV D0120][ 00001 MOV D0121]----------
+[ 00012 MOV D0122][ 00001 MOV D0123][ 00001 MOV D0124]----------
+[ 00000 MOV D0125][ 00000 MOV D0126][ 00006 MOV D0127]----------
+[ 00000 MOV D0128][ 00004 MOV D0129][ 00000 MOV D0130]----------
+[ 00001 MOV D0131][ 00004 MOV D0132][ 00000 MOV D0133]----------
+[ 00000 MOV D0134]----------
/* 2nd unit */
R0126
12 -| |-+[ 00000 MOV D0135][ 00020 MOV D0136][ 00001 MOV D0137]----------
+[ 00012 MOV D0138][ 00001 MOV D0139][ 00001 MOV D0140]----------
+[ 00000 MOV D0141][ 00000 MOV D0142][ 00006 MOV D0143]----------
+[ 00000 MOV D0144][ 00004 MOV D0145][ 00000 MOV D0146]----------
+[ 00001 MOV D0147][ 00004 MOV D0148][ 00000 MOV D0149]----------
+[ 00000 MOV D0150]----------
/* 3rd unit */


R0126
13 -| |-+[ 00000 MOV D0151][ 00008 MOV D0152][ 00001 MOV D0153]----------
+[ 00006 MOV D0154][ 00006 MOV D0155][ 00000 MOV D0156]----------
+[ 00000 MOV D0157][ 00001 MOV D0158][ 00000 MOV D0159]----------
+[ 00000 MOV D0160][ 00000 MOV D0161][ 00000 MOV D0162]----------
+[ 00001 MOV D0163][ 00003 MOV D0164][ 00000 MOV D0165]----------
+[ 00000 MOV D0166]----------
/* 4th unit */
R0126
14 -| |-+[ 00000 MOV D0167][ 00022 MOV D0168][ 00001 MOV D0169]----------
+[ 00006 MOV D0170][ 00006 MOV D0171][ 00000 MOV D0172]----------
+[ 00000 MOV D0173][ 00001 MOV D0174][ 00000 MOV D0175]----------
+[ 00000 MOV D0176][ 00000 MOV D0177][ 00000 MOV D0178]----------
+[ 00001 MOV D0179][ 00003 MOV D0180][ 00000 MOV D0181]----------
+[ 00000 MOV D0182]----------
/* 5th unit */
R0126
15 -| |-+[ D0102 * 00016 -> D0266•D0265][D0265 + 00003 -> D0266]----------
+[ 00820 MOV RW100][D0266 MOV RW101]----------
+-|^|--[D0100 WRITE RW100 -> H0001][ SET R0127]----------
/* Writes in the request area: Slave device parameter setting request */
R0127
16 -| |-+[ 00001 MOV D0090]----------
+[ 01021 MOV RW102][ 00001 MOV RW103]----------
+[D0090 WRITE RW102 -> H0001][ SET R0128][ RST R0127 ]---------
/* Writes "1" in the request flag register */
R0128
17 -| |-+[ 00256 MOV D0091]----------
+[ 01023 MOV RW104][ 00001 MOV RW105]----------
+[D0091 WRITE RW104 -> H0001][ SET R0129][ RST R0128]----------
/* Writes "256" in the request register */


R0129
18
[ 01020 MOV RW106][ 00001 MOV RW107]
[H0001 READ RW106 -> D0093]
/* Reads the acknowledgement flag register */
[D0093 = 00001][ SET R012A][ RST R0129]
R012A
19
[ 00720 MOV RW108][ 00002 MOV RW109]
[H0001 READ RW108 -> D0300][D0301•D0300 DMOV D0511•D0510]
/* Reads the acknowledgement are (completion status) */
[D0300 = 00018][D0301 = 00001][ SET R012B][ RST R012A]
R012B
20
[ 00000 MOV D0094]
[ 01020 MOV RW106][ 00001 MOV RW107]
[D0094 WRITE RW106 -> H0001][ RST R012B][ RST R0126]
/* Writes "0" in the acknowledgement flag register */
[ RST R0012]
R0001
21
R0001

### 5.2.6 Operation Mode Control Request

See"4.6.5 Operation Mode Control Request" for details.

| Request area | F | 0 | | Register allocation |
|---|---|---|---|---|
| 0334H | 0013H | | Operation mode control request code | D0100 |
| 0335H | 1210H | | Specified information | D0101 |

| Acknowledgement area | | | Register allocation |
|---|---|---|---|
| 02D0H | 0013H | Operation mode control request code | D0300 |
| 02D1H | | Completion status | D0301 |
| | | | D0515 |
| | | | D0516 |

| Semaphore register | | | Register allocation |
|---|---|---|---|
| 03FDH | | Request flag register | D0090 |
| 03FFH | | Request register | D0091 |
| 03FCH | | Acknowledgement flag register (read) | D0092 |
| 03FCH | | Acknowledgement flag register(write) | D0094 |

| RAS information | | | Register allocation |
|---|---|---|---|
| 010BH | | Input/output data setting information | D1000 |
| : | | | : |
| 028AH | | | D01383 |
| 02CEH | | Station status | D1665 |

| Work register | | Register allocation |
|---|---|---|
| Request area address store | 0334H | RW100 |
| Request data length store | 0002H | RW101 |
| Request flag register address store | 03FDH | RW102 |
| Request flag register length store | 0001H | RW103 |
| Request register address store | 03FFH | RW104 |
| Request register length store | 0001H | RW105 |
| Acknowledgement flag register address store | 03FCH | RW106 |
| Acknowledgement flag register length store | 0001H | RW107 |
| Acknowledgement area address store | 02D0H | RW108 |
| Acknowledgment data length store | 0002H | RW109 |
| RAS information reading address store | 02CEH | RW116 |
| RAS information reading data length store | 0001H | RW117 |
| Input/output data setting information address store | | RW118 |
| Input/output data setting information data length store | | RW119 |

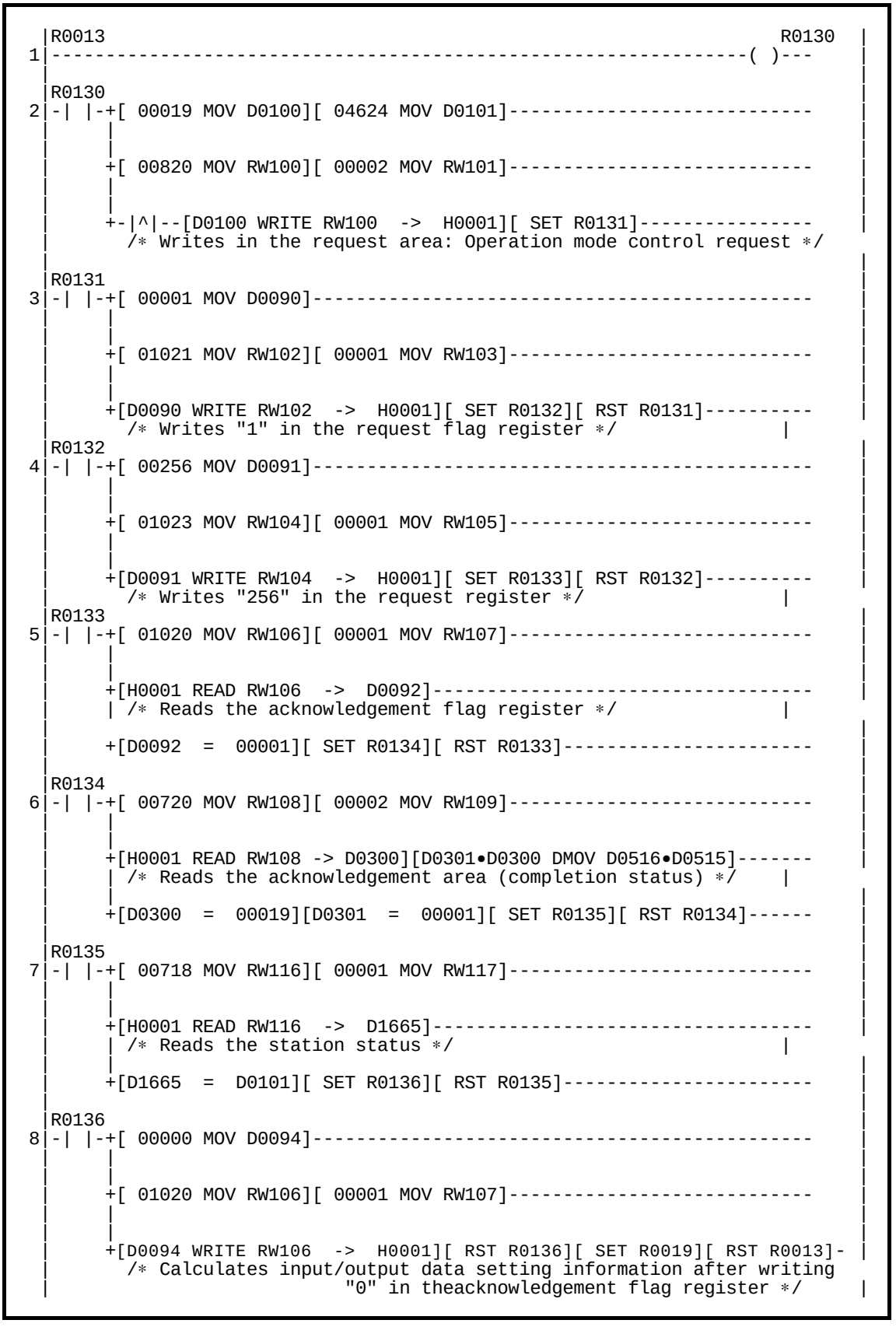
Allocations of the slave device data in the input/output data area (input/output data setting information) are read onto D1000 - D1383. Based on this information, Obtain parameters for reading and writing input/output data area using the READ/WRITE instructions.

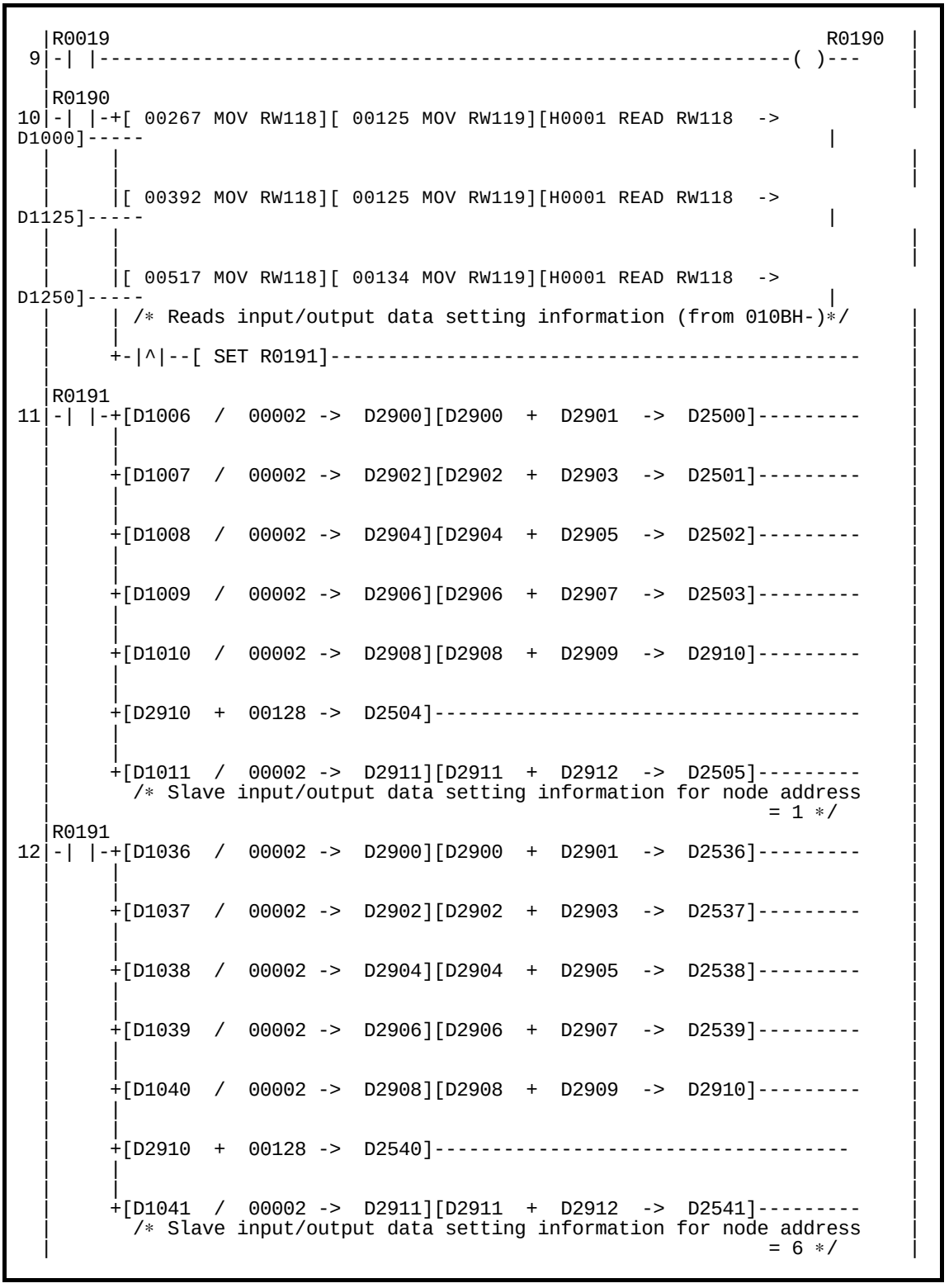
**Table 5.1 READ/WRITE Instruction Parameters**

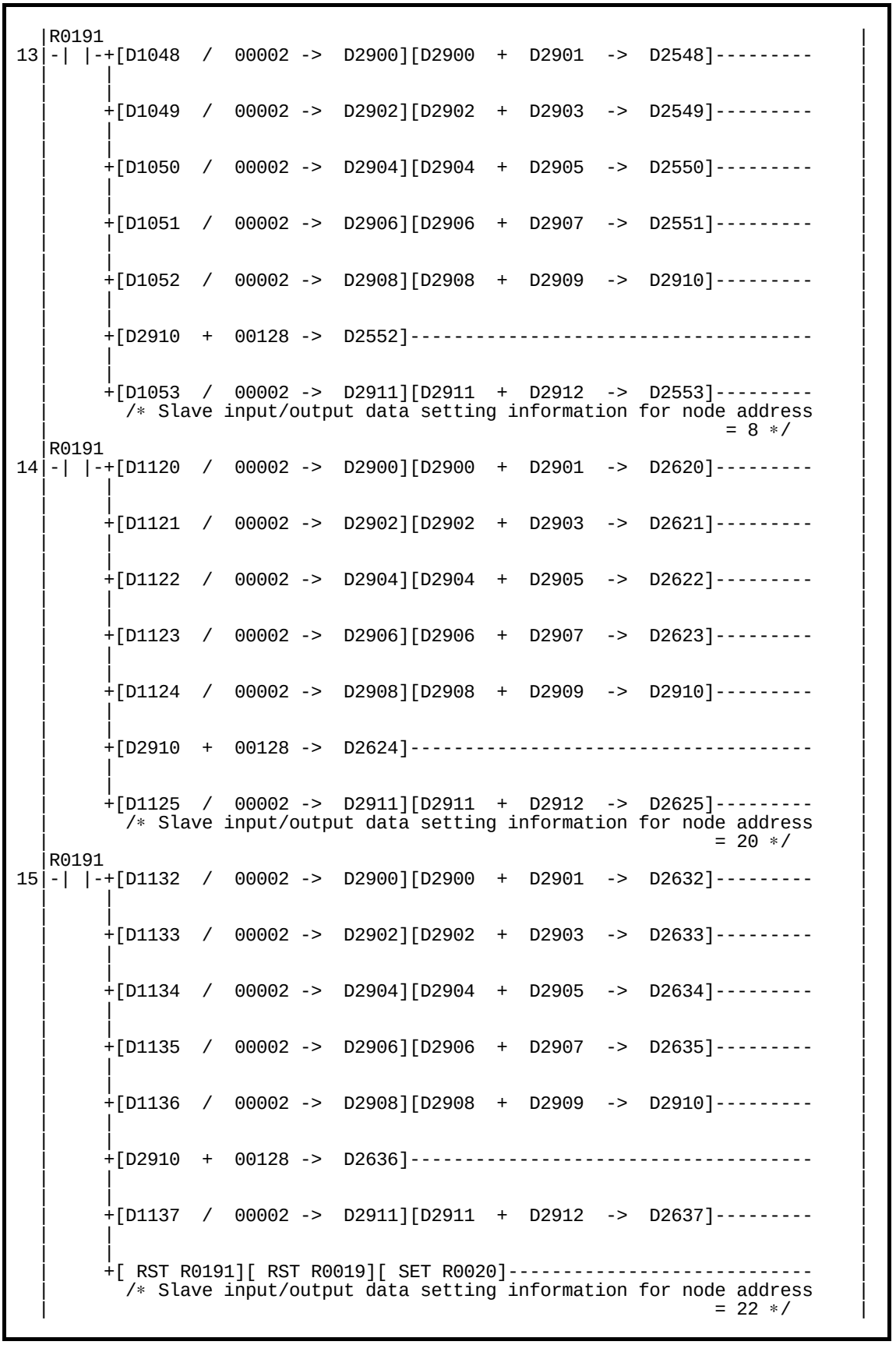
| Node Address | Description | Register |
|---|---|---|
| 1 | BS input data top address | D2500 |
| | Number of BS input data words | D2501 |
| | Polling input data top address | D2502 |
| | Number of polling input data words | D2503 |
| | Polling output data top address | D2504 |
| | Number of polling output data words | D2505 |
| 6 | BS input data top address | D2536 |
| | Number of BS input data words | D2537 |
| | Polling input data top address | D2538 |
| | Number of polling input data words | D2539 |
| | Polling output data top address | D2540 |
| | Number of polling output data words | D2541 |
| 8 | BS input data top address | D2548 |
| | Number of BS input data words | D2549 |
| | Polling input data top address | D2550 |
| | Number of polling input data words | D2551 |
| | Polling output data top address | D2552 |
| | Number of polling output data words | D2553 |
| 20 | BS input data top address | D2620 |
| | Number of BS input data words | D2621 |
| | Polling input data top address | D2622 |
| | Number of polling input data words | D2623 |
| | Polling output data top address | D2624 |
| | Number of polling output data words | D2625 |
| 22 | BS input data top address | D2632 |
| | Number of BS input data words | D2633 |
| | Polling input data top address | D2634 |
| | Number of polling input data words | D2635 |
| | Polling output data top address | D2636 |
| | Number of polling output data words | D2637 |

BS : Bit Strobe

R0013 in the sample program on the following page indicates the startup relay for mode control request operation.


R0013
R0130
1
R0130
2
[ 00019 MOV D0100][ 04624 MOV D0101]
[ 00820 MOV RW100][ 00002 MOV RW101]
[D0100 WRITE RW100 -> H0001][ SET R0131]
/* Writes in the request area: Operation mode control request */
R0131
3
[ 00001 MOV D0090]
[ 01021 MOV RW102][ 00001 MOV RW103]
[D0090 WRITE RW102 -> H0001][ SET R0132][ RST R0131]
/* Writes "1" in the request flag register */
R0132
4
[ 00256 MOV D0091]
[ 01023 MOV RW104][ 00001 MOV RW105]
[D0091 WRITE RW104 -> H0001][ SET R0133][ RST R0132]
/* Writes "256" in the request register */
R0133
5
[ 01020 MOV RW106][ 00001 MOV RW107]
[H0001 READ RW106 -> D0092]
/* Reads the acknowledgement flag register */
[D0092 = 00001][ SET R0134][ RST R0133]
R0134
6
[ 00720 MOV RW108][ 00002 MOV RW109]
[H0001 READ RW108 -> D0300][D0301•D0300 DMOV D0516•D0515]
/* Reads the acknowledgement area (completion status) */
[D0300 = 00019][D0301 = 00001][ SET R0135][ RST R0134]
R0135
7
[ 00718 MOV RW116][ 00001 MOV RW117]
[H0001 READ RW116 -> D1665]
/* Reads the station status */
[D1665 = D0101][ SET R0136][ RST R0135]
R0136
8
[ 00000 MOV D0094]
[ 01020 MOV RW106][ 00001 MOV RW107]
[D0094 WRITE RW106 -> H0001][ RST R0136][ SET R0019][ RST R0013]
/* Calculates input/output data setting information after writing
"0" in theacknowledgement flag register */


R0019
R0190
9
R0190
10
D1000]
[ 00267 MOV RW118][ 00125 MOV RW119][H0001 READ RW118 ->
D1125]
[ 00392 MOV RW118][ 00125 MOV RW119][H0001 READ RW118 ->
D1250]
[ 00517 MOV RW118][ 00134 MOV RW119][H0001 READ RW118 ->
/* Reads input/output data setting information (from 010BH-)*/
SET R0191
R0191
11
[D1006 / 00002 -> D2900][D2900 + D2901 -> D2500]
[D1007 / 00002 -> D2902][D2902 + D2903 -> D2501]
[D1008 / 00002 -> D2904][D2904 + D2905 -> D2502]
[D1009 / 00002 -> D2906][D2906 + D2907 -> D2503]
[D1010 / 00002 -> D2908][D2908 + D2909 -> D2910]
[D2910 + 00128 -> D2504]
[D1011 / 00002 -> D2911][D2911 + D2912 -> D2505]
/* Slave input/output data setting information for node address
= 1 */
R0191
12
[D1036 / 00002 -> D2900][D2900 + D2901 -> D2536]
[D1037 / 00002 -> D2902][D2902 + D2903 -> D2537]
[D1038 / 00002 -> D2904][D2904 + D2905 -> D2538]
[D1039 / 00002 -> D2906][D2906 + D2907 -> D2539]
[D1040 / 00002 -> D2908][D2908 + D2909 -> D2910]
[D2910 + 00128 -> D2540]
[D1041 / 00002 -> D2911][D2911 + D2912 -> D2541]
/* Slave input/output data setting information for node address
= 6 */


R0191
13 -| |-+[D1048 / 00002 -> D2900][D2900 + D2901 -> D2548]---------
+[D1049 / 00002 -> D2902][D2902 + D2903 -> D2549]---------
+[D1050 / 00002 -> D2904][D2904 + D2905 -> D2550]---------
+[D1051 / 00002 -> D2906][D2906 + D2907 -> D2551]---------
+[D1052 / 00002 -> D2908][D2908 + D2909 -> D2910]---------
+[D2910 + 00128 -> D2552]-----------------------------------
+[D1053 / 00002 -> D2911][D2911 + D2912 -> D2553]---------
/* Slave input/output data setting information for node address = 8 */
R0191
14 -| |-+[D1120 / 00002 -> D2900][D2900 + D2901 -> D2620]---------
+[D1121 / 00002 -> D2902][D2902 + D2903 -> D2621]---------
+[D1122 / 00002 -> D2904][D2904 + D2905 -> D2622]---------
+[D1123 / 00002 -> D2906][D2906 + D2907 -> D2623]---------
+[D1124 / 00002 -> D2908][D2908 + D2909 -> D2910]---------
+[D2910 + 00128 -> D2624]-----------------------------------
+[D1125 / 00002 -> D2911][D2911 + D2912 -> D2625]---------
/* Slave input/output data setting information for node address = 20 */
R0191
15 -| |-+[D1132 / 00002 -> D2900][D2900 + D2901 -> D2632]---------
+[D1133 / 00002 -> D2902][D2902 + D2903 -> D2633]---------
+[D1134 / 00002 -> D2904][D2904 + D2905 -> D2634]---------
+[D1135 / 00002 -> D2906][D2906 + D2907 -> D2635]---------
+[D1136 / 00002 -> D2908][D2908 + D2909 -> D2910]---------
+[D2910 + 00128 -> D2636]-----------------------------------
+[D1137 / 00002 -> D2911][D2911 + D2912 -> D2637]---------
+[ RST R0191][ RST R0019][ SET R0020]---------------------------
/* Slave input/output data setting information for node address = 22 */

### 5.2.7 RAS Information Read

See "4.6.6 RAS Information Read Request" for details.

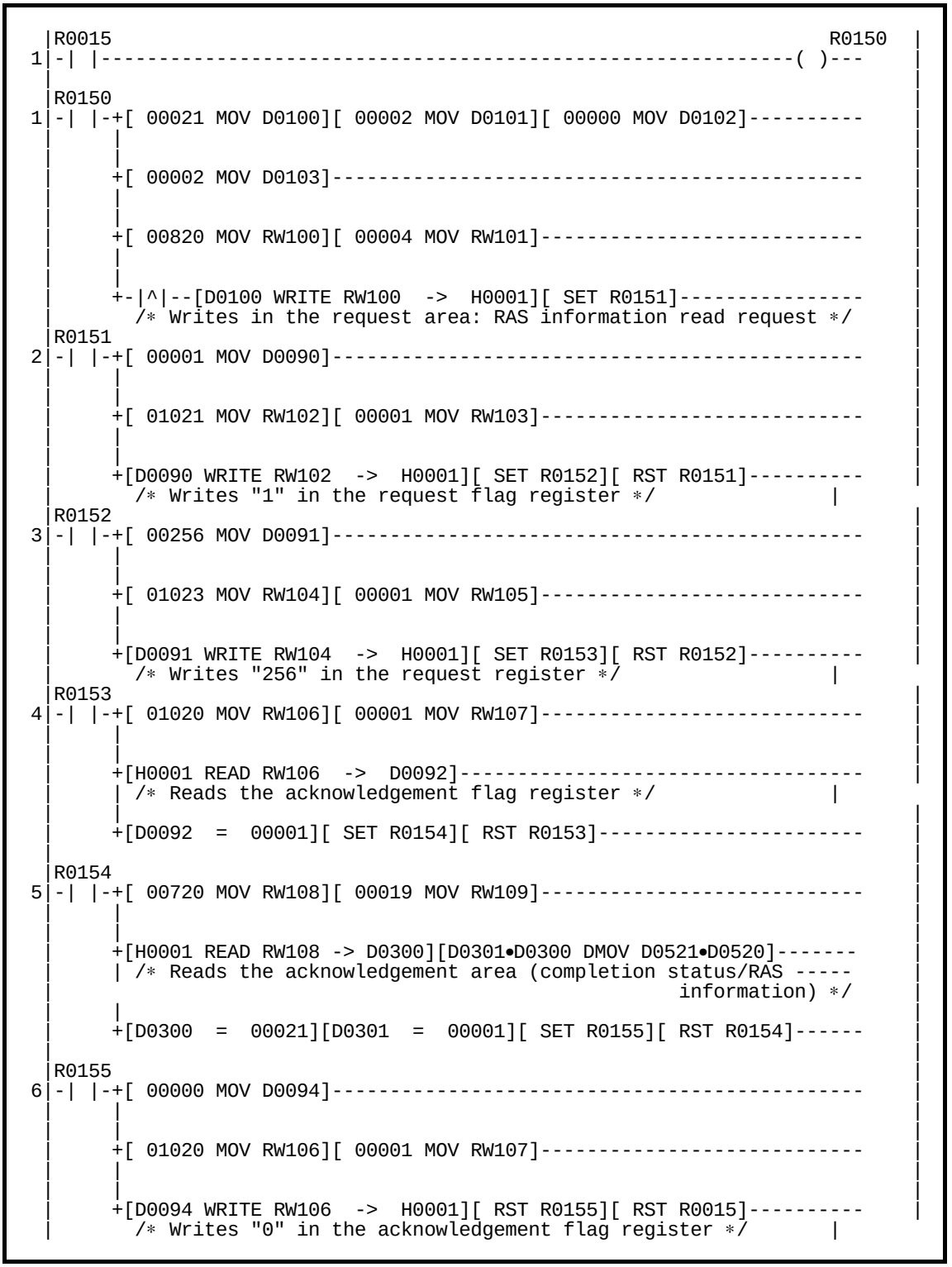
| Request area | F / 0 | | Register allocation |
|---|---|---|---|
| 0334H | 0015H | RAS information read request code | D0100 |
| 0335H | 0002H | Request information type (event history) | D0101 |
| 0336H | 0000H | Starting position (from newest - ) | D0102 |
| 0337H | 0002H | Number of events to read (2) | D0103 |

| Acknowledgement area | | | | Register allocation |
|---|---|---|---|---|
| 02D0H | 0015H | | RAS information read request code | D0300 |
| 02D1H | | | Completion status | D0301 |
| 02D2H | 0010H | | Number of RAS information words (16) | D0302 |
| 02D3H | Event code | | | D0303 |
| 02D4H | Detailed information1 | | | D0304 |
| 02D5H | Detailed information2 | | | D0305 |
| 02D6H | Detailed information3 | | | D0306 |
| 02D7H | Detailed information4 | | | D0307 |
| 02D8H | Month | Year | | D0308 |
| 02D9H | Hour | Day | | D0309 |
| 02DAH | Second | Minute | | D0310 |
| 02DBH | Event code | | | D0311 |
| 02DCH | Detailed information1 | | | D0312 |
| 02DDH | Detailed information2 | | | D0313 |
| 02DEH | Detailed information3 | | | D0314 |
| 02DFH | Detailed information4 | | | D0315 |
| 02E0H | Month | Year | | D0316 |
| 02E1H | Hour | Day | | D0317 |
| 02E2H | Second | Minute | | D0318 |
| | | | | D0520 |
| | | | | D0521 |

| Semaphore register | | | Register allocation |
|---|---|---|---|
| 03FDH | | Request flag register | D0090 |
| 03FFH | | Request register | D0091 |
| 03FCH | | Acknowledgement flag register (read) | D0092 |
| 03FCH | | Acknowledgement flag register (write) | D0094 |

| Work register | | Register allocation |
|---|---|---|
| Request area address store | 0334H | RW100 |
| Request data length store | 0004H | RW101 |
| Request flag register address store | 03FDH | RW102 |
| Request flag register length store | 0001H | RW103 |
| Request register address store | 03FFH | RW104 |
| Request register length store | 0001H | RW105 |
| Acknowledgement flag register address store | 03FCH | RW106 |
| Acknowledgement flag register length store | 0001H | RW107 |
| Acknowledgement area address store | 02D0H | RW108 |
| Acknowledgement data length store | 0013H | RW109 |
| RAS information read address store | 02CEH | RW116 |
| RAS information read data length store | 0001H | RW117 |

R0015 in the sample program on the following page indicates the startup relay for RAS information read request.


R0015
R0150
1
R0150
1
[ 00021 MOV D0100][ 00002 MOV D0101][ 00000 MOV D0102]
[ 00002 MOV D0103]
[ 00820 MOV RW100][ 00004 MOV RW101]
[D0100 WRITE RW100 -> H0001][ SET R0151]
/* Writes in the request area: RAS information read request */
R0151
2
[ 00001 MOV D0090]
[ 01021 MOV RW102][ 00001 MOV RW103]
[D0090 WRITE RW102 -> H0001][ SET R0152][ RST R0151]
/* Writes "1" in the request flag register */
R0152
3
[ 00256 MOV D0091]
[ 01023 MOV RW104][ 00001 MOV RW105]
[D0091 WRITE RW104 -> H0001][ SET R0153][ RST R0152]
/* Writes "256" in the request register */
R0153
4
[ 01020 MOV RW106][ 00001 MOV RW107]
[H0001 READ RW106 -> D0092]
/* Reads the acknowledgement flag register */
[D0092 = 00001][ SET R0154][ RST R0153]
R0154
5
[ 00720 MOV RW108][ 00019 MOV RW109]
[H0001 READ RW108 -> D0300][D0301•D0300 DMOV D0521•D0520]
/* Reads the acknowledgement area (completion status/RAS information) */
[D0300 = 00021][D0301 = 00001][ SET R0155][ RST R0154]
R0155
6
[ 00000 MOV D0094]
[ 01020 MOV RW106][ 00001 MOV RW107]
[D0094 WRITE RW106 -> H0001][ RST R0155][ RST R0015]
/* Writes "0" in the acknowledgement flag register */

### 5.2.8 Time Setting Request

See "4.6.7 Time Setting Request" for details.

Request area F 0

| | | | | Register allocation |
|---|---|---|---|---|
| 0334H | 0018H | | Time setting request | D0100 |
| 0335H | Month | Year | 0597H | D0101 |
| 0336H | Hour | Day | 1512H | D0102 |
| 0337H | Second | Minute | 0030H | D0103 |

Acknowledgement area

| | | | Register allocation |
|---|---|---|---|
| 02D0H | 0018H | Time setting request | D0300 |
| 02D1H | | Completion status | D0301 |
| | | | D0530 |
| | | | D0531 |

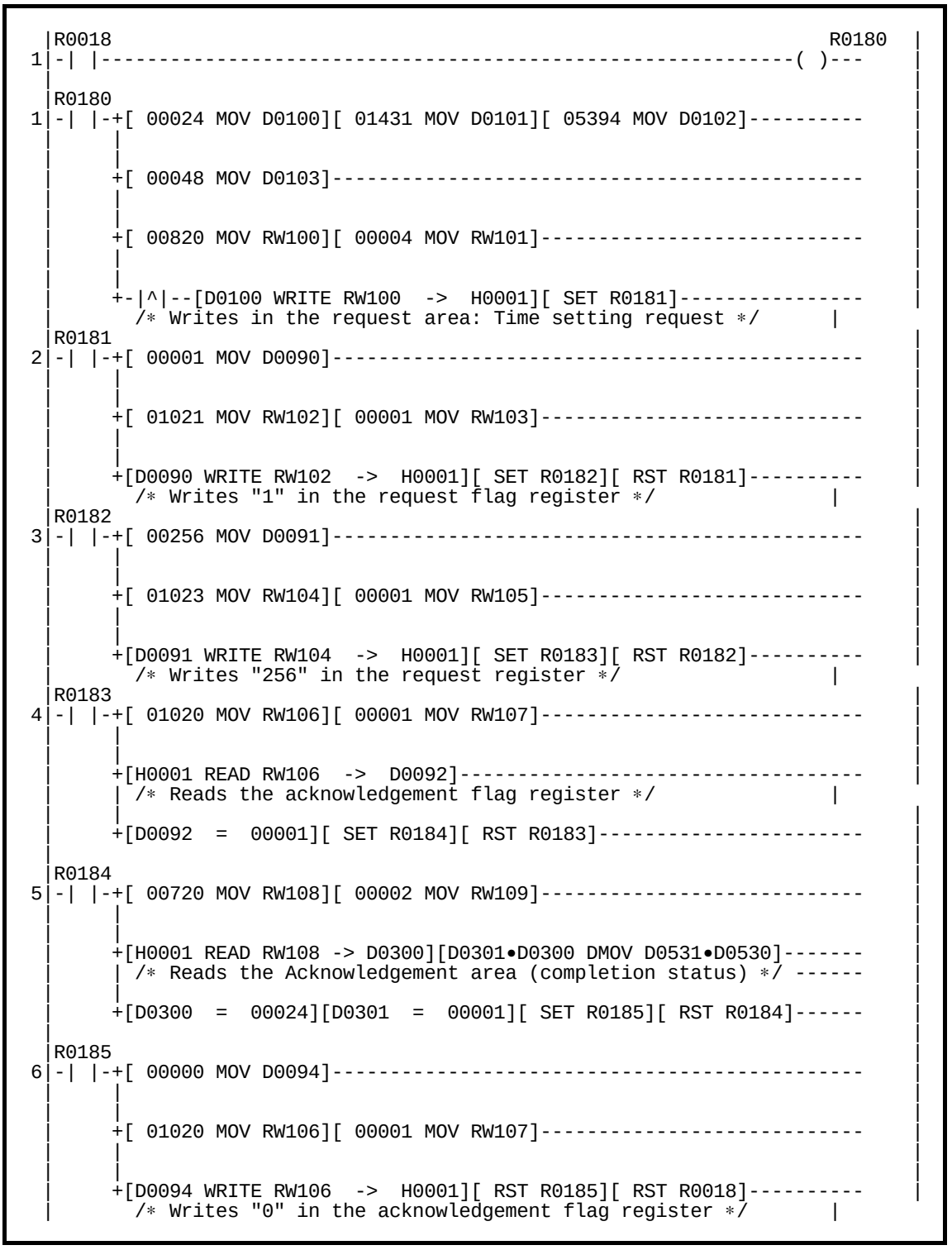
Semaphore register

| | | | Register allocation |
|---|---|---|---|
| 03FDH | | Request flag register | D0090 |
| 03FFH | | Request register | D0091 |
| 03FCH | | Acknowledgement flag register (read) | D0092 |
| 03FCH | | Acknowledgement flag register (write) | D0094 |

Work register

| | | Register allocation |
|---|---|---|
| Request area address store | 0334H | RW100 |
| Request data length store | 0004H | RW101 |
| Request flag register address store | 03FDH | RW102 |
| Request flag register length store | 0001H | RW103 |
| Request register address store | 03FFH | RW104 |
| Request register length store | 0001H | RW105 |
| Acknowledgement flag register address store | 03FCH | RW106 |
| Acknowledgement flag register length store | 0001H | RW107 |
| Acknowledgement area address store | 02D0H | RW108 |
| Acknowledgement data length store | 0002H | RW109 |
| RAS information read address store | 02CEH | RW116 |
| RAS information read data length store | 0001H | RW117 |

R0018 in the sample program on the following page indicates the startup relay for time setting request.


R0018
R0180
1
R0180
1
[ 00024 MOV D0100][ 01431 MOV D0101][ 05394 MOV D0102]
[ 00048 MOV D0103]
[ 00820 MOV RW100][ 00004 MOV RW101]
[D0100 WRITE RW100 -> H0001][ SET R0181]
/* Writes in the request area: Time setting request */
R0181
2
[ 00001 MOV D0090]
[ 01021 MOV RW102][ 00001 MOV RW103]
[D0090 WRITE RW102 -> H0001][ SET R0182][ RST R0181]
/* Writes "1" in the request flag register */
R0182
3
[ 00256 MOV D0091]
[ 01023 MOV RW104][ 00001 MOV RW105]
[D0091 WRITE RW104 -> H0001][ SET R0183][ RST R0182]
/* Writes "256" in the request register */
R0183
4
[ 01020 MOV RW106][ 00001 MOV RW107]
[H0001 READ RW106 -> D0092]
/* Reads the acknowledgement flag register */
[D0092 = 00001][ SET R0184][ RST R0183]
R0184
5
[ 00720 MOV RW108][ 00002 MOV RW109]
[H0001 READ RW108 -> D0300][D0301•D0300 DMOV D0531•D0530]
/* Reads the Acknowledgement area (completion status) */
[D0300 = 00024][D0301 = 00001][ SET R0185][ RST R0184]
R0185
6
[ 00000 MOV D0094]
[ 01020 MOV RW106][ 00001 MOV RW107]
[D0094 WRITE RW106 -> H0001][ RST R0185][ RST R0018]
/* Writes "0" in the acknowledgement flag register */

## 5.3 Slave Data Input/Output

After the DN611 is set to "run mode" by operation mode control request, the ladder program for the S2T writes data to output slave devices and also reads data inputted from slave devices as well. As described in "1.4 The Basic Functions," the communication between the DN611 and slave devices can be performed with the polling instruction/response mode and bit strobe instruction/response mode. In addition, synchronous mode or asynchronous mode can be used to exchange data between the S2T and the DN611.
This section describes data input/output between the S2T and the DN611 in synchronous mode or asynchronous mode.

### 5.3.1 Slave Device Check

**It is recommended to check the communication circuits with the slave devices before reading/writing slave input/output data.** This can be done when you check for MS/NS's green lighting on the front panel and for the local node address indication on the 7-segment LED. **This checking also can be done through the program when you find the number of the total devices (029EH) and the number of the online devices (029DH) in the RAS information are equal.** Moreover, when a difference is found in the numbers of the total devices and of the online devices, no-responded slave devices can be identified using the polling no-responded device map and the bit strobe no-responded device map.
The sample program in this chapter checks communication circuits by comparing the number of the total devices with the number of the online devices; and when these numbers differ, the program will stop data updates.

- The number of total devices(029EH):
  Indicates the number of the slave devices specified by a parameter setting request (setting information).
- The number of online devices(029DH):
  Indicates the number of the slave devices which are performing data input/output with the DN611 (execution information).
- Polling no-responded device map
  Indicates, per bit per device, the number of the slave devices not responded to the DN611 (No response for ON). The figure in frames in Table 5.2 represent the node address of a slave device.

**Table 5.2 Polling No-response Slave Devices**

| | F | E | D | C | B | A | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0297H | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| 0298H | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 |
| 0299H | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 |
| 029AH | 63 | 62 | 61 | 60 | 59 | 58 | 57 | 56 | 55 | 54 | 53 | 52 | 51 | 50 | 49 | 48 |

- Bit strobe no-responded device map
  Indicates, per bit per device, the number of the slave devices not responded to the DN611 (No response for ON). The figure in frames in Table 5.3 represents the node address of a slave device.

**Table 5.3 Bit Strobe No-response Slave Devices**

| | F | E | D | C | B | A | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0293H | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| 0294H | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 |
| 0295H | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 |
| 0296H | 63 | 62 | 61 | 60 | 59 | 58 | 57 | 56 | 55 | 54 | 53 | 52 | 51 | 50 | 49 | 48 |

### 5.3.2 Asynchronous Mode Data Input/Output

When outputting: Output data to slave devices will be written in the output data area of the DN611 from the S2T. The DN611 transmits output data written in its scan cycle to slave devices (unrelated to the output data write timing by the S2T).Unless output data is updated, the DN611 continues to transmit the same data.

When inputting: The DN611 receives data from slave devices in polling response/bit strobe response. The DN611 updates data in the input data area when completing data reception from all slave devices. The DN611 doesn't inform the S2T of the completion of receiving data. The S2T reads input data regardless of the timing of input data updates by the DN611.

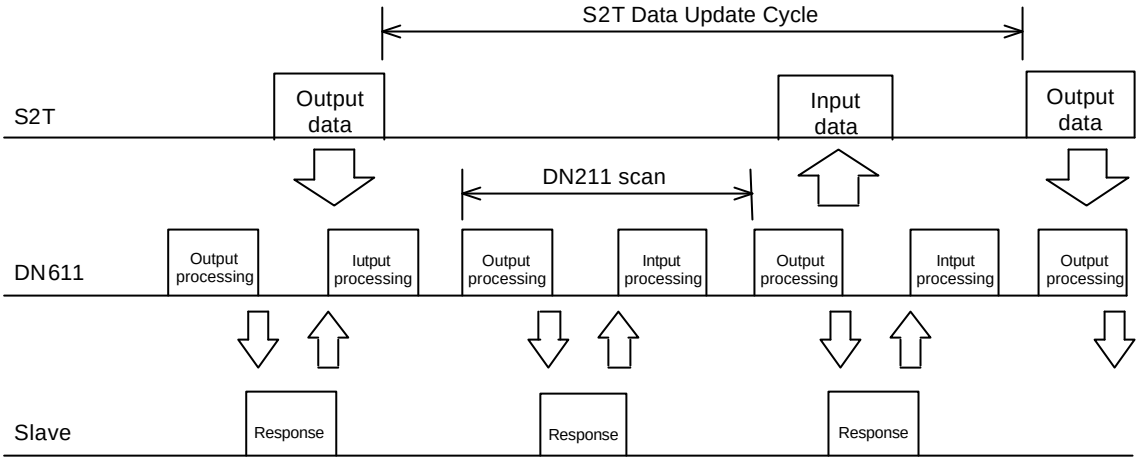



**Figure 5.4 Asynchronous Mode Data Input/Output**

Input data area

| | | Register allocation |
|---|---|---|
| 0000H | Node address = 1 | D02100 |
| 0001H | | D02101 |
| 0002H | | D02102 |
| 0003H | Node address = 6 | D02103 |
| 0004H | | D02104 |
| 0005H | | D02105 |
| 0006H | Node address = 8 | D02106 |
| 0007H | Node address = 20 | D02107 |
| 0008H | | D02108 |
| 0009H | | D02109 |
| 000AH | Node address = 22 | D02110 |

Output data area

| | | Register allocation |
|---|---|---|
| 0080H | Node address = 1 | D1710 |
| 0081H | | D1711 |
| 0082H | Node address = 6 | D1712 |
| 0083H | | D1713 |
| 0084H | Node address = 20 | D1714 |
| 0085H | | D1715 |

Bit strobe output data area

| | Register allocation |
|---|---|
| 0100H | D1700 |
| 0101H | D1701 |
| 0102H | D1702 |
| 0103H | D1703 |

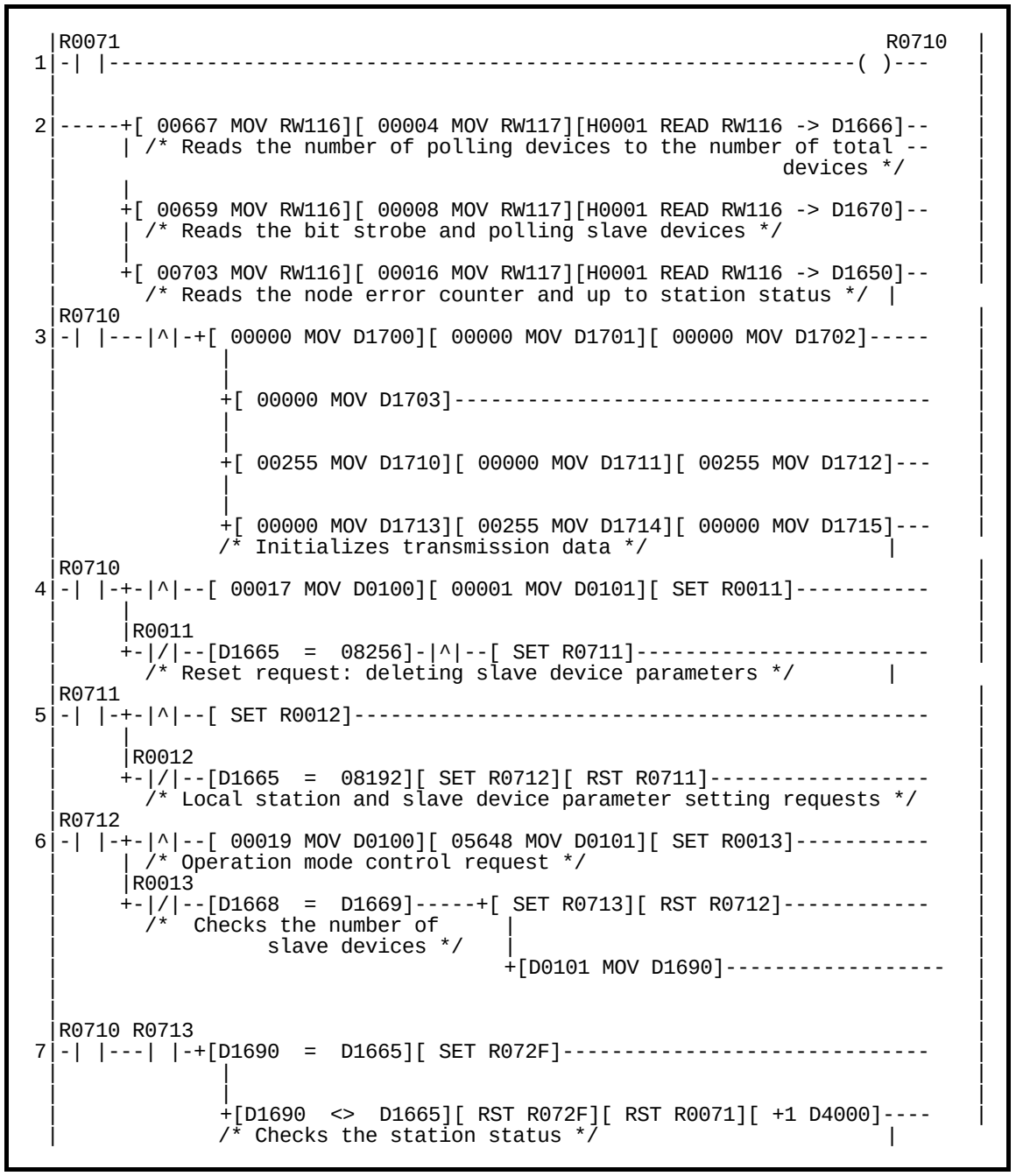
| RAS information | | | Register allocation |
|---|---|---|---|
| 029BH | | Number of polling devices | D1666 |
| 029CH | | Number of bit strobe devices | D1667 |
| 029DH | | Number of online devices | D1668 |
| 029EH | | Number of total devices | D1669 |
| 0293H | | | D1670 |
| 0294H | | Bit strobe | D1671 |
| 0295H | | No-response device | D1672 |
| 0296H | | | D1673 |
| 0297H | | | D1674 |
| 0298H | | Polling | D1675 |
| 0299H | | No-response device | D1676 |
| 029AH | | | D1677 |
| 02CEH | | Station status | D1665 |

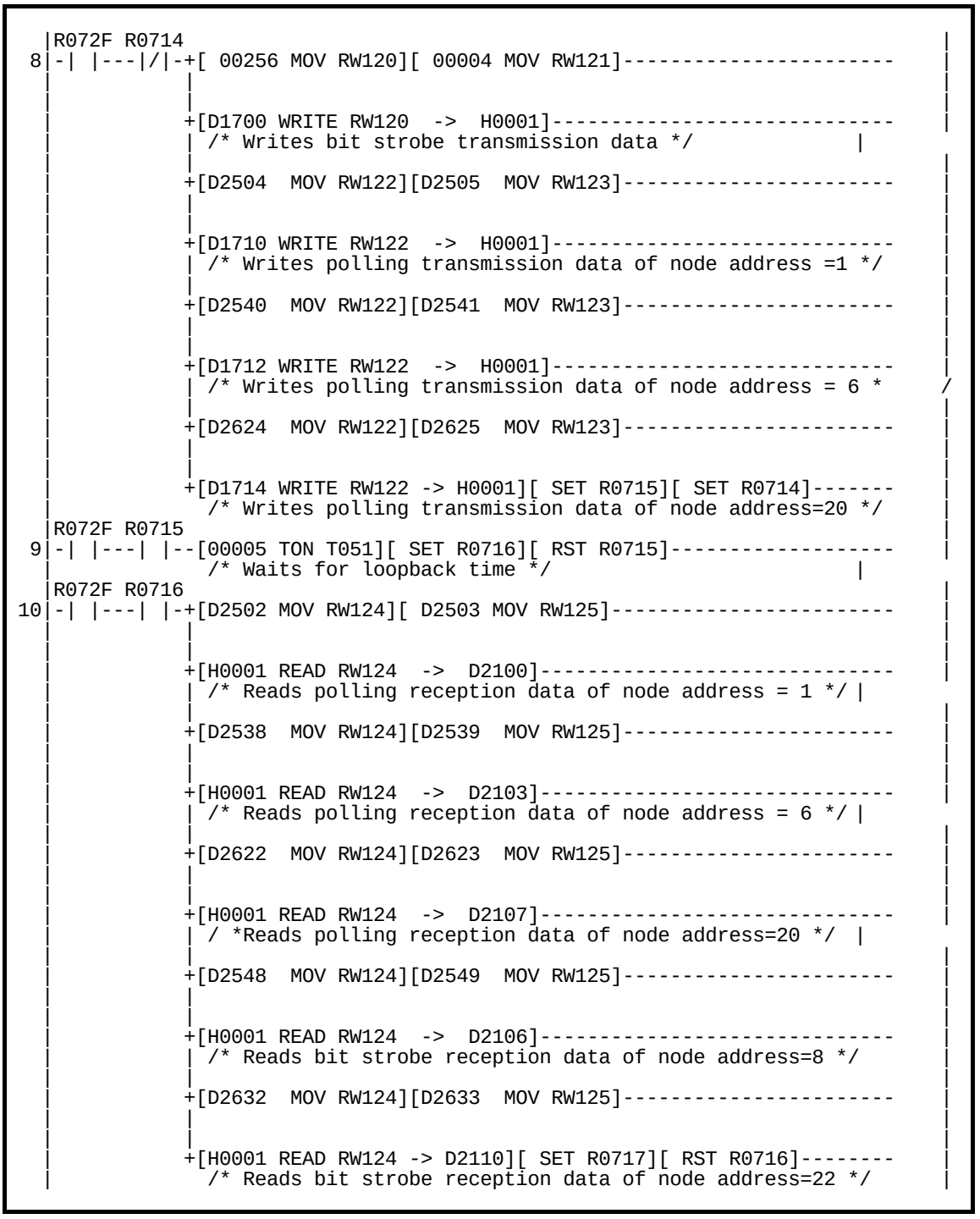
| Work register | Register allocation |
|---|---|
| RAS information read address store | RW116 |
| RAS information read data length store | RW117 |
| Request mode store of operation mode control request | D1690 |

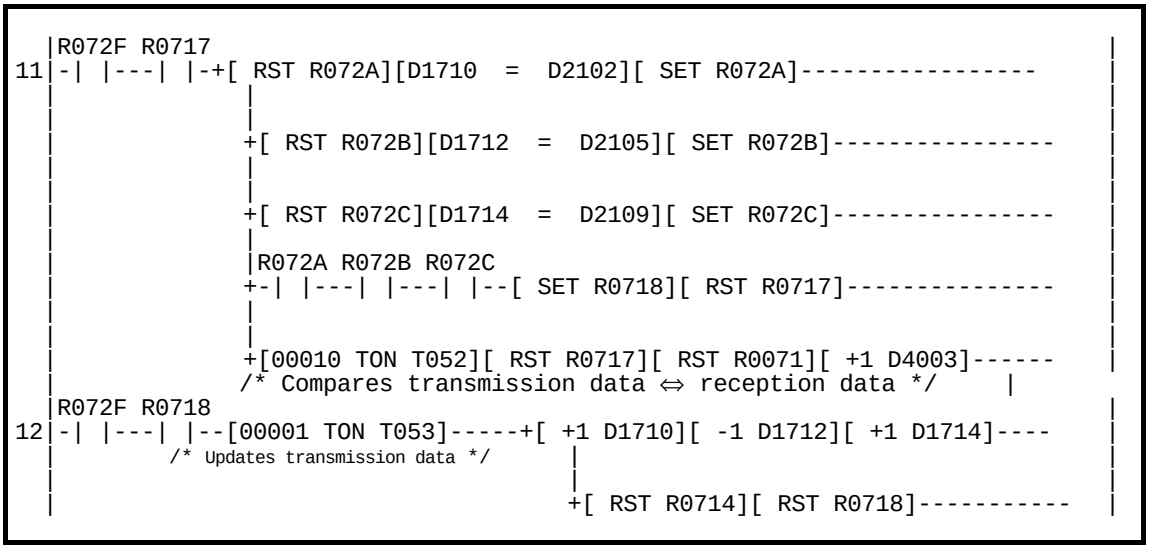
| | | Register allocation |
|---|---|---|
| Node address = 1 | Polling input data top address | D2502 |
| | Number of polling input data words | D2503 |
| | Polling output data top address | D2504 |
| | Number of polling output data words | D2505 |
| Node address = 6 | Polling input data top address | D2538 |
| | Number of polling input data words | D2539 |
| | Polling output data top address | D2540 |
| | Number of polling output data words | D2541 |
| Node address = 8 | BS input data top address | D2548 |
| | Number of BS input data words | D2549 |
| Node address = 20 | Polling input data top address | D2622 |
| | Number of polling input data words | D2623 |
| | Polling output data top address | D2624 |
| | Number of polling output data words | D2625 |
| Node address = 22 | BS input data top address | D2632 |
| | Number of BS input data words | D2633 |

Remarks:

- This sample program performs loopback check of data transmitted to FLEX I/O.
- R0071 in the sample program on the next page indicates the startup relay for asynchronous data input/output.
- This sample program requires the programs stated in **"5.2.3 Reset Request"**, **"5.2.4/5.2.5 Parameter Setting Request"**, and **"5.2.6 Operation Mode Control Request."**
- This program allows the WRITE / READ instructions to write/read output and input data for individual slave devices. Besides these performances, input/output data can be read/written in batch processing (maximum 128 words). This method allows to reduce the number of READ/WRITE executions, resulting in a shorter execution time for the ladder program.


R0071
R0710
1
( )
2
[ 00667 MOV RW116][ 00004 MOV RW117][H0001 READ RW116 -> D1666]
/* Reads the number of polling devices to the number of total devices */
[ 00659 MOV RW116][ 00008 MOV RW117][H0001 READ RW116 -> D1670]
/* Reads the bit strobe and polling slave devices */
[ 00703 MOV RW116][ 00016 MOV RW117][H0001 READ RW116 -> D1650]
/* Reads the node error counter and up to station status */
R0710
3
[ 00000 MOV D1700][ 00000 MOV D1701][ 00000 MOV D1702]
[ 00000 MOV D1703]
[ 00255 MOV D1710][ 00000 MOV D1711][ 00255 MOV D1712]
[ 00000 MOV D1713][ 00255 MOV D1714][ 00000 MOV D1715]
/* Initializes transmission data */
R0710
4
[ 00017 MOV D0100][ 00001 MOV D0101][ SET R0011]
R0011
[D1665 = 08256]
[ SET R0711]
/* Reset request: deleting slave device parameters */
R0711
5
[ SET R0012]
R0012
[D1665 = 08192][ SET R0712][ RST R0711]
/* Local station and slave device parameter setting requests */
R0712
6
[ 00019 MOV D0100][ 05648 MOV D0101][ SET R0013]
/* Operation mode control request */
R0013
[D1668 = D1669]
[ SET R0713][ RST R0712]
/* Checks the number of slave devices */
[D0101 MOV D1690]
R0710 R0713
7
[D1690 = D1665][ SET R072F]
[D1690 <> D1665][ RST R072F][ RST R0071][ +1 D4000]
/* Checks the station status */


R072F R0714
8
[ 00256 MOV RW120][ 00004 MOV RW121]
[D1700 WRITE RW120 -> H0001]
/* Writes bit strobe transmission data */
[D2504 MOV RW122][D2505 MOV RW123]
[D1710 WRITE RW122 -> H0001]
/* Writes polling transmission data of node address =1 */
[D2540 MOV RW122][D2541 MOV RW123]
[D1712 WRITE RW122 -> H0001]
/* Writes polling transmission data of node address = 6 *
[D2624 MOV RW122][D2625 MOV RW123]
[D1714 WRITE RW122 -> H0001][ SET R0715][ SET R0714]
/* Writes polling transmission data of node address=20 */
R072F R0715
9
[00005 TON T051][ SET R0716][ RST R0715]
/* Waits for loopback time */
R072F R0716
10
[D2502 MOV RW124][ D2503 MOV RW125]
[H0001 READ RW124 -> D2100]
/* Reads polling reception data of node address = 1 */
[D2538 MOV RW124][D2539 MOV RW125]
[H0001 READ RW124 -> D2103]
/* Reads polling reception data of node address = 6 */
[D2622 MOV RW124][D2623 MOV RW125]
[H0001 READ RW124 -> D2107]
/ *Reads polling reception data of node address=20 */
[D2548 MOV RW124][D2549 MOV RW125]
[H0001 READ RW124 -> D2106]
/* Reads bit strobe reception data of node address=8 */
[D2632 MOV RW124][D2633 MOV RW125]
[H0001 READ RW124 -> D2110][ SET R0717][ RST R0716]
/* Reads bit strobe reception data of node address=22 */


R072F R0717
11
RST R072A][D1710 = D2102][ SET R072A]
RST R072B][D1712 = D2105][ SET R072B]
RST R072C][D1714 = D2109][ SET R072C]
R072A R072B R072C
SET R0718][ RST R0717]
[00010 TON T052][ RST R0717][ RST R0071][ +1 D4003]
/* Compares transmission data ⇔ reception data */
R072F R0718
12
[00001 TON T053]
+[ +1 D1710][ -1 D1712][ +1 D1714]
/* Updates transmission data */
+[ RST R0714][ RST R0718]

### 5.3.3 Synchronous Mode Data Input/Output

When outputting: Output data to slave devices from the S2T is written into the output data area of the DN611. Then, an output data semaphore or bit strobe output data semaphore is used for commanding a polling instruction or bit strobe instruction. When receiving the polling instruction / bit strobe instruction, the DN611 will transmit the written output data to slave devices.

When inputting: The DN611 receives data from slave devices in polling response / bit strobe response. When Completing receiving data from all slave devices, the DN611 will update data in the input data area. Then, an input data semaphore is used for notifyingthe S2T of the input completion.
When reading input data, the S2T read data after checking for input completion by the DN611.

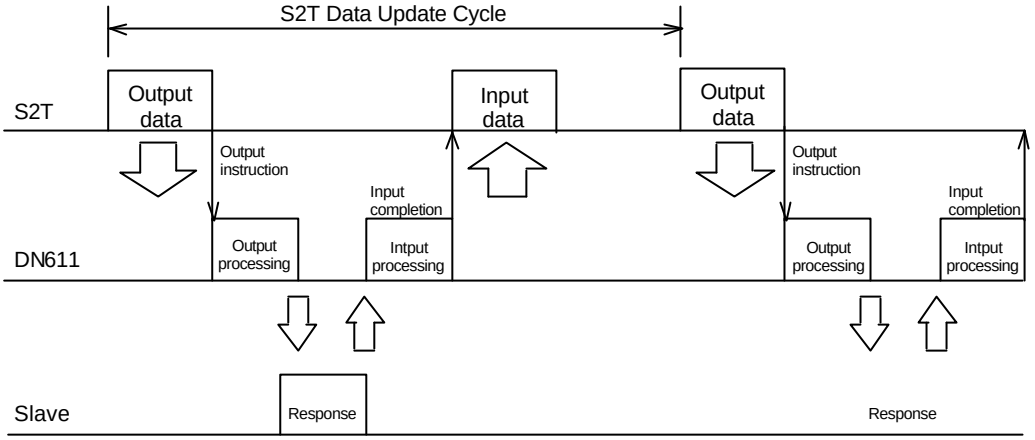



**Figure 5.5 Synchronous Mode Data Input/Output**

How to Use an Output/Input Data Semaphore (for synchronous mode only):

Figure 5.6 illustrates the relation between the output data semaphore (polling/bit strobe) and the input data semaphore. The squares in oblique lines indicate the value of individual semaphores are set to "1."

When devices with the polling system and bit strobe system are intermingled, use of the input data semaphore register is shared by the polling mode and bit strobe mode. Therefore, input/output data must be **processed alternatively after the other mode completes the processing, as shown below:**

**Polling mode ® Bit strobe mode ® Polling mode ® Bit strobe mode ® ¼**

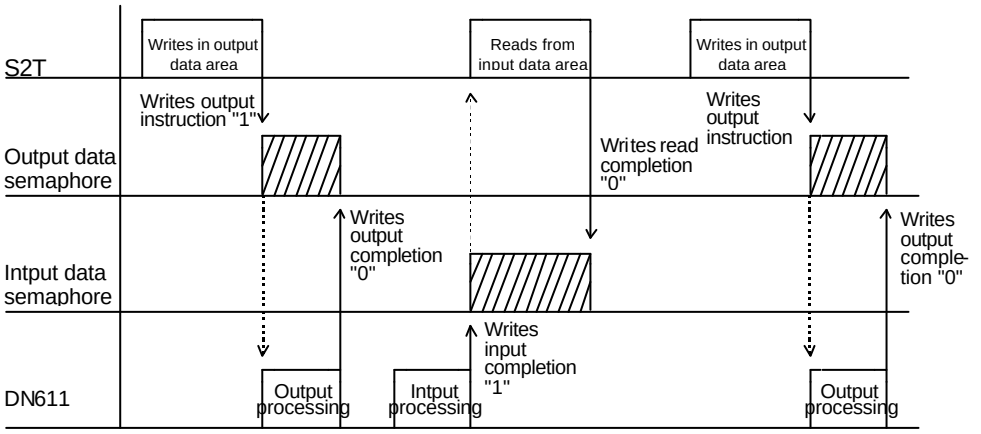
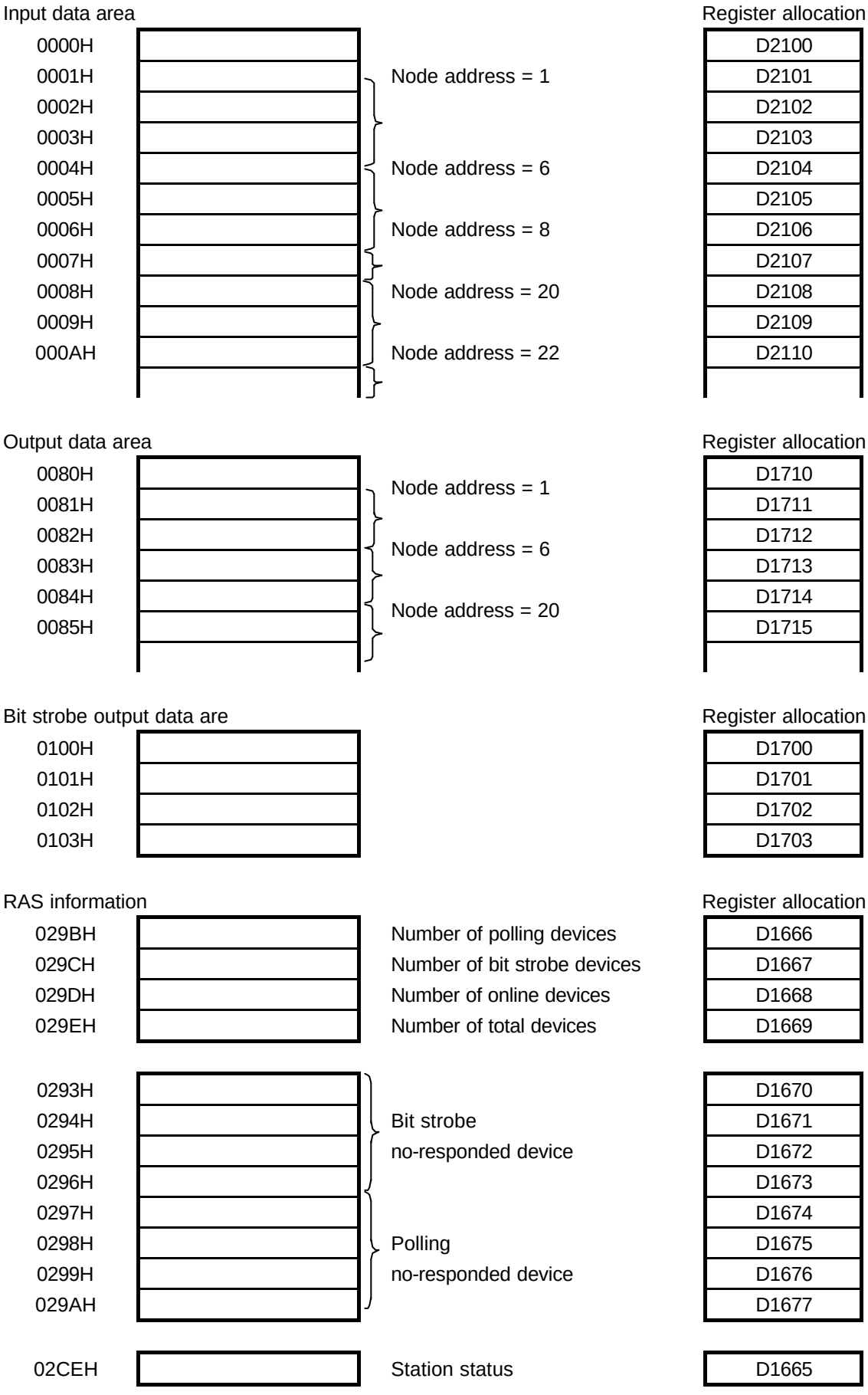



**Figure 5.6 How to Use Semaphores in Synchronous Mode**


Input data area
Register allocation
0000H
0001H
0002H
0003H
0004H
0005H
0006H
0007H
0008H
0009H
000AH
Node address = 1
Node address = 6
Node address = 8
Node address = 20
Node address = 22
D2100
D2101
D2102
D2103
D2104
D2105
D2106
D2107
D2108
D2109
D2110
Output data area
Register allocation
0080H
0081H
0082H
0083H
0084H
0085H
Node address = 1
Node address = 6
Node address = 20
D1710
D1711
D1712
D1713
D1714
D1715
Bit strobe output data are
Register allocation
0100H
0101H
0102H
0103H
D1700
D1701
D1702
D1703
RAS information
Register allocation
029BH
029CH
029DH
029EH
Number of polling devices
Number of bit strobe devices
Number of online devices
Number of total devices
D1666
D1667
D1668
D1669
0293H
0294H
0295H
0296H
0297H
0298H
0299H
029AH
Bit strobe
no-responded device
Polling
no-responded device
D1670
D1671
D1672
D1673
D1674
D1675
D1676
D1677
02CEH
Station status
D1665

| Semaphore register | | | Register allocation |
|---|---|---|---|
| 0104H | | BS output data semaphore | D0095 |
| 0105H | | Output data semaphore | D0096 |
| 0106H | | Input data semaphore (read) | D0097 |
| 0106H | | Input data semaphore (write) | D0098 |

Work register

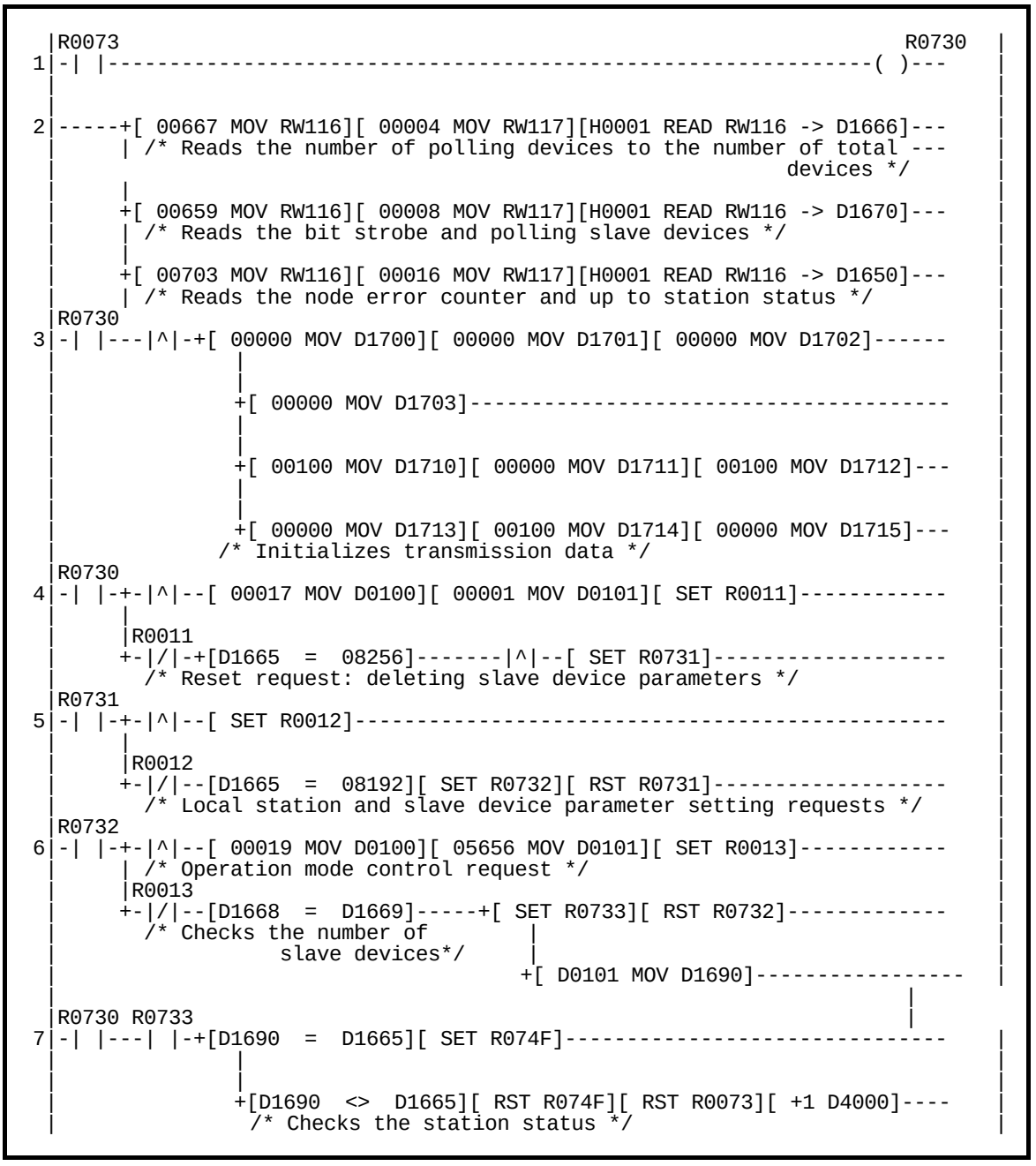
| | |
|---|---|
| Bit strobe output data semaphore address store | RW110 |
| Bit strobe output data semaphore data length store | RW111 |
| Output data semaphore address store | RW112 |
| Output data semaphore data length store | RW113 |
| Input data semaphore address store | RW114 |
| Input data semaphore data length store | RW115 |
| RAS information read address store | RW116 |
| RAS information read data length store | RW117 |

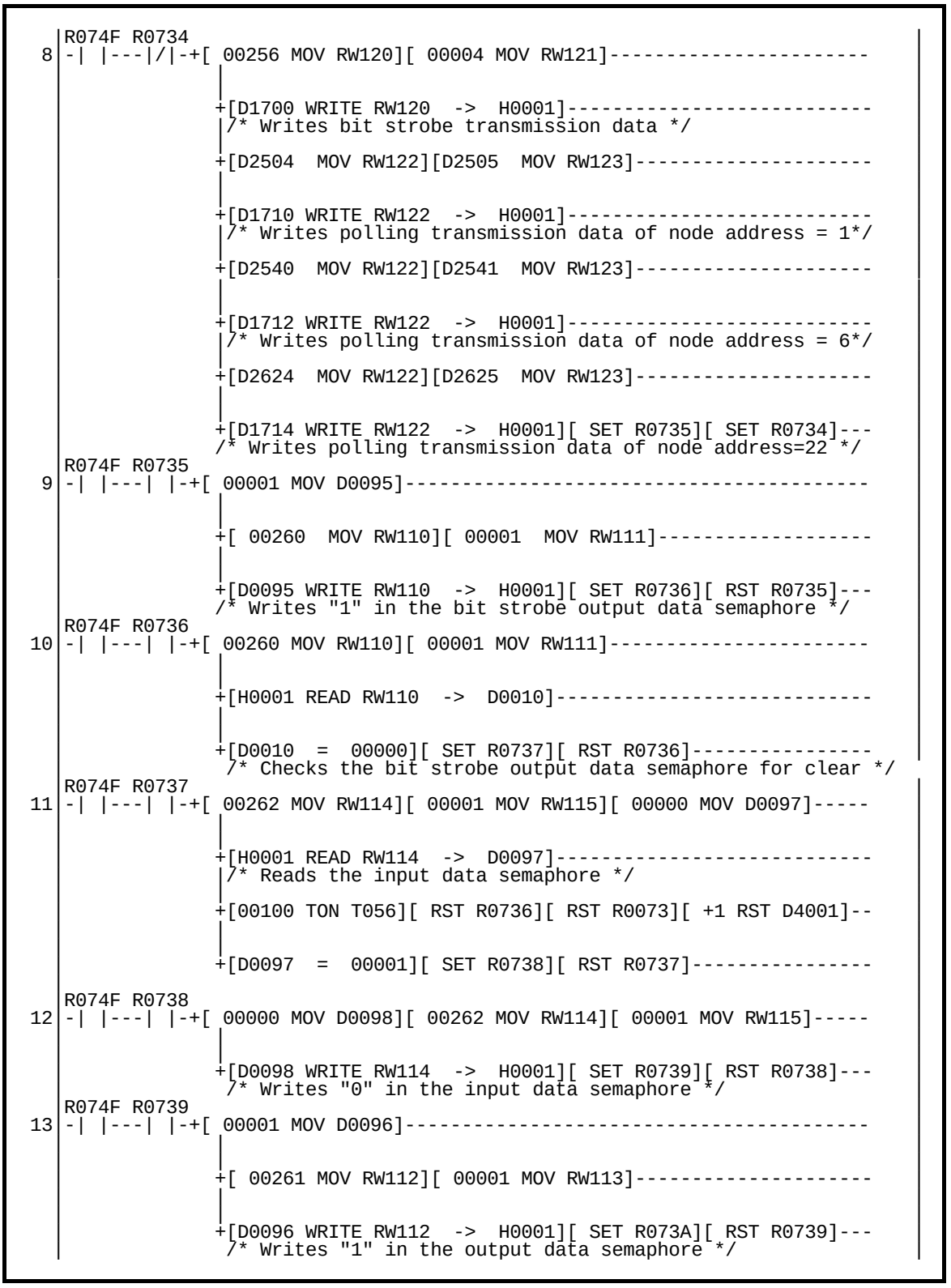
| | |
|---|---|
| Storing request mode for operation mode control request | D1690 |

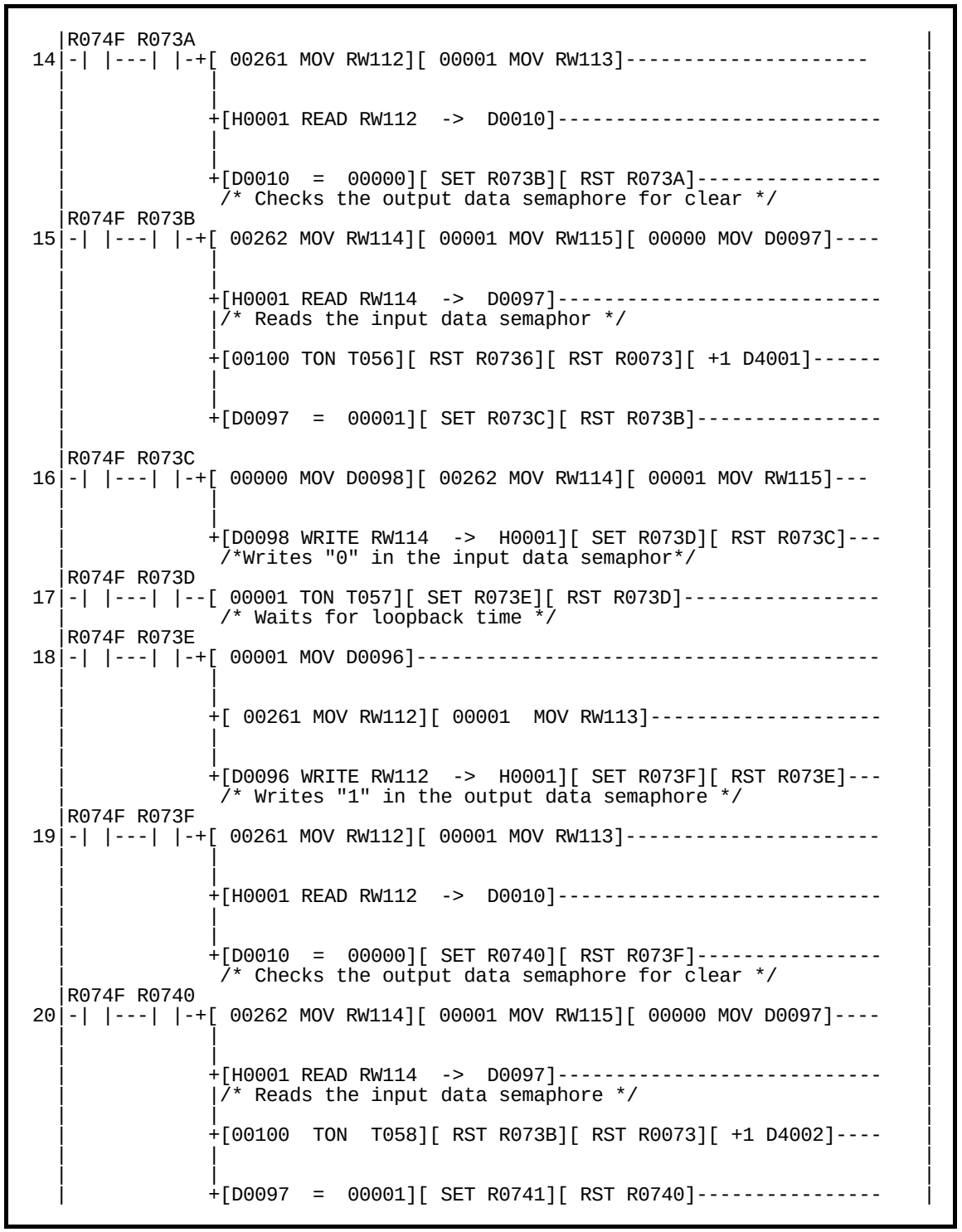
| | | |
|---|---|---|
| Node address = 1 | Polling input data top address | D2502 |
| | Number of polling input data words | D2503 |
| | Polling output data top address | D2504 |
| | Number of polling output data words | D2505 |
| Node address = 6 | Polling input data top address | D2538 |
| | Number of polling input data words | D2539 |
| | Polling output data top address | D2540 |
| | Number of polling output data words | D2541 |
| Node address = 8 | BS input data top address | D2548 |
| | Number of BS input data words | D2549 |
| Node address = 20 | Polling input data top address | D2622 |
| | Number of polling input data words | D2623 |
| | Polling output data top address | D2624 |
| | Number of polling output data words | D2625 |
| Node address = 22 | BS input data top address | D2632 |
| | Number of BS input data words | D2633 |

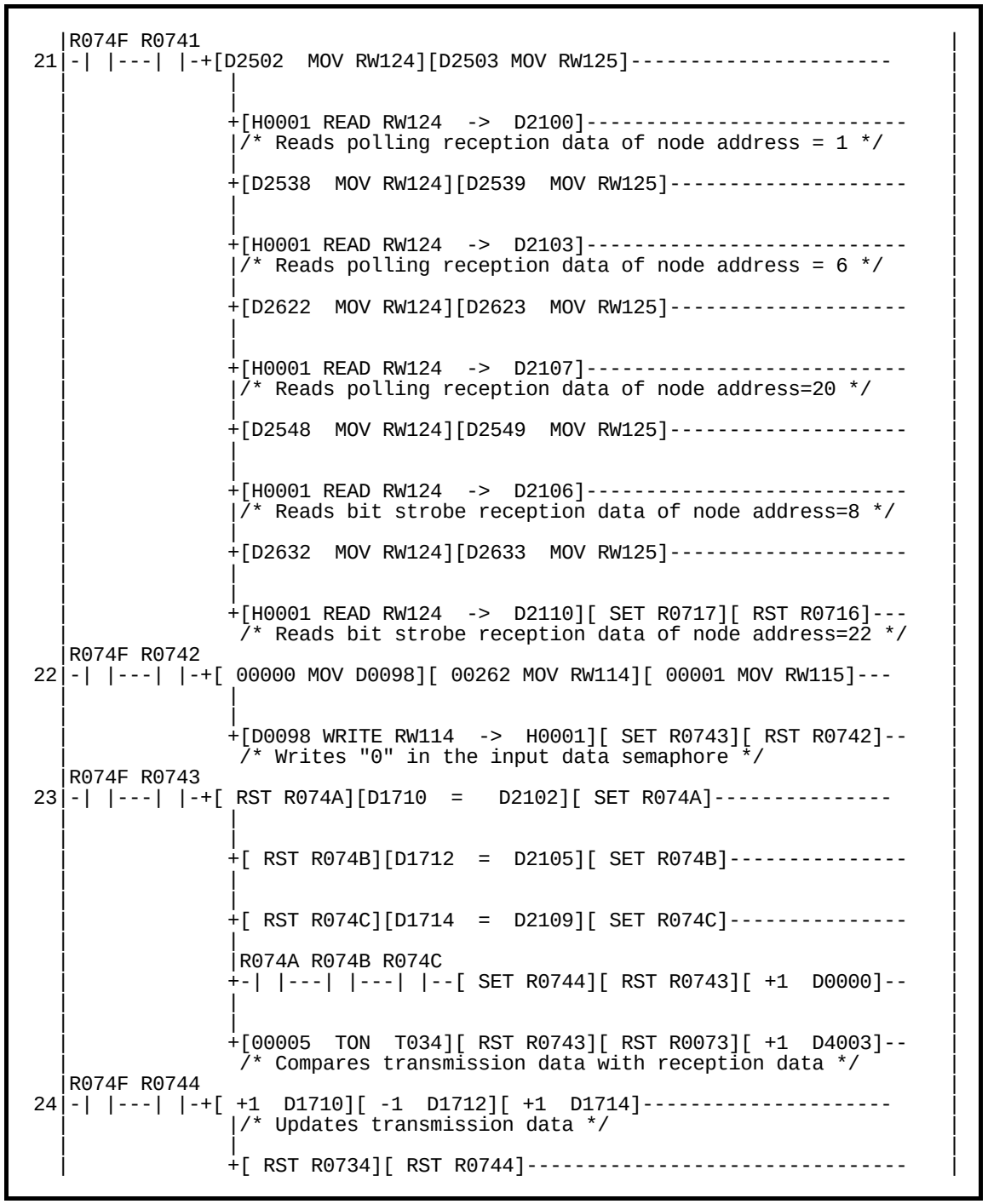
Remarks

- This sample program performs loopback check of data transmitted to FLEX I/O.
- R0073 in the sample program on the next page indicates the startup relay for asynchronous data input/output.
- This sample program requires the programs stated in **"5.2.3 Reset Reques**t", **"5.2.4/5.2.5 Parameter Setting Request"**, and **"5.2.6 Operation Mode Control Request."**
- This program allows the WRITE/READ instructions to write/read output and input data for individual slave devices. Besides these performances, input/output data can be read/written in batch processing (maximum 128 words). This method allows to reduce the number of READ/WRITE executions, resulting in a shorter execution time for the ladder program.


R0073
R0730
1
/* Reads the number of polling devices to the number of total devices */
00667 MOV RW116][ 00004 MOV RW117][H0001 READ RW116 -> D1666]
2
/* Reads the bit strobe and polling slave devices */
00659 MOV RW116][ 00008 MOV RW117][H0001 READ RW116 -> D1670]
/* Reads the node error counter and up to station status */
00703 MOV RW116][ 00016 MOV RW117][H0001 READ RW116 -> D1650]
R0730
3
00000 MOV D1700][ 00000 MOV D1701][ 00000 MOV D1702]
00000 MOV D1703]
00100 MOV D1710][ 00000 MOV D1711][ 00100 MOV D1712]
00000 MOV D1713][ 00100 MOV D1714][ 00000 MOV D1715]
/* Initializes transmission data */
R0730
4
00017 MOV D0100][ 00001 MOV D0101][ SET R0011]
R0011
D1665 = 08256]
/* Reset request: deleting slave device parameters */
R0731
5
SET R0012]
R0012
D1665 = 08192][ SET R0732][ RST R0731]
/* Local station and slave device parameter setting requests */
R0732
6
00019 MOV D0100][ 05656 MOV D0101][ SET R0013]
/* Operation mode control request */
R0013
D1668 = D1669]
/* Checks the number of slave devices*/
SET R0733][ RST R0732]
D0101 MOV D1690]
R0730 R0733
7
D1690 = D1665][ SET R074F]
D1690 <> D1665][ RST R074F][ RST R0073][ +1 D4000]
/* Checks the station status */


R074F R0734
8
[ 00256 MOV RW120][ 00004 MOV RW121]
[D1700 WRITE RW120 -> H0001]
/* Writes bit strobe transmission data */
[D2504 MOV RW122][D2505 MOV RW123]
[D1710 WRITE RW122 -> H0001]
/* Writes polling transmission data of node address = 1*/
[D2540 MOV RW122][D2541 MOV RW123]
[D1712 WRITE RW122 -> H0001]
/* Writes polling transmission data of node address = 6*/
[D2624 MOV RW122][D2625 MOV RW123]
[D1714 WRITE RW122 -> H0001][ SET R0735][ SET R0734]
/* Writes polling transmission data of node address=22 */
R074F R0735
9
[ 00001 MOV D0095]
[ 00260 MOV RW110][ 00001 MOV RW111]
[D0095 WRITE RW110 -> H0001][ SET R0736][ RST R0735]
/* Writes "1" in the bit strobe output data semaphore */
R074F R0736
10
[ 00260 MOV RW110][ 00001 MOV RW111]
[H0001 READ RW110 -> D0010]
[D0010 = 00000][ SET R0737][ RST R0736]
/* Checks the bit strobe output data semaphore for clear */
R074F R0737
11
[ 00262 MOV RW114][ 00001 MOV RW115][ 00000 MOV D0097]
[H0001 READ RW114 -> D0097]
/* Reads the input data semaphore */
[00100 TON T056][ RST R0736][ RST R0073][ +1 RST D4001]
[D0097 = 00001][ SET R0738][ RST R0737]
R074F R0738
12
[ 00000 MOV D0098][ 00262 MOV RW114][ 00001 MOV RW115]
[D0098 WRITE RW114 -> H0001][ SET R0739][ RST R0738]
/* Writes "0" in the input data semaphore */
R074F R0739
13
[ 00001 MOV D0096]
[ 00261 MOV RW112][ 00001 MOV RW113]
[D0096 WRITE RW112 -> H0001][ SET R073A][ RST R0739]
/* Writes "1" in the output data semaphore */


R074F R073A
14 -| |---| |-+[ 00261 MOV RW112][ 00001 MOV RW113]----------
+[H0001 READ RW112 -> D0010]----------
+[D0010 = 00000][ SET R073B][ RST R073A]----------
/* Checks the output data semaphore for clear */
R074F R073B
15 -| |---| |-+[ 00262 MOV RW114][ 00001 MOV RW115][ 00000 MOV D0097]----
+[H0001 READ RW114 -> D0097]----------
/* Reads the input data semaphor */
+[00100 TON T056][ RST R0736][ RST R0073][ +1 D4001]------
+[D0097 = 00001][ SET R073C][ RST R073B]----------
R074F R073C
16 -| |---| |-+[ 00000 MOV D0098][ 00262 MOV RW114][ 00001 MOV RW115]---
+[D0098 WRITE RW114 -> H0001][ SET R073D][ RST R073C]---
/*Writes "0" in the input data semaphor*/
R074F R073D
17 -| |---| |--[ 00001 TON T057][ SET R073E][ RST R073D]----------
/* Waits for loopback time */
R074F R073E
18 -| |---| |-+[ 00001 MOV D0096]----------
+[ 00261 MOV RW112][ 00001 MOV RW113]----------
+[D0096 WRITE RW112 -> H0001][ SET R073F][ RST R073E]---
/* Writes "1" in the output data semaphore */
R074F R073F
19 -| |---| |-+[ 00261 MOV RW112][ 00001 MOV RW113]----------
+[H0001 READ RW112 -> D0010]----------
+[D0010 = 00000][ SET R0740][ RST R073F]----------
/* Checks the output data semaphore for clear */
R074F R0740
20 -| |---| |-+[ 00262 MOV RW114][ 00001 MOV RW115][ 00000 MOV D0097]----
+[H0001 READ RW114 -> D0097]----------
/* Reads the input data semaphore */
+[00100 TON T058][ RST R073B][ RST R0073][ +1 D4002]----
+[D0097 = 00001][ SET R0741][ RST R0740]----------


R074F R0741
21
D2502 MOV RW124][D2503 MOV RW125]
H0001 READ RW124 -> D2100]
/* Reads polling reception data of node address = 1 */
D2538 MOV RW124][D2539 MOV RW125]
H0001 READ RW124 -> D2103]
/* Reads polling reception data of node address = 6 */
D2622 MOV RW124][D2623 MOV RW125]
H0001 READ RW124 -> D2107]
/* Reads polling reception data of node address=20 */
D2548 MOV RW124][D2549 MOV RW125]
H0001 READ RW124 -> D2106]
/* Reads bit strobe reception data of node address=8 */
D2632 MOV RW124][D2633 MOV RW125]
H0001 READ RW124 -> D2110][ SET R0717][ RST R0716]
/* Reads bit strobe reception data of node address=22 */
R074F R0742
22
00000 MOV D0098][ 00262 MOV RW114][ 00001 MOV RW115]
D0098 WRITE RW114 -> H0001][ SET R0743][ RST R0742]
/* Writes "0" in the input data semaphore */
R074F R0743
23
RST R074A][D1710 = D2102][ SET R074A]
RST R074B][D1712 = D2105][ SET R074B]
RST R074C][D1714 = D2109][ SET R074C]
R074A R074B R074C
SET R0744][ RST R0743][ +1 D0000]
00005 TON T034][ RST R0743][ RST R0073][ +1 D4003]
/* Compares transmission data with reception data */
R074F R0744
24
+1 D1710][ -1 D1712][ +1 D1714]
/* Updates transmission data */
RST R0734][ RST R0744]

# 6. RAS Information (except RAS area on communication memory)

This chapter describes the following RAS functions of the DN611.

1. Indicators on the front panel
   - Module status / network status LED (MS/NS)
   - 7-segment LED (NA/ERROR)
2. Information by reading RAS Information
   - RAS history counter
   - Event history

See "4.3 The RAS information Area" for the RAS information area on the DN611 communication memory.

| ⚠ CAUTION |
|---|
| 1. This chapter describes the subjects necessary for using many functions of the DN611 from the S2T. Try to understand well before writing programs. Chapter 5 explains a sample program that can read RAS information. Because the sample program is basic, you need to discuss it before applying to real systems. |

## 6.1 Module Status / Network Status LED (MS/NS)

The 2-color light-emitting diode (LED) on the front panel of the DN611 (module status/network status LED) has two colors (green/red) to light, and blinking/not lit states, which distinctively indicates the module status (MS) and the network status (NS).

**Table 6.1 Module Status / Network Status LED**

| LED | Indication state | Meaning of indication (major trouble) |
|---|---|---|
| MS | Not lit | • No power is supplied to the DN611.<br>• Although the power is supplied to the DN611, it is not in run mode. |
| | | While the 7-segment LED node address/error code is indicating the local station node address, the power is supplied. |
| | Green lighting | • The DN611 is normally operating. |
| | Green blinking | • The DN611 is reading switch settings. |
| | Red blinking | • The DN611 is encountering a recoverable trouble.<br>→ Switch setting abnormal (DIP switch / rotary switch), etc. |
| | Red lighting | • The DN611 is encountering an unrecoverable trouble (down state). Yoy may have to replace the module. |
| NS | Not lit | •No power is supplied to the DN611 (check MS).<br>• Although the power is supplied to the DN611, it is not in run mode (check MS).<br>• The DN611 is encountering an unrecoverable trouble (down state: check MS).<br>• No network power is supplied to the DN611. |
| | Green lighting | • The DN611 is normally communicating with slave devices. |
| | Green blinking | • No communication is established between the DN611 and slave devices.<br>• Not a single slave device is registered in the DN611. |
| | Red blinking | • The DN611 is unable to communicate with an abnormal slave device. |
| | Red lighting | • Communication halted due to busoff in the DN611.<br>• Communication halted due to an overlapped node address. |

## 6.2 Indications of the 7-Segment LED

The 7-segment LED (NA/ERROR) on the front panel of the DN611 is used for indicating a node address/error code.

When the DN611 is normally transmitting with slave devices, the local station node address (value set by the rotary switch on the side panel of the module) is displayed.

Moreover, if one of the following troubles occurs, the 7-segment LED indicates the state of the module or the network.

- When the DN611/network/slave device is encountering trouble
- When an error occurs with requests from the S2T
- When the DN611 is downed

This LED is blinking the local station node address while creating a scan list at the step of setting slave device parameters.

Table 6.2 and Table 6.3 describe combinations in the 7-segment LED for module status / network status, and their meanings. The mark "⇔" in the tables indicates alternative display of indications on both sides.

**Table 6.2.7 Combined Indications of the 7-segment LED and 2-Color LED**
M: DN611 node address S: Slave device node address

| 7-segment LED | MS | NS | Description |
|---|---|---|---|
| Not lit | Not lit | Not lit | No power is supplied to the S2T<br>Initialization is underway after reset request. |
| M lighting | Not lit | Not lit | Indicates standby mode<br>(Just after switching ON the power; after reset request) |
| M blinking | Not lit | Not lit | In the processing of setting slave device parameters |
| M lighting | Green lighting | Green lighting | Is engaging in normal transmission (both module and network have no trouble) |
| 70 ⇔ M | Green lighting | Red lighting | The DN611 detected an duplicated node address with a slave device. |
| 72 ⇔ S | Green lighting | Red blinking | 1) When the response from a slave device ceased during normal transmission<br>2) When setting no polling mode to enabled state at operation mode setting though polling mode devices are found in the scan list<br>3) When setting no bit strobe mode to enabled state at operation mode setting though bit strobe mode devices are found in the scan list<br>4) When setting slave device parameters, reception data size or scan type is different from the actual one. |
| 73 ⇔ S | Green lighting | Red blinking | When setting slave device parameters, the vendor ID, product type, or product code is different from the actual one. |
| 75 ⇔ M | Green lighting | Red blinking | No slave device is found on the network when starting transmission (this indication only) |
| 75 ⇔ M | Green lighting | Green blinking | 1) When run mode is requested without setting the parameters of a slave device<br>* This state can occur before the DN611 and a slave device start transmission.<br>If this state lasts for 30 seconds or more, check the parameters of the slave device. |
| 77 ⇔ S | Green lighting | Red blinking | Transmission size is different from the actual size when setting slave device parameters. |

**Table 6. 3 Combined Indications of the 7-Segment LED and 2-Color LED**
M: DN611 node address S: Slave device node address

| 7-segment LED | MS | NS | Description |
|---|---|---|---|
| 78 ⇔ S | Green lighting | Red blinking | When unable to start communicating with one or more slave devices in the scan list |
| 79 ⇔ M | Green lighting | Red blinking | 1) When the "START" bit was not set to "1" at run request (followed by the indication of 78 ⇔ S )<br>2) When response from all slaves ceased during normal transmission (followed by the indication of 72 ⇔ S )<br>3) No slave device is found in network when starting transmission (this display only) |
| 84 ⇔ M | Green lighting | Green blinking | When the slave devices were not initialized |
| 91 ⇔ M | Green lighting | Red lighting | When busoff occurred (communication halt was chosen when busoff occurred) |
| 92 ⇔ M | Green lighting | Not lit | 1) No network power is supplied to the 1DN611.<br>2) The network connector on the DN611 was disconnected. |
| A0 - CA | Irregular | Irregular | When requests to the S2T are completed unsuccessfully, completion status (Table 4.17) is indicated on the 7-segment LED. |
| F0 ⇔ M | Red lighting | Not lit | Down mode: Watchdog timeout error |
| F1 ⇔ M | Red blinking | Not lit | Down mode: Memory bus trouble occurred |
| F2 ⇔ M | Red blinking | Not lit | Down mode: TRAP occurred |
| F3 ⇔ M | Red lighting | Not lit | Down mode: BCC check error occurred on ROM (at DN611 startup) |
| F4 ⇔ M | Red lighting | Not lit | Down mode: Read/write error occurred on RAM (at DN611 startup) |
| F5 ⇔ M | Red lighting | Not lit | Down mode: Read/write error occurred on the S2T communication memory at DN611 startup |
| F6 ⇔ M | Red blinking | Not lit | Down mode: DN611 node address setting abnormal |
| F7 ⇔ M | Red blinking | Not lit | Down mode: DN611 network communication rate setting abnormal |
| F8 ⇔ M | Red blinking | Not lit | Down mode: EEPROM for scan list read error occurred |

## 6.3 RAS Information Reading Data

This section describes the RAS information of the DN611 (RAS counter, event history, execution node information) read by the ladder program. See "4.6.6 RAS Information Read Request" for RAS information reading request.

### 6.3.1 The RAS Counter

When you specify "1" for request information type at RAS information read request, the RAS counter can be read on to the acknowledgement area. Individual items in the RAS counter of the DN611 have one byte data in size.

"H" or "L" in address column in Table 6.4 indicates the high-order byte or the low-order byte of the register area read.

H: F-8 bits side
L: 7-0 bits side

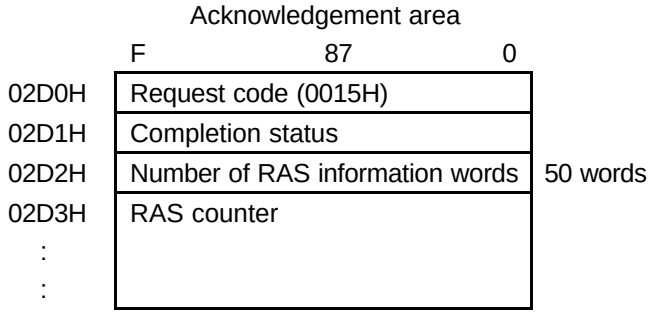



**Table 6.4 List of RAS Counters (1)**

| Symbol name | Address | | Description |
|---|---|---|---|
| RAS_CNT[0] | 02D3H | L | Abnormal interrupt (intret) |
| RAS_CNT[1] | 02D3H | H | Abnormal interrupt (trap) |
| RAS_CNT[2] | 02D4H | L | Number of HOST interrupt times |
| RAS_CNT[3] | 02D4H | H | Number of port request interrupt times |
| RAS_CNT[4] | 02D5H | L | Number of reception response interrupt times |
| RAS_CNT[5] | 02D5H | H | Reception response ID abnormal |
| RAS_CNT[6] | 02D6H | L | Reception response request code invalid |
| RAS_CNT[7] | 02D6H | H | Number of port request reception times |
| RAS_CNT[8] | 02D7H | L | Number of times other than port request register ON |
| RAS_CNT[9] | 02D7H | H | Number of port memory pool abnormal times |
| RAS_CNT[10] | 02D8H | L | Status code of port memory pool abnormal |
| RAS_CNT[11] | 02D8H | H | Number of reset request times |
| RAS_CNT[12] | 02D9H | L | Reset response |
| RAS_CNT[13] | 02D9H | H | Number of parameter request times |
| RAS_CNT[14] | 02DAH | L | Number of parameter response times |
| RAS_CNT[15] | 02DAH | H | Number of control request times |
| RAS_CNT[16] | 02DBH | L | Number of control response times |
| RAS_CNT[17] | 02DBH | H | Number of RAS read request times |
| RAS_CNT[18] | 02DCH | L | Number of RAS read response |
| RAS_CNT[19] | 02DCH | H | Number of time setting request times |

**Table 6.5 List of RAS Counters (2)**

| Symbol name | Address | | Description |
|---|---|---|---|
| RAS_CNT[20] | 02DDH | L | Number of time setting response times |
| RAS_CNT[21] | 02DDH | H | Number of input data read request times |
| RAS_CNT[22] | 02DEH | L | Number of input data read response times |
| RAS_CNT[23] | 02DEH | H | Number of output data write request times (bit strobe) |
| RAS_CNT[24] | 02DFH | L | Number of output data write response times (bit strobe) |
| RAS_CNT[25] | 02DFH | H | Number of output data write request times (polling) |
| RAS_CNT[26] | 02E0H | L | Number of output data write response times (polling) |
| RAS_CNT[27] | 02E0H | H | Number of explicit message request times |
| RAS_CNT[28] | 02E1H | L | Number of explicit message response times |
| RAS_CNT[29] | 02E1H | H | Number of invalid request code reception times |
| RAS_CNT[30] | 02E2H | L | Content of invalid request code reception |
| RAS_CNT[31] | 02E2H | H | Number of normal response times |
| RAS_CNT[32] | 02E3H | L | Number of abnormal response times |
| RAS_CNT[33] | 02E3H | H | Transmission MBX memory pool abnormal (for data) |
| RAS_CNT[34] | 02E4H | L | Transmission MBX memory pool abnormal (MBX) |
| RAS_CNT[35] | 02E4H | H | MBX transmission abnormal |
| RAS_CNT[36] | 02E5H | L | MBX reception abnormal |
| RAS_CNT[37] | 02E5H | H | Reception data size 0 byte |
| RAS_CNT[38] | 02E6H | L | Reception MBX release abnormal (for data) |
| RAS_CNT[39] | 02E6H | H | MBX Reception normal |
| RAS_CNT[40] | 02E7H | L | Down code |
| RAS_CNT[41] | 02E7H | H | Down detail code |
| RAS_CNT[42] | 02E8H | L | Number of confirm register 2-second waiting times |
| RAS_CNT[43] | 02E8H | H | Number of indication register 2-second waiting times |
| RAS_CNT[44] | 02E9H | L | EP-ROM SCAN list CRC error |
| RAS_CNT[45] | 02E9H | H | Number of DBASE normal SCAN lists |
| RAS_CNT[46] | 02EAH | L | Number of SCAN list settings (EP-ROM) |
| RAS_CNT[47] | 02EAH | H | Bit strobe 20 ms response wait |
| RAS_CNT[48] | 02EBH | L | Number of overrun times |
| RAS_CNT[49] | 02EBH | H | Number of error active times |
| RAS_CNT[50] | 02ECH | L | Number of error passives times |
| RAS_CNT[51] | 02ECH | H | Number of busoff times |
| RAS_CNT[52] | 02EDH | L | Number of transmission interrupt times |
| RAS_CNT[53] | 02EDH | H | Number of reception data ID abnormal times |
| RAS_CNT[54] | 02EEH | L | NMI error |
| RAS_CNT[55] | 02EEH | H | DEVICE-NET request data timeout |
| RAS_CNT[56] | 02EFH | L | I/O connection inactivity timeout |
| RAS_CNT[57] | 02EFH | H | Explicit connection inactivity timeout |
| RAS_CNT[58] | 02F0H | L | Vendor ID invalid |
| RAS_CNT[59] | 02F0H | H | Project type invalid |

**Table 6.6 List of RAS Counters (3)**

| Symbol name | Address | | Description |
|---|---|---|---|
| RAS_CNT[60] | 02F1H | L | Project code invalid |
| RAS_CNT[61] | 02F1H | H | Transmission maximum data length unmatched (polling) |
| RAS_CNT[62] | 02F2H | L | Transmission maximum data length unmatched (COS) |
| RAS_CNT[63] | 02F2H | H | Reception maximum data length unmatched (NO fragment) |
| RAS_CNT[64] | 02F3H | L | Connection table fragment buffer acquisition failed |
| RAS_CNT[65] | 02F3H | H | Fragment data type abnormal |
| RAS_CNT[66] | 02F4H | L | Fragment data intermediate counter abnormal |
| RAS_CNT[67] | 02F4H | H | Fragment data final counter abnormal |
| RAS_CNT[68] | 02F5H | L | Reception maximum size over |
| RAS_CNT[69] | 02F5H | H | Reception data length abnormal (fragment data) |
| RAS_CNT[70] | 02F6H | L | Polling 20 ms response wait |
| RAS_CNT[71] | 02F6H | H | NMI read port reading value |
| RAS_CNT[72] | 02F7H | L | Number of CAN transmission times |
| RAS_CNT[73] | 02F7H | H | CAN transmission disabled (content of status register) |
| RAS_CNT[74] | 02F8H | L | |
| RAS_CNT[75] | 02F8H | H | |
| RAS_CNT[76] | 02F9H | L | |
| RAS_CNT[77] | 02F9H | H | |
| RAS_CNT[78] | 02FAH | L | |
| RAS_CNT[79] | 02FAH | H | |
| RAS_CNT[80] | 02FBH | L | |
| RAS_CNT[81] | 02FBH | H | |
| RAS_CNT[82] | 02FCH | L | |
| RAS_CNT[83] | 02FCH | H | |
| RAS_CNT[84] | 02FDH | L | |
| RAS_CNT[85] | 02FDH | H | |
| RAS_CNT[86] | 02FEH | L | |
| RAS_CNT[87] | 02FEH | H | |
| RAS_CNT[88] | 02FFH | L | |
| RAS_CNT[89] | 02FFH | H | |
| RAS_CNT[90] | 0300H | L | |
| RAS_CNT[91] | 0300H | H | |
| RAS_CNT[92] | 0301H | L | |
| RAS_CNT[93] | 0301H | H | |
| RAS_CNT[94] | 0302H | L | |
| RAS_CNT[95] | 0302H | H | |
| RAS_CNT[96] | 0303H | L | |
| RAS_CNT[97] | 0303H | H | |
| RAS_CNT[98] | 0304H | L | |
| RAS_CNT[99] | 0304H | H | |

### 6.3.2 Event History

When you specify "2" for RAS information read request at request information type, event history data can be read into the acknowledgement area.

| | Acknowledgement area | |
|---|---|---|
| 02D0H | Request code (0015H) | |
| 02D1H | Completion status | |
| 02D2H | Number of RAS information words | n pieces × 8 words |
| 02D3H | Event history | (max. 80 words) |
| : | | |
| : | | |

➢Event history composition

- Record capacity: 8 word
- Number of records: 160 pieces
- Operation when overflowed: Old information is updated. Thus, 160 of event traces can be checked from new information.
- Format: Binary code is used because the format is for the DN611 internal information. See Table 6.7 and Table 6.8 for the contents of the binary codes. Note, however, the BCD time is displayed.

| | F | 0 | |
|---|---|---|---|
| 02D3H | Event code | | 1st event history |
| 02D4H | Detailed information 1 | | |
| 02D5H | Detailed information 2 | | |
| 02D6H | Detailed information 3 | | |
| 02D7H | Detailed information 4 | | |
| 02D8H | Month | Year | |
| 02D9H | Hour | Day | |
| 02DAH | Second | Minute | |
| 02DBH | Event code | | 2nd event history |
| 02DCH | Detailed information 1 | | |
| 02DDH | Detailed information 2 | | |
| 02DEH | Detailed information 3 | | |
| | | | |
| 02DFH | Detailed information 4 | | |
| 02E0H | Month | Year | |
| 02E1H | Hour | Day | |
| 02E2H | Second | Minute | |

**Figure 6.1 Event History Composition (when reading 2 events)**

**Table 6.7 Event Trace Items (1)**

| Event Code | Detailed Information 1 (H) | Detailed Information 2 (H) | Detailed Information 3 (H) | Detailed Information 4 (H) | Description |
|---|---|---|---|---|---|
| 0001H | Down code | 1: Memory check<br>2: TRAP<br>3: WDT | Content of read port<br>Content of WDT_FLG | | When module downed |
| 0002H | Startup type<br>01: Power<br>02: Soft reset<br>03: T2/E/N HALT | <br><br>Station status<br>Station Status | <br><br>Write port<br>Write port | <br><br><br>Read port | DN startup<br><br>Reset accept abnormal |
| 0003H | Before mode change | After mode change | | | Station mode change |
| 0004H | Request mode | Reception request code | Comparison ID | Reception ID | Reception instruction response |
| 0005H | 1<br>2 | EP_ROM composition data<br>EP_ROM_CRC | Number of DBASE settings<br>Calculation CRC | | Creating a scan list |
| 0050H | Request code | Completion status | | | Loader processing |
| 0100H | Request ID | Request code | Completion status | | Control port |
| 0111H | Station status | Contents of write port | | | Reset request |
| 0112H | Type<br>00: Local station setting | <br>01: Port No error<br>02: Node address unmatched<br>03: Polling mode<br>04: Scan time<br>05: Skipped<br>06: Transmission counter | | | Parameter request |
| | 01: Slave setting | 01: Number of pieces abnormal<br>02: Port No error<br>03: Node address abnormal<br>04: Specifying as the local station node address<br>05: Data length abnormal | | | |
| 0113H | Type<br>01: Unassigned BITON<br>02: Identical request<br>03: Permission bit ON (invalid in STBY)<br>04: STBY + RUN<br>05: RUN among RUNs<br>06: Task activation abnormal<br>07: STBY among STBY<br>08: Composition data end | <br>Request node<br><br><br><br><br><br><br>Parameter setting flag | <br>Present station status<br><br><br><br><br><br><br>Completion status | | Control request |
| 0118H | Request code (18H) | Completion status | | | Time setting |
| 0200H | Request ID | Request code | Completion status | | |
| 0241H | Request device ID | Scan type | | | Data read |
| 0242H | Type<br>01: Size abnormal<br>02: Scan type | <br>Request device<br>Request device | <br>Scan type<br>Scan type | <br>Data size | Data write |

**Table 6.8 Event Trace Items (2)**

| Event Code | Detailed Information 1 (H) | Detailed Information 2 (H) | Detailed Information 3 (H) | Detailed Information 4 (H) | Description |
|---|---|---|---|---|---|
| 0300H | MBX-ID | Event ID | Server node address | Client node address | MBX transmission abnormal |
| 0401H | Node address | Reception vendor ID | | | Reception vendor ID abnormal |
| 0402H | Node address | Reception project | | | Project type |
| 0403H | Node address | Reception project | | | Project code |
| 0404H | Node address | Reception data length | | | Data length abnormal |
| 0405H | Node address | Data length | | | Reception data length abnormal |
| 0406H | Error code | Node address | Reception node address | | Duplicated node address reception |
| 0407H | Error code | | | | Duplicated node address abnormal |
| 0408H | Node address | | | | Strobe deletion |
| 0409H | Node address | | | | Polling deletion |
| FFFFH | Pre-station status | Station status | Error code | Detailed code | System down |

### 6.3.3 Execution Node Information

When you specify "3" for request information type at RAS information read request, the execution information of the slave devices (module status, 7-segment LED status) can be read into the acknowledgement area.

| | Acknowledgement area | |
|---|---|---|
| 02D0H | Request code (0015H) | |
| 02D1H | Completion status | |
| 02D2H | Number of RAS information words | 64 words |
| 02D3H | Execution node information | |
| : | | |
| 0312H | | |

#### (1) Module Status (02D3H - 02F2H: 32 words)

02D3H-02F2H in the acknowledgement area are used for module status.

Module status indicates the operations in code that the DN611 is executing with slave devices and the network. "NA = □" in Table 6.9 shows a node address.

**Table 6.9 Module Status**

| | F 8 | 7 0 | | F 8 | 7 0 |
|---|---|---|---|---|---|
| 02D3H | NA = 1 | NA = 0 | 02E3H | NA = 33 | NA = 32 |
| 02D4H | NA = 3 | NA = 2 | 02E4H | NA = 35 | NA = 34 |
| 02D5H | NA = 5 | NA = 4 | 02E5H | NA = 37 | NA = 36 |
| 02D6H | NA = 7 | NA = 6 | 02E6H | NA = 39 | NA = 38 |
| 02D7H | NA = 9 | NA = 8 | 02E7H | NA = 41 | NA = 40 |
| 02D8H | NA = 11 | NA = 10 | 02E8H | NA = 43 | NA = 42 |
| 02D9H | NA = 13 | NA = 12 | 02E9H | NA = 45 | NA = 44 |
| 02DAH | NA = 15 | NA = 14 | 02EAH | NA = 47 | NA = 46 |
| 02DBH | NA = 17 | NA = 16 | 02EBH | NA = 49 | NA = 48 |
| 02DCH | NA = 19 | NA = 18 | 02ECH | NA = 51 | NA = 50 |
| 02DDH | NA = 21 | NA = 20 | 02EDH | NA = 53 | NA = 52 |
| 02DEH | NA = 23 | NA = 22 | 02EEH | NA = 55 | NA = 54 |
| 02DFH | NA = 25 | NA = 24 | 02EFH | NA = 57 | NA = 56 |
| 02E0H | NA = 27 | NA = 26 | 02F0H | NA = 59 | NA = 58 |
| 02E1H | NA = 29 | NA = 28 | 02F1H | NA = 61 | NA = 60 |
| 02E2H | NA = 31 | NA = 30 | 02F2H | NA = 63 | NA = 62 |

**Table 6.10 Module Status Code**

| Module status code | Description |
|---|---|
| 0 ( 00H ) | Normal status |
| 1 ( 01H ) | Not set to transmittable status enabled |
| 2 ( 02H ) | No data flows onto the transmission path |
| 3 ( 03H ) | Communication error occurred. |
| 4 ( 04H ) | The scan list differs from the actual slave composition. |
| 5 ( 05H ) | The network is encountering trouble. |
| 6 ( 06H ) | Abnormal network power is detected. |
| 9 ( 09H ) | Busoff is detected. |
| 10 ( 0AH ) | An Duplicated node address is detected. |

### (2) 7-Segment LED Status (02F3H - 0312H: 32 words)

02F3H-0312H in the acknowledgement area are used for the 7-segment LED status. The 7-segment LED status shows the DN611 status, network status, and status of the slave devices the DN611 manages. It corresponds with the error code indication on the front panel of the of DN611 (some of the statuses are not displayed on Table 6. 2 and Table 6.3). "NA = □ " in Table 6.11 shows a node address.

**Table 6.11 7-Segment LED Status**

| | F 8 | 7 0 | | F 8 | 7 0 |
|---|---|---|---|---|---|
| 02F3H | NA = 1 | NA = 0 | 0303H | NA = 33 | NA = 32 |
| 02F4H | NA = 3 | NA = 2 | 0304H | NA = 35 | NA = 34 |
| 02F5H | NA = 5 | NA = 4 | 0305H | NA = 37 | NA = 36 |
| 02F6H | NA = 7 | NA = 6 | 0306H | NA = 39 | NA = 38 |
| 02F7H | NA = 9 | NA = 8 | 0307H | NA = 41 | NA = 40 |
| 02F8H | NA = 11 | NA = 10 | 0308H | NA = 43 | NA = 42 |
| 02F9H | NA = 13 | NA = 12 | 0309H | NA = 45 | NA = 44 |
| 02FAH | NA = 15 | NA = 14 | 030AH | NA = 47 | NA = 46 |
| 02FBH | NA = 17 | NA = 16 | 030BH | NA = 49 | NA = 48 |
| 02FCH | NA = 19 | NA = 18 | 030CH | NA = 51 | NA = 50 |
| 02FDH | NA = 21 | NA = 20 | 030DH | NA = 53 | NA = 52 |
| 02FEH | NA = 23 | NA = 22 | 030EH | NA = 55 | NA = 54 |
| 02FFH | NA = 25 | NA = 24 | 030FH | NA = 57 | NA = 56 |
| 0300H | NA = 27 | NA = 26 | 0310H | NA = 59 | NA = 58 |
| 0301H | NA = 29 | NA = 28 | 0311H | NA = 61 | NA = 60 |
| 0302H | NA = 31 | NA = 30 | 0312H | NA = 63 | NA = 62 |

**Table 6.12 7-Segment LED Status Code**

| Module status code | Description |
|---|---|
| 70 (46H ) | DN611 is encountering trouble at duplicated node address checking. |
| 72 (48H ) | DN611 cannot communicate with slave devices. |
| 73 ( 49H ) | The vendor ID, product type, or product code of a slave device differ from those in the scan list of the DN611. |
| 75 ( 4BH ) | No slave device is found on the network.<br>No slave device is registered in the scan list. |
| 76 ( 4CH ) | DN611 has detected communication timeout since no response from slave devices. |
| 77 ( 4DH ) | When the transmission size of a slave device differs from the size in the scan list of DN611. |
| 78 ( 4EH ) | DN611 cannot start transmission with slave devices. |
| 79 ( 4FH ) | DN611 cannot send to slave devices. |
| 80 ( 50H ) | DN611's communication port is set to IDLE mode. |
| 81 ( 51H ) | DN611's communication port is set to FAULT mode. |
| 82 ( 52H ) | An error occurred due to fragmented transmission/reception data. |
| 83 ( 53H ) | Slave device initialization was refused. |
| 84 ( 54H ) | Slave device initialization is not completed. |
| 85 ( 55H ) | DN611 reception buffer has an overflow. |
| 91 ( 5BH ) | Busoff has occurred at DN611. |
| 92 ( 5CH ) | Network power of DN611 has trouble. |

# 7. Troubleshooting

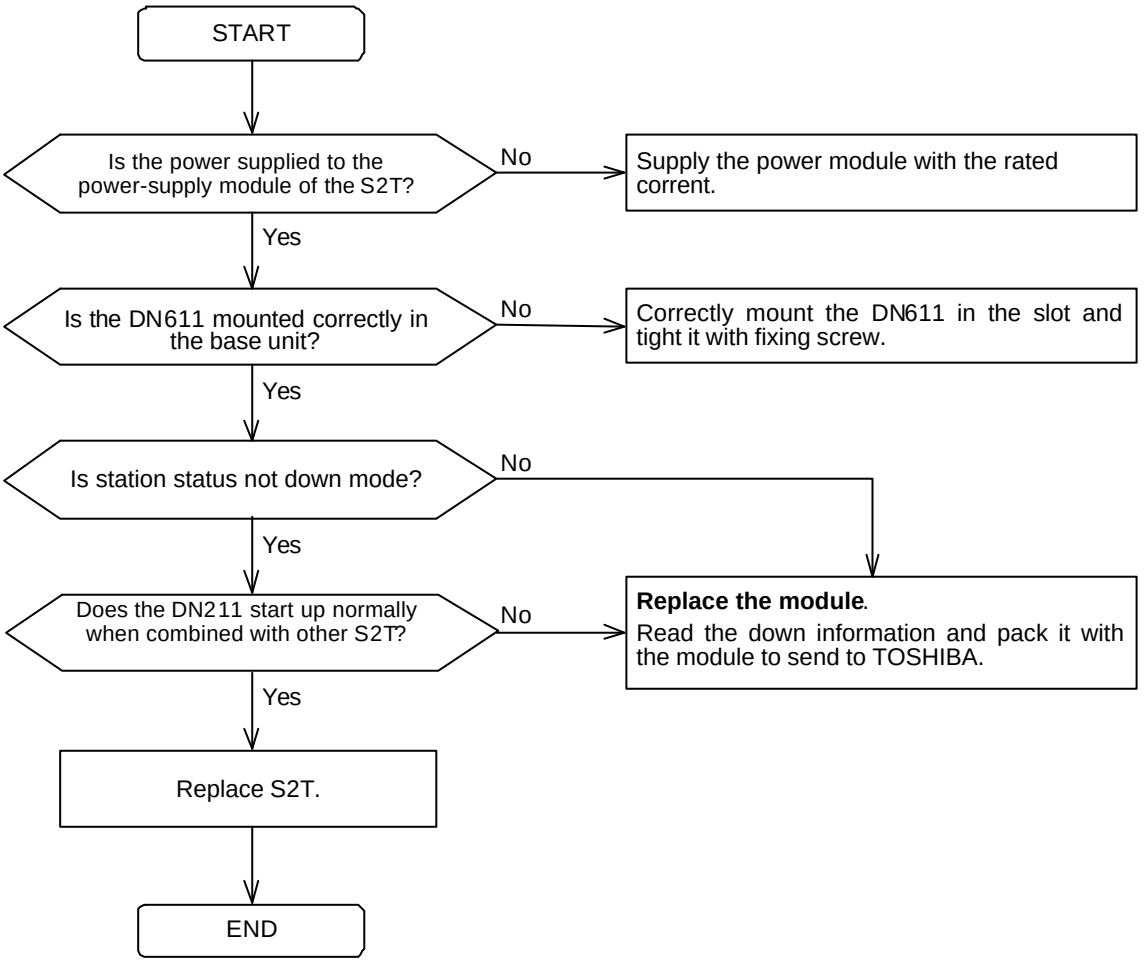
This chapter discusses how to find the cause of the trouble and countermeasures during the DN611 operation. Also refer to the S2T Main Unit User's Manual when encountering trouble.

## 7.1 When Starting up the Module

### (1) If the module does not start up normally (becoming no standby status)

When the module is normal, the DN611 starts module initialization when the power is turned ON or reset is requested, and then becomes standby status.

Standby status: MS, NS: Not lit 7-Segment LED: Node address is lighting.

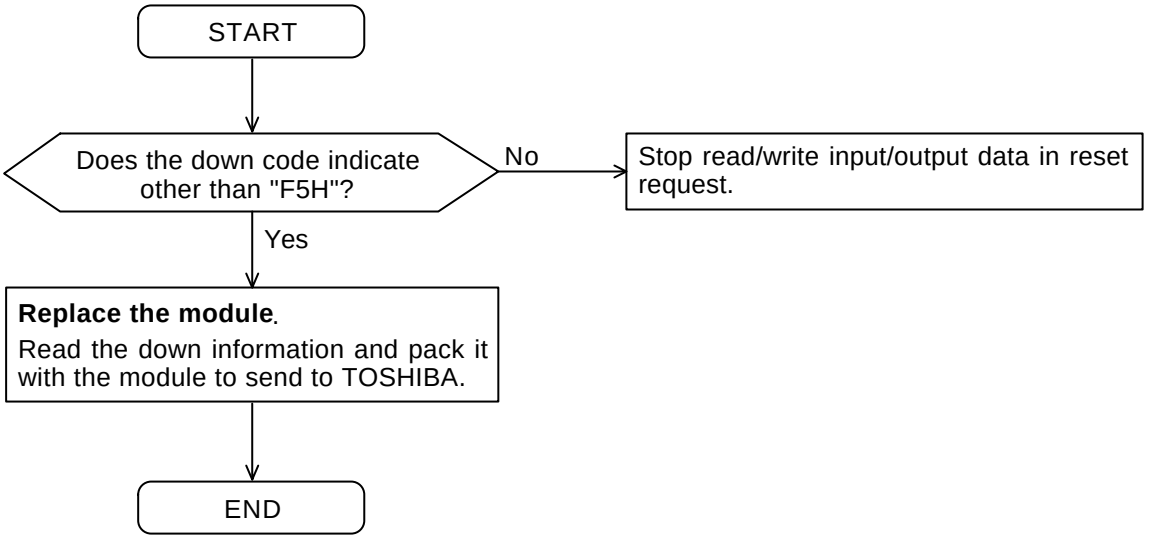



### (2) When Encountering Down Mode While Communicating with Slave Devices

| | |
|---|---|
| Countermeasure | **Replace the modules**.<br>Record the down information before replacing the module (as noted on the module front).<br>Send the downed module and down information to TOSHIBA. |

## 7.2 Reset Request (scan list clear)

### (1) The module Becomes Down Mode After Issuing a Reset Request




### (2) The Module Doesn't Return to Standby Mode When Requesting Reset with Scan List Clear

When scan list clear is specified and when the scan list is unassigned, the reset request takes about 9 seconds. When it takes a longer time, reset the power.

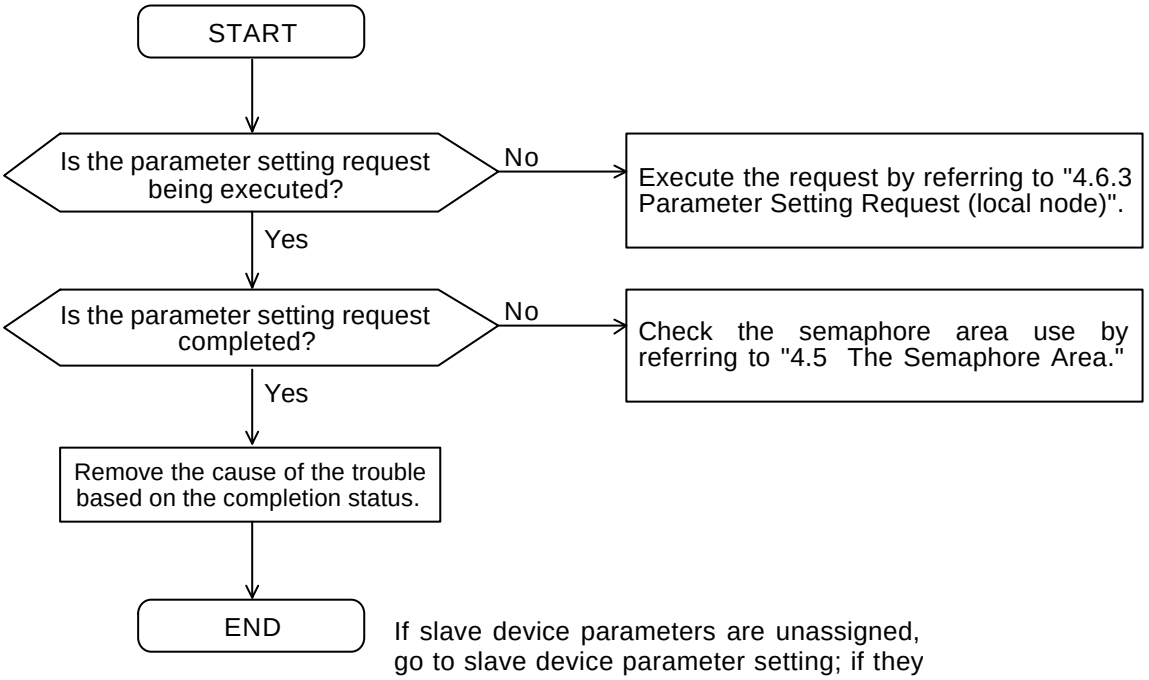
If it takes 9 seconds or more after resetting the power, **replace the module**.

## 7.3 When the Module Doesn't Become Run Mode

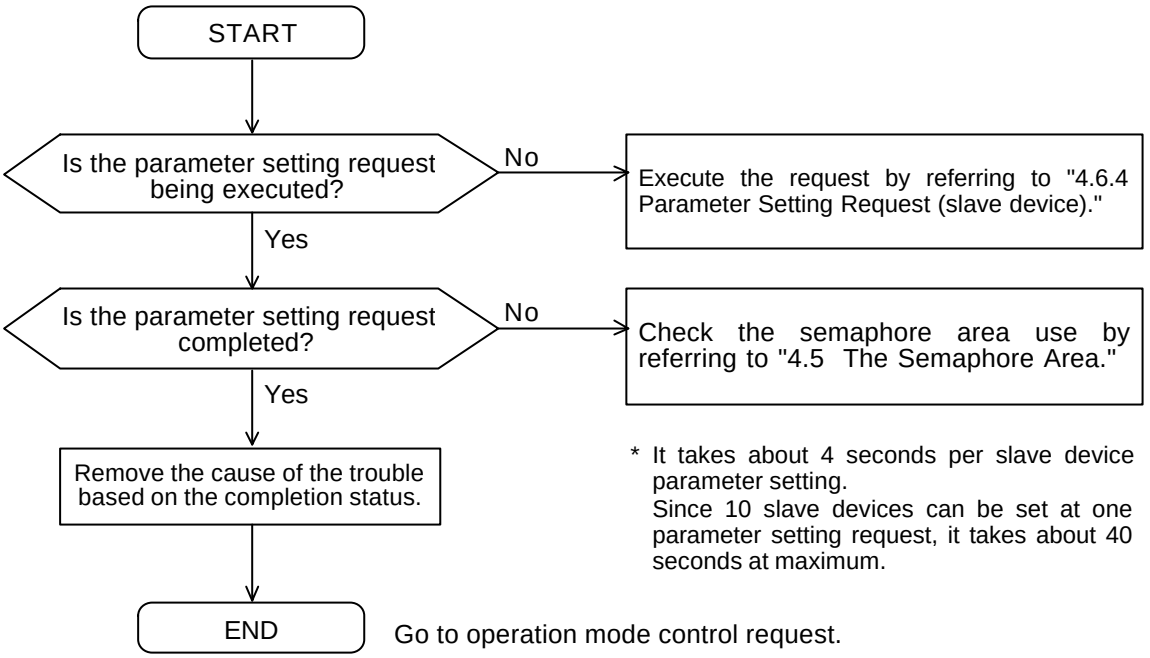
This section describes on the assumption that the module has started up normally.

Set the parameters of the local station at parameter setting request before issuing an operation mode control request when you are changing to run mode from standby mode after having started up the module. Also, clear the scan list before setting slave device parameters at parameter setting request when the configuration of the slave devices is changed.

### (1) Local Node Parameter Setting Request



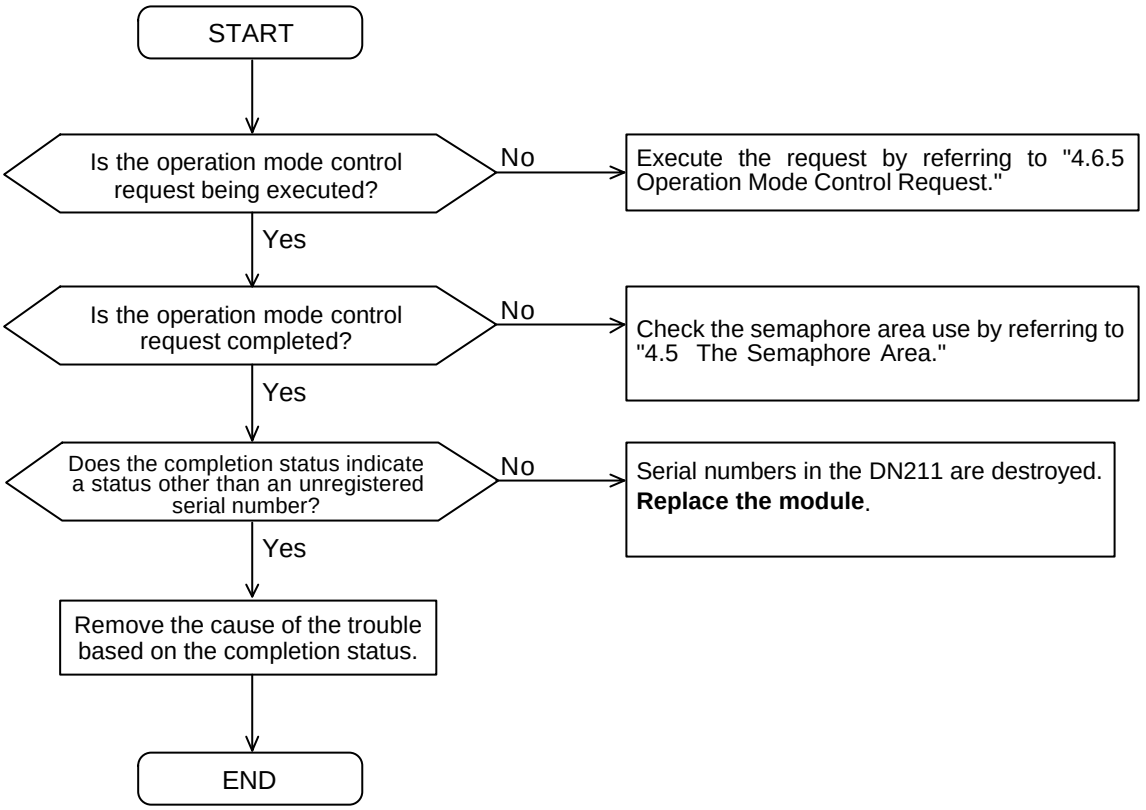
### (2) Slave Device Parameter Setting Request




* It takes about 4 seconds per slave device parameter setting.
Since 10 slave devices can be set at one parameter setting request, it takes about 40 seconds at maximum.

Go to operation mode control request.

### (3) Operation Mode Control Request



## 7.4 Data Communication with Slave Devices

### (1) Data Communications with Slave Devices Don't Start

When the 7-segment LED indicates an error, try to remove the cause of the trouble by referring to "6.2 Indications of the 7-Segment LED."

| | **Checking objects** |
|---|---|
| DN611 | Check the S2T side power-supplies. |
| | Check the connection of the network cables (mis-wiring, disconnection).<br>Refer to "3.4 Connection with the Network." |
| | Check the node address setting (for node address duplicated).<br>Refer to "3.2.2 Rotary Switch for Node Address Setting." |
| | Check the setting of the network communication rate (for the same communication rate).<br>Refer to "3.2.1 DIP Switch for Setting Operation Mode / Communication Rate." |
| | Check the local node parameter setting and the scan list.<br>Refer to "4.6.3 Parameter Setting Request (local node)" and "4.6.4 Parameter Setting Request (slave device)". |
| | Check the slave devices for normal operation by referring to the slave device description. |
| Slave device | Check the slave device main unit for the power. |
| | Check the connection of the network cables (mis-wiring, disconnection). |
| | Check the node address settings (for node address overlapped). |
| | Check the network communication rates (for the same communication rate). |
| | Check setting items specific to individual slave devices. |
| | Check the terminal resistor on both ends of the trunk cable (121Ω). |
| Network | Check the maximum network length specified.<br>Refer to "1.2.2 Trunk Line/Drop Line and Maximum Cable Length." |
| | Check the drops cable length (less than 6 m). |
| | Check the total extension of drops cables.<br>Refer to "1.2.2 Trunk Line/Drop Line and Maximum Cable Length." |
| | Check the network power mechanism and the power capacity.<br>Refer to "3.5.1 The Network Power Mechanism" and "3.5.3 The Network Power Unit (24vdc)." |
| | Check the grounding of the network cables.<br>Refer to "3.5.4 The Network Grounding." |
| | |

### (2) Communication with Slave Devices Aborted

When the 7-segment LED indicates an abnormal code, remove the cause of the trouble by referring to "6.2 Indications of the 7-Ssegment LED."

| | Checking objects |
|---|---|
| DN611 | Check the S2T side power-supplies. |
| | Check the connection of the network cables (mis-wiring, disconnection).<br>Refer to "3.4 Connection with the Network." |
| | Check the node address setting (for node address duplicated).<br>Refer to "3.2.2 Rotary Switch for Node Address Setting." |
| | Check the setting of the network communication rate (for the same communication rate).<br>Refer to "3.2.1 DIP Switch for Setting Operation Mode / Communication Rate." |
| | Check the local node parameter setting and the scan list.<br>Refer to "4.6.3 Parameter Setting Request (local node)" and "4.6.4 Parameter Setting Request (slave device)". |
| Slave device | Check the slave devices for normal operation by referring to the slave device description. |
| | Check the slave device main unit for the power. |
| | Check the connection of the network cables (mis-wiring, disconnection). |
| | Check the node address settings (for node address overlapped). |
| | Check the network communication rates (for the same communication rate). |
| | Check setting items specific to individual slave devices. |
| Network | Check the terminal resistor on both ends of the trunk cable (121Ω). |
| | Check the maximum network length specified.<br>Refer to "1.2.2 Trunk Line/Drop Line and Maximum Cable Length." |
| | Check the drops cable length (less than 6 m). |
| | Check the total extension of drops cables.<br>Refer to "1.2.2 Trunk Line/Drop Line and Maximum Cable Length." |
| | Check the network power mechanism and the power capacity.<br>Refer to "3.5.1 The Network Power Mechanism" and "3.5.3 The Network Power Unit (24vdc)." |
| | Check the grounding of the network cables.<br>Refer to "3.5.4 The Network Grounding." |

### (3) Overrun Errors Occur

An overrun error occurs when data slave devices transmitted cannot be received by the DN611 (the number of overrun error times is stored at 02C5H in the RAS information area).

**How to Solve Overrun Error:**

1) **Lower the network communication rate when overrun errors occur.**
(500 kbps → 250 kbps → 125 kbps)

2) **Set the polling transmission mode to "1" at local station parameter setting request when the polling slaves and bit strobe slave devices have been intermingled.**
(waiting for polling response after polling request by a slave device is issued)

# 8. Installation/Wiring Work

## 8.1 Installation Environment and Mounting in the Base Unit

Use your DN611 in the installation environment specified in the "Installation Environment" of "S2T User's Manual." Also, follow the instructions specified in "Installation Environment" when you are installing the control board containing your DN611.

Read the instructions relating to the base unit mounting specified in the 'S2T User's Manual" before you mount the base unit.

**⚠ CAUTION**

1. Apply the environment specified in the User's Manual of the S2T.

   When using your DN611 in the environment other than specified, the DN611 can cause electric shock, fire, failure, and/or malfunction.

2. Mount your DN611 in the way specified in the User's Manual of the S2T.

   If mounted in the direction other than specified or if mounted incorrectly, the DN611 could fall off, or cause fire, failure, and/or malfunction.

## 8.2 Mounting/Removing the Module

Follow the instructions specified in "Mounting the Module" of the 'S2T User's Manual" when you are mounting/removing the module.

**⚠ CAUTION**

1. Since the DN611 is designed for the T2 series, be sure to attach it to the base unit. Don't use your DN611 in stand-alone state or to other applications.

   Failing to do so could cause electric shock, injury, and/or failure.

2. Be sure to turn OFF the power before mounting, removing, wiring, or un-wiring the DN611. Failing to do so can cause electric shock, malfunction, and/or failure.

3. Keep your DN611 free from foreign matter such as electric-wire waste. Failing to do so could cause fire, failure, and/or malfunction.

4. Check the connectors and cables and the DN611 mount in the base unit, for their firm connection and mount using stoppers/screws. Loose connection and mounting becomes shaky and easily disconnected, resulting in failure or malfunction.

## 8.3 Power Unit Wiring/Grounding

### 8.3.1 Power Unit Wiring

#### (1) S2T Side Power Unit Wiring

Follow the instructions in "Power Unit Wiring" of the "S2T User's Manual" when wiring them.

#### (2) Network Power Unit Wiring

Refer to "3.5 Network Power/Grounding" in this instruction manual.

### 8.3.2 Grounding

#### (1) S2T Side Ground Wiring

Follow the instructions in "Grounding" and "Installation Method" in 'S2T User's Manual" when wiring them.

#### (2) Ground Wiring of the Network Power Unit

Refer to "3.5 Network Power Unit/Grounding" in this manual.

**⚠ CAUTION**

1. Be sure to turn OFF the power before wiring cables. Failing to do so could cause electric shock.
2. Use crimp-on connectors with sheath or cover the conducting part with tape when wiring your S2T power module. Also, handle the terminal block cover correctly to avoid fall-off and damage when fixing. Be sure to fix the cover on the terminal block when completing the wiring. If the conducting part is exposed, you can have electric shock.
3. Be sure to have grounding. When not grounded, electric shock and/or malfunction can occur.
4. Make sure the wiring is correct when connecting the DeviceNet cables to the network side connector. The short circuit of the network power, etc. can fail communication with other nodes.
5. When you are going to detach or connect the network side connector to/from the device side connector on the DN611 front panel, don't engage yourself while the S2T side power is rising. Failing to do so can cause the DN611 to fail or malfunction.
6. Attaching the opposite end of the network side connector with/from the device side connector is not possible because of the specific form. Trying connecting the wrong end by excessive force can damage both the network side connector and the device side connector.
7. Ask a qualified person to wire cables. Incorrect wiring can cause fire, failure, and/or electric shock.

## 8.4 Network Installation

Refer to "3.6 The Network Components" for the network components.

This section describes the installation gists both for outside and inside the control board.

| ⚠ CAUTION |
|---|
| 1. Ask the qualified subcontractor for sufficient safety and noise-suppression measures when installing the DeviceNet cable.<br>Refer to DeviceNet Volume I, Release 1.3, for the standard installation.<br>2. It is recommended to consign a subcontractor specialized in safety measures and standards.<br>3. Avoid the network components for the DeviceNet cable from installing into a noisy environment. When installing, be sure to furnish noise-suppression measures as described in the following section. |

### 8.4.1 Installation Gists Outside the Control Board

#### (1) Installation Environment and Application Construction:

Performs the cable installation work as shown in the following table, depending on the environment.

**Table 8.1 Installation Environment and Application Construction**

| Environment for cable installation | | Work description |
|---|---|---|
| **Large classification** | **Small classification** | |
| Site that cables get damaged | | Installation work except piping /Piping work |
| Site that cables get damaged | Place where people and things move | Piping work |
| | Place subject to humidity, chemicals, oil, heat, etc. | Metal piping work |
| | Place where cables are subject to damage by rats and other animals | Piping work |
| | Place subject to strong mechanical shock or pressure by heavy stuff | Metal piping work |
| Place subject to possible electromagnetic interference | | Cable separation and protection work Metal piping work |

Either metal pipes or hard vinyl pipes are good for "piping work."

### (2) Installation Work Without Piping

① Install a floor duct to protect cables or use wire protector cable covers.Don't intermingle these cables with high-voltage current cables when installing them.

② Wire cables along the wall to avoid cable damage, or under the floor where an electromagnetic interference device is not installed.

③ Keep the standard separation distance for the cables when they are going to be wired in parallel, or wired close, or crossed with low-voltage cables for the building.

④ Fix the cable on the wall in every 3-meter distance to protect them when you wire them on the wall or when you wire them vertically.

⑤ Don't bend cables in circle of a radius smaller than the minimum bending radius.

### (3) Cautions in Piping Work

① Don't mix these cable with high-voltage current cables in the same piping.

② Keep the bending angle of piping within 90 degrees.

③ Keep the bending radius of piping 6 times or larger than the inner radius of piping; keep the bending radius of piping larger than the minimum bending radius of the cables in the pipe.

④ Ground metal pipes.

### (4) Separation from Other Wiring

Keep the network cables 2 meters away from electric power lines and from those devices which generate magnetic fields and electric fields. When you are wiring cables at a distance smaller than 2 meters, refer to the following table to find a minimum permissible distance based on the actual voltage and current of the induction source.

Note, however, that the induction source must be kept at 440 V and 100 A or less to protect weak signals.

**Table 8.2 Minimum Distance of Separation Recommended**

| Induction source voltage and current | Minimum distance of parallel lines (mm) | | | |
|---|---|---|---|---|
| | Over 100 A | 100 A or less | 50 A or less | 10 A or less |
| Over 440 V | 2000 | 2000 | 2000 | 2000 |
| 440 V or less | 2000 | 600 | 600 | 600 |
| 220 V or less | 2000 | 600 | 600 | 500 |
| 110 V or less | 2000 | 600 | 500 | 300 |
| 60 V or less | 2000 | 500 | 300 | 150 |

It is recommended to use a metal cable duct with lid or a protective pipe made from steel in consideration of noise-proof nature. The following table shows electric power lines in parallel wiring and a recommended minimum distance table.

**Table 8.3 Recommended Minimum Distance (metal duct with lid, and metal piping work) in mm**

| Cable Installation | | Duct with lid or protective steel piping | | | | | |
|---|---|---|---|---|---|---|---|
| Parallel distance | | 10 m or less | 25 m or less | 100 m or less | 200 m or less | 500 m or less | 501 m or more |
| Electric power cable | 125 V and 10A, or less | 10 | 10 | 50 | 100 | 200 | 250 |
| | 250 V and 50A, or less | 10 | 50 | 150 | 200 | 250 | 250 |
| | 400 V and 100A, or less | 50 | 100 | 200 | 250 | 250 | 250 |
| | 500 V and 200A, or less | 100 | 200 | 250 | 250 | 250 | 250 |
| | Exceding the above | 500 or more | | | | | |

<Microcomputer–Applied Measuring Instrument Installation Guideline>
By Japan Electrical Measurement Equipment Industry Association

Place a separator (steel) in the cable duct as shown below to separate from electric power lines.

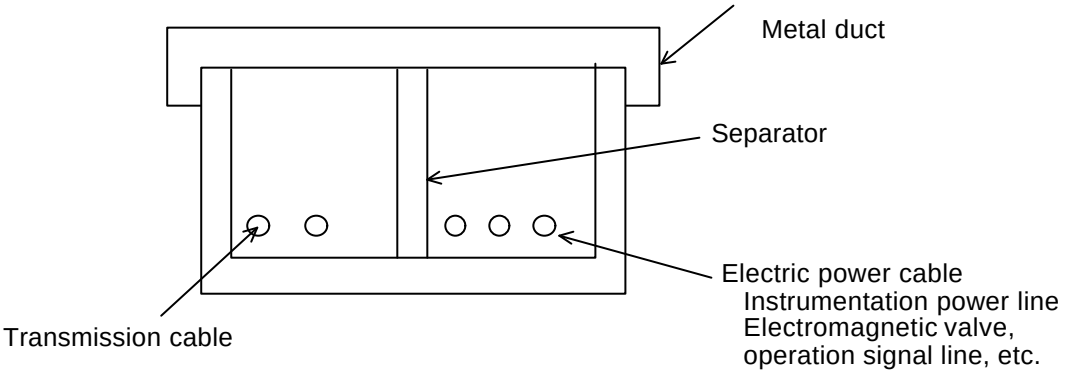



**Figure 8.1 Example of Installation in the Duct**

Use a separator to install cables in the pit as in the duct.

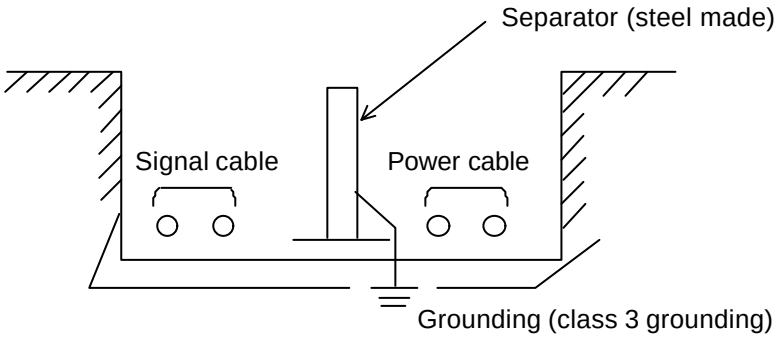



**Figure 8.2 Example of Installation in the Pit**

#### (5) Installation Routes

The following route order is recommended to install transmission cables.

① Using the leased route

② Using the computer system leased route

③ Using the general instrumentation route

④ Using the leased route for plant control

### 8.4.2 Installation Gists Inside the Control Board

Abide by the following points when installing the DeviceNet cable in the Control board.

1) Wiring route

   Use the weak signal route in the Control board when wiring DeviceNet cables.

   In particular, keep these cables 50 cm away from the power cable.

2) Fixing the Cables

   Use clamps to bear the weight of the cable so that the connector doesn't bear it.

   Don't bend the cable in circle smaller the minimum bending radius.

3) Ask the manufacturer for the bending radius of the cable and other physical characteristic values.

4) Don't install cables at a place that has a high temperature, humid environment, dust, or oil mist.

## Appendix 1 Maintenance and Inspection

<Periodical Inspection>

Perform periodical inspection (once for every six months or so). Also perform inspection when the surroundings or environment is changed.

**Table 1 Periodical Inspection Items**

| Check item | Check content | Judgment standard | Measure when abnormal |
|---|---|---|---|
| Power, etc. (S2T side power/network power) | Measure the voltage on power terminal. | Must be within the limits specified. | Keep the input voltage within the limits specified. |
| | Is a power terminal screw loose? | Not loose. | Turn OFF the power to tighten the loose screw. |
| | Is a wired cable damaged? | Not damaged | Turn OFF the power to wire the cable again. |
| Attachment state | Is the module fixed firmly? | Not loose, not saccadic | Tighten the screwdriver. |
| Connecting network cables | Is the network cable fixed with the network side connector? | No loose cable fixing screw | Loose the cable fixing screws and tighten them again. |
| | Is the connection cable is nearly broken? | No abnormal appearance | Strip the cable coating and connect the cable core with the connector. |
| | Is the network side connector completely inserted into the module side? | No loose module side connector | Firmly insert the network side connector into the module side before tightening the fixing screws. |
| Wiring transmission cables (see "8.4 Network Installation") | Is the trunk/drops cable not damaged? | No damage. | Stop the system; turn OFF the power; wire the cables again. |
| | Is a cable not wired near the power cable, etc.? | No power line near the cable | Keep the cable distance from the power cable.<br>Cover the cable with shield. |
| Surrondings | Check whether the temperature, humidity, vibration, dust, etc. are within the specification. | Within general specification. | Improve them into permissible range specified. |

## ⚠ CAUTION

1. Be sure to turn OFF the power mounting or removing the module, terminal block, and cable. Failing to do so can cause electric shock, malfunction, and/or failure.
2. Carry out daily check, periodical check, and cleaning to keep the system in normal condition.
3. If your DN611 does not operate normally, refer to "7. Troubleshooting" to identify the cause of the trouble.

   Contact a Toshiba's branch office (or dealer) or service agency for returning your DN611 for repair when failed. Operation and safety of your DN611 can be guaranteed only when repaired by Toshiba or a Toshiba's authorized service agency.
4. Neither try to disassemble nor modify the hardware of the module. Similarly, don't modify the software by any means. Failing to do so could cause fire, electric shock, and/or injury due to failure or malfunctioning.
5. Make sure you are safe when measuring the voltage on the connector of the module.

   Failing to do so could cause electric shock.
6. Stop the network and turn OFF the S2T side power before replacing the module.

   Failing to do so could cause electric shock, malfunction, and/or failure.
7. Don't use your DN611 in abnormal condition such as smoking or nasty smelling.

   Failing to do so could cause fire, electric shock, and/or failure.

   If such an abnormal condition happens, turn OFF all the power supplies immediately and contact a Toshiba branch office (or dealer) or authorized service agency.

   Since it is very dangerous, don't engage yourself in modifying or repairing your DN611 by any means.

## Appendix 2 READ/WRITE Instruction Execution Time

The READ and WRITE instructions have different execution times, depending on the S2T.

1) For the basic base unit

- READ instruction

  Instruction execution time (μs) = 123.8 (μs) + 5.00 (μs/word) × N (word)

- WRITE instruction

  Instruction execution time (μs) = 127.8 (μs) + 5.00 (μs/word) × N (word)

2) For the extended base unit

- READ instruction

  Instruction execution time (μs) = 127.8 (μs) + 5.38 (μs/word) × N (word)

- WRITE instruction

  Instruction execution time (μs) = 127.8 (μs) + 5.24 (μs/word) × N (word)

## Appendix 3 DN611A

In DN611A, the function enhancing old model DN611 and the problem are corrected.

A. Feature of DN611A

A-1 DN611A has passed ODVA conformance test


A-2 Compatibility with old model DN611

(a) DeviceNet communication function

It has not changed with old model DN611 (polling instruction / response mode and bit strobe instruction / response mode are supported).

(b) The communication memory map between S2T and DN611A

It has not changed with old model DN611.

(c) Station status

A bit 0 displays network power supply normal / abnormal in DN611A. (In old model DN611, it was a "reservation bit" )

ON : Network power abnormal

OFF: Network power normal

(d) Parameter setting request (slave device)

In specifing scan type of slave device, "the mix of polling and bit strobe" was available at old model DN611, but this specification is stopped using in DN611A.

This is because the slave which uses the mix of polling and a bit strobe does not exist.

(e) Operation mode control request

Although the bit 4 was "transmission start / stop bit" in old model DN611, this bit does not influence operation of DN611A even if it is operated .

In DN611A, if it becomes the run mode and it will become the "transmission start", if it becomes the standby mode and it will become "transmission stop."

However, In DN611A, ON/OFF of bit 4 is reflected in the bit 4 of station status for compatibility with the radder program of old model DN611.

(f) 7 segment LED display

| Situation | Old model DN611 | DN611A |
|---|---|---|
| The slave which does not exist on a network was registered into the master, and transmission was started. | “72” and the node address of the slave which does not exist are displayed by turns. | “78” and the node address of the slave which does not exist are displayed by turns. |
| The response of a slave were lost during normal transmission between master and slave. | “72” and the node address of the slave which does not exist are displayed by turns. | “78” and the node address of the slave which does not exist are displayed by turns. |
| The receiving size of the slave registered into the master differed from the receiving size of an actual slave. | "72" and the node address of the slave from which reception size is different are displayed by turns. | "77" and the node address of the slave from which reception size is different are displayed by turns. |
| The scan type of the slave registered into the master differed from the scan type of an actual slave. | “72” and the node address of the slave from which scan type is different are displayed by turns. | “83” and the node address of the slave from which scan type is different are displayed by turns. |

B. "Local node parameter" is written in DN611A.

Using old model DN611, the user must set the local node parameter in DN611 by the ladder program at each time of control power supply turning on (or module reset).

DN611A memorizes the local node parameter to the nonvolatile memory in oneself (as well as the slave device parameter).

For this reason, if the local node parameter and the slave device parameter are set once as DN611A, a user can make DN611A the run mode after a control power supply turning on (or module reset) using the operation mode control request.

C. DN611A corresponds to DeviceNet Wizard for TOSHIBA.

C-1 Registration of local node parameter and slave device parameter

The user needed to carry out the local node parameter setup and the slave device parameter registration to old model DN611 by the ladder program.

DN611A can use DeviceNet Wizard for TOSHIBA (option), the user can register a self-node parameter and a slave device parameter into DN611A using DeviceNet Wizard for TOSHIBA.

The local node parameter registration and slave device parameter registration which used the ladder program of course are also possible in DN611A.

C-2 Allocating slave device data to the input/output data area in DN611A

In old model DN611, the slave device data is allocated from the head of input/output data area for DN611 in order with small node address of the registered slave device (Refer to 4.4 Allocating Slave Device Data to the Input/Output Data Area).

In DN611A, after setting the slave device parameter in DN611A by using DeviceNet Wizard for TOSHIBA, the user can freely allocate the slave device data to input/output data area of DN611A.

C-3 The parameter registration by ladder program and the parameter registration by DeviceNet Wizard for TOSHIBA

Registration by the ladder program and registration by DeviceNet Wizard for TOSHIBA must not exist together (The example:The node parameter is registerd by the ladder program and the slave device parameter is registerd by DeviceNet Wizard for TOSHIBA).

If registration by both is intermingled, rewriting of the contents of registration etc. occurs and there is a possibility that the allocation of slave device data to input/output data area may become impossible.

D. Problem in old model DN611

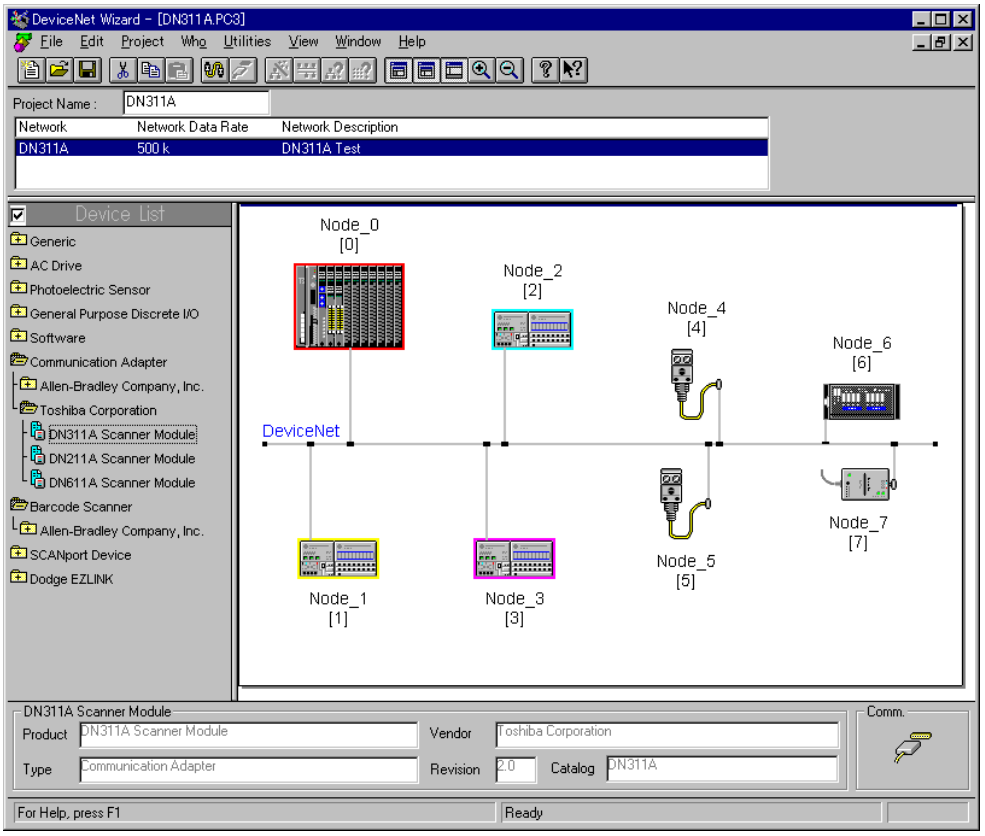
The following restriction which was in old model DN611 is solved in DN611A.

| |
|---|
| Using the polling mode slave device which transmission data size from master device is "0 bytes", when that slave device fails to communicate with DN611 due to some reason (power of that slave device side turned OFF, connector removed, etc.), DN611 cannot identify that slave device being malfunctioned.<br>Even after the cause of the failure is solved, no communication between that slave device and DN611 can be resumed. |

E. DeviceNet Wizard for TOSHIBA

DeviceNet Wizard for TOSHIBA is software which works on Microsoft Windows 95/98/NT4.0. The user can keep handy with the registration of the slave parameter to the master module and the allocation of the slave data to master module input/output area by graphical user interface like the figure below.

Please buy DeviceNet Wizard for TOSHIBA from our company. Product code:TDW33E2SS



The personal computer in which DeviceNet Wizard for TOSHIBA is installed is connected with the DeviceNet network and actual, various work is done. There are three kinds of interfaces of the following by which the personal computer is connected with the DeviceNet network. Please buy the product from each maker's agency.

| Product code | Explanation | Maker |
|---|---|---|
| 1770- KFD | RS-232C interface | Rockwell Automation |
| 1784- PCD | PCMCIA interface | Rockwell Automation |
| 5136- DN | ISA bus interface | S-S Technologies |

## Appendix 4 Added/ corrected function of DN611A firmware (revision B)

In this section, the function added / corrected in the DN611A firmware (revision B) is explained. A firmware (revision B) improves the following phenomena generated in the conventional firmware (revision A). The firmware (revision B) is introduced from the product after the serial number "02800001" of DN611A. Moreover, when the seal of "B" is attached on the end of a serial number, a firmware is upgrade ending at revision B.

| | |
|---|---|
| A manufacture year / month (August, 2002)<br>↓<br>Serial number : 02800001<br>↑<br>Reference number of manufacturing products in August, 2002 | Manufacture month<br>October : X<br>November : Y<br>December : Z |

## (1) Correction functions

| No.1 | Starting action on S3 and DN311A (S2 and DN611A) combined system |
|---|---|
| Phenomenon | In the combination of S3 (OS version: 02.60 or later) and DN311A (firmware revision: A), if you carry out starting of the S3 CPU module, the S3 CPU module will become down mode by "the abnormalities in DN initialization."<br>Same phenomenon will occur on the combination of S2 (OS version: 02.60 or later) and DN611A (firmware revision: A). |
| Generating conditions | S3 (OS version: 02.60 or later) and DN311A (firmware revision: A) are combined.<br>S2 (OS version: 02.60 or later) and DN611A (firmware revision: A) are combined. |
| Supplement | 1) This phenomenon does not occur if the OS version of S3/S2 is a thing before "version 02.60".<br>2) When T3-series/T2-series and DN311A/DN211A are combined, this phenomenon does not occur.<br>**3) When S2T and DN611A are combined, this phenomenon does not occur.** |

| | |
|---|---|
| No.2 | DN311A/DN611A/DN211A action at the time of requesting “a RUN request” and ”a STANDBY request” continuously |
| Phenomenon | In DN311A/DN611A/DN211A (firmware revision: A), when "a RUN request" and "a STANDBY request" are continuously requested from the user program, DN311A/DN611A/DN211A may not restore communication with slave devices. |
| Generating conditions | If the interval between “a STANDBY request” and “a RUN request” is longer than a fixed period(*), this phenomenon does not occur.<br>(*)A fixed period -- Period of the "transmission timing" set as the local node parameter of DN311A/DN611A/DN211A |
| Supplement | When this phenomenon occurs, reset DN311A/DN611A/DN211A and request a RUN request. Then DN311A/DN611A/DN211A restores communication with slave devices. |

| | |
|---|---|
| No.3 | DN311A/DN611A/DN211A action when network power supply is restored to normal condition. |
| Phenomenon | In DN311A/DN611A/DN211A (firmware revision: A), the malfunctions in a network power supply are detected during communication with slave devices.<br>When a network power supply is restored to normal condition after that, DN311A/DN611A/DN211A may not restore communication with slave devices. |
| Generating conditions | If the interval between “no network power supply detection” and “normal detection” is longer than a fixed period(*), this phenomenon does not occur.<br>(*)A fixed period -- Period of the "transmission timing" set as the local node parameter of DN311A/DN611A/DN211A |
| Supplement | When this phenomenon occurs, reset DN311A/DN611A/DN211A and request a RUN request. Then DN311A/DN611A/DN211A restores communication with slave devices. |

## (2) An additional function

| No.1 | Integrated Controller S3/S2 operate DN311A/DN611A |
|---|---|
| Contents | 1) If you carry out RUN starting of the S3/S2 CPU module, DN311A/DN611A will automatically carry out RUN starting in the asynchronous mode.<br>Former, it was needed to request the RUN request to DN311A/DN611A by the user program.<br>2) It became possible to register the input/output data of DN311A/DN611A as a network variable using "the engineering tool 2", and to use them by S3/S2.<br>Former, it was needed to transfer the input/output data of DN311A/DN611A by the MREAD/MWRITE command in the user program. |
| Application conditions | 1) Please combine S3/S2 (OS version: 02.60 or subsequent ones), and DN311A/DN611A (firmware revision B or subsequent ones).<br>2) Please use “the engineering tool 2” and register the module as "DN311A-AS" and "DN611A-AS."<br>3) When you register a slave device parameter to DN311A/DN611A, please use DeviceNet Wizard for TOSHIBA.<br>4) The DN311A/DN611A registration number of S3/S2 is a maximum of 32 sets. |
| Restrictions | 1) When you use a reset request, a parameter setting request, a operation mode control request, a RAS information read request, and a time setting request to DN311A/DN611A, please use MREAD/MWRITE command (or function block) as usual.<br>2) When module registration with the engineering tool 2 is set to "DN311A" and "DN611A", please use MREAD/MWRITE command (or function block) as usual.<br>3) When you use DN311/DN611 (A-less model), please give module registration as "DN311A" or "DN611A." |

**The registration process of network variable (in brief)**

(1) Register DN311A as DN311A-AS in model 3000 station.
(Register DN611A as DN611A-AS in model 2000 station)

(2) Register DN_X module in other station as a representative of whole slave devices.

(3) Register DevicenetLAN to Network configuration.

(4) Register DN311A-AS (or DN611A-AS) and DN_X in the DevicenetLAN.

(5) Register “DN311A-AS send block (or DN611A-AS send block)” and “DN_X send block” in DevicenetLAN scan memory.
The head address of DN311A-AS send block is “378”.
The head address of DN611A-AS send block is “128”.
The head address of DN_X send block is “0”.

(6) Register network variable in each send block.

*) You should read the manual of the engineering tool 2 for the registration process of network variable in detail.

変 更 記 録 REVISIONS

| 変更記号 REV.MARK 変更発行日 REV.ISSUED | ﾍﾟｰｼﾞ PAGE | 変 更 箇 所 ・ 変 更 内 容 CHANGED PLACE AND CONTENTS | 承 認 APPROVED BY | 調 査 CHECKED BY | 担 当 PREPARED BY | 保 管 REGISTERED |
|---|---|---|---|---|---|---|
| ⓪ . . | | First Edition | | | T.Shibamiya | |
| | | | | | | |

| 配布先 DISTRIBUTION | 部数 COPY | | | | | 発行 ISSUED | 承認 APPROVED BY | T.Inoue/T.Sato 02. 9. 3 |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | 調査 CHECKED BY | K.Takenaka 02. 9. 2 |
| | | | | | | MSブ | 担当 PREPARED BY | T.Shibamiya 02. 9. 2 |
| | | | | | | M開3 | F | 保管 REGISTERED |