

Introduction

Thank you for purchasing this DeviceNet wireless unit.

This DeviceNet wireless unit was developed based on OMRON's advanced control technology and experience.

Carefully read and understand the functions and performance of this device before using the DeviceNet master and DeviceNet slave together as a structured system.

● Personnel to whom this manual is directed

This User's Manual was designed for use by the following personnel.

Persons with a knowledge of electronics (electricians or those with similar training) and who:

- are in charge of introducing FA equipment
- design FA system
- install and connect FA equipment
- manage FA sites

● Precautions for use

- This equipment should be used as indicated in the general specifications.
- If this equipment is used under conditions or in an environment such as those listed below, the user should contact the OMRON business office for assistance. All uses and safety measures should be considered carefully according to the ratings and functions of the equipment.
 - (1) Using the equipment under conditions or in environments not indicated in this manual
 - (2) Using the equipment to control nuclear power, for railway facilities, for airline facilities, for automobiles, for combustion facilities, for medical equipment, for entertainment equipment, or for safety equipment
 - (3) Using the equipment in a manner that is expected to have an effect on human life or property, and particularly for applications that require safety measures
- The information contained in this manual is required for the correct use of the DeviceNet wireless unit. Be sure to carefully read and understand this User's Manual, the DeviceNet User's Manual (SCCC-308□), and the DeviceNet Slave Manual (SBCD-305□) before using this equipment. After reading this User's Manual, store it in a safe location where it can be referred to at any time as necessary. The frequency band used for this equipment is also used for the manufacture of products such as microwave ovens, in scientific applications, and in medical equipment.

DRAFT

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful Interference, and (2) this device must accept any interference received, including interference that may cause undesired operation .

The case in which this device is used in Canada;
To prevent radio interference to the licensed service, this device is intended to be operated indoors and away from windows to provide maximum shielding . Equipment (or its transmit antenna) that is installed outdoors is subject to licensing.

CAUTION:

To ensure that the WLAN transmitter complies with current FCC regulations limiting both maximum RF output power and human exposure to radio frequency radiation, a separation distance of at least 20 cm must be maintained between the unit's antenna and the body of the user and any nearby persons at all times and in all applications and uses.

Safety Precautions

Observe the following points to ensure safe operation of this equipment.

- Do not use this equipment for real-time control (I/O control that requires a response rate the same as that of DeviceNet).
- Do not apply excess vibrations or shock to this equipment. Do not drop this equipment.
- Do not use this equipment in any of the following environments:
 - Areas with corrosive or combustible gasses
 - Areas with large amounts of dust or dirt
 - Areas containing water, oils, or chemical agents
 - Areas with severe fluctuations in humidity that results in condensation
 - Areas with static electricity or excessive noise
- Do not place the communications cables nearby other cables with high voltage or strong currents.
- Do not attach connectors to the communications cables while they are supplied by the power supply.
- Use the cables specified in this manual for connections with the communications cables.
- Prevent objects such as chips from getting inside the equipment while the cover is open.
- Do not install this equipment in areas where it will be subject to excess external force, or in walkways.
- Tighten installation screws at the rated torque specified in this User's Manual.
- Do not use this equipment near other devices that may malfunction due to the electronic waves emitted by the DeviceNet wireless unit.

Proper Use of This Equipment

- (1) Any disassembly and modification of this unit is prohibited by the Radio Law. Any such action will result in penalties by law.
- (2) Do not remove the stickers that certify conformance with technological standards.
- (3) Turn the power source OFF before performing any wiring work.
- (4) When adjusting the installation position, use double-sided tape or rope to fix the equipment and prevent it from falling.
- (5) Do not use this equipment in areas exposed to direct sunlight, in areas of very high humidity, near televisions or radios, near motors or drills that emit sparks, near strong magnets, or near fluorescent lights.
- (6) Do not turn or bend the antennas. Do not wrap electric wires around the antennas.
- (7) Install the equipment so that the antennas are not near any electric wires or metal plates. Install the equipment as far away as possible from electric wires and metal plates.
- (8) Communications performance will vary according to environment. Other wireless devices that operate within the same frequency band may interfere with this equipment. Be sure to perform the tests provided for this equipment (such as the installation test) before operating it.

Manual Revisions

The revision number for this manual can be found in the lower left corner of the rear cover.

Man.No.	SGTF-702
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└─ Revision
number

Revision number	Revision date	Revised pages/contents
-	February 2000	First printing

Manual Structure

The following DeviceNet manuals are available.

DeviceNet User's Manual (SCCC-308□)

This manual gives detailed explanations of DeviceNet functions and uses. It also includes detailed explanations of master unit types, specifications, and uses for various functions.

Be sure to carefully read and understand this manual before using DeviceNet.

DeviceNet Slave Manual (SBCD-305□)

This manual gives detailed explanations of DeviceNet slave types, functions, specifications, and uses.

It should be used in addition to the DeviceNet User's Manual if slaves are added to your system.

Be sure to carefully read and understand both this manual and the DeviceNet User's Manual before using DeviceNet.

DeviceNet Configurator Operation Manual (SCCW-307□)

With the use of the DeviceNet configurator, the remote I/O area can be assigned in any manner you like. In addition, you can also connect multiple master units to a single computer, connect multiple master units inside a single DeviceNet network, and perform individual remote I/O communications.

The DeviceNet Configurator Operation Manual explains how to use the DeviceNet configurator. It should be consulted as necessary when using the DeviceNet configurator.

DeviceNet Multiple I/O Terminal Manual (SCBD-306□)

This manual gives detailed explanations of the types, functions, specifications, and uses of the multiple I/O terminal, one type of DeviceNet slave.

Be sure to carefully read and understand both this manual and the DeviceNet User's Manual before adding a multiple I/O terminal to your system. Refer to the DeviceNet User's Manual regarding how to connect it for use as a DeviceNet slave and the assignment of channels.

DeviceNet Wireless Unit User's Manual

This manual gives detailed explanations of DeviceNet functions and uses. Be sure to carefully read and understand this manual before using DeviceNet.

In addition, if you are using a wireless setup tool as an added function to the DeviceNet configurator, refer to the DeviceNet Configurator Operation Manual as necessary.

Manual Outline

■ Outline of This Manual

Section 1 DeviceNet Wireless Unit

This section explains the features of the DeviceNet Wireless Unit, including system structure, types of units, basic functions, and configurator outline.

Section 2 Hardware Settings and Checking of Operations

This section gives specific explanations of the operations and procedures necessary for you to use the DeviceNet wireless unit. Follow the explanations in this section to perform operation check procedures.

Section 3 Sample Program

This section contains an example program for monitoring the status of the DeviceNet wireless unit.

Section 4 DeviceNet Wireless Unit Station Specifications

This section explains the settings and installation procedures for the parts and switches of the DeviceNet wireless unit.

Section 5 Test

This section explains the procedures for the system tests required for using the DeviceNet wireless unit.

Section 6 Relay Function

This section gives detailed explanations of the wireless slave station relay function used to increase the communications area.

Section 7 Message Communication Function

This section gives detailed explanations of the basic format and commands for the Explicit messages used in the Message Communications Function performed by setting and reading the status of the DeviceNet wireless master station.

Section 8 Communications Timing

This section explains the remote I/O communications response time and the delay time between wireless networks when the DeviceNet wireless unit is connected.

Section 9 Troubleshooting

This section contains information regarding troubleshooting and inspection methods to be performed by daily inspectors when errors occur.

Appendices

The appendices include DeviceNet wireless unit profiles and lists of connecting devices that are required when connecting with a DeviceNet master manufactured by a different company.

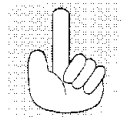
■ Instruction Markings

Instruction markings are used throughout this manual to indicate additional information.

These markings are described below.



This mark indicates information/instructions that should be followed precisely.



This mark indicates additional information that the user would find constructive.

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SECTION 1

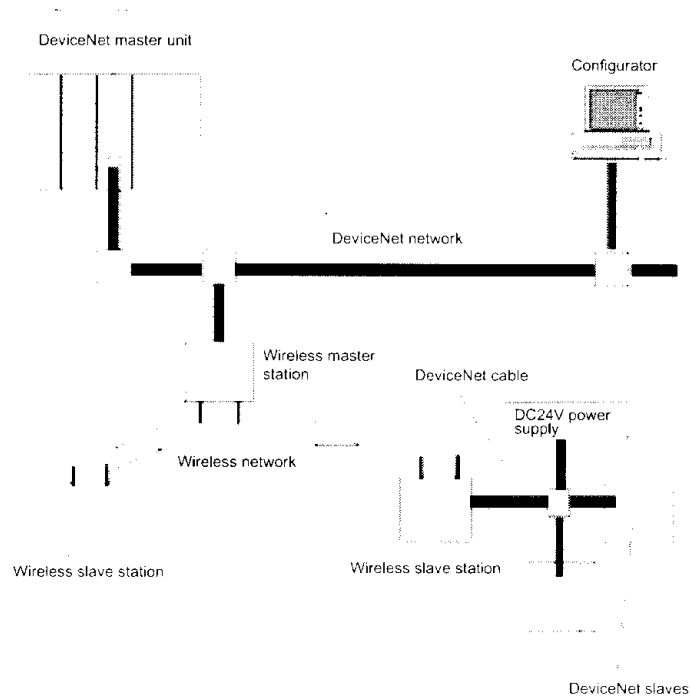
DeviceNet Wireless Unit

1-1 DeviceNet Wireless Unit

The DeviceNet wireless unit, consisting of a DeviceNet wireless master station and a DeviceNet wireless slave station, allows wireless communication with the DeviceNet slave.

Basically, the wireless master station is connected to the DeviceNet network and acts as either a virtual DeviceNet slave or wireless network master station for the DeviceNet master unit. The wireless slave station acts as either a wireless network slave station or a virtual DeviceNet master with the DeviceNet slave unit.

■ System configuration



■ Features

● DeviceNet slaves can be made wireless

Wireless DeviceNet slaves allows for a variety of field level applications. However, DeviceNet slaves that require message communications can not be connected.

We recommend that this function be used for applications that are not required to operate in real time (such as displays for indicators and manufacturing instruction data transmissions).

● Errors can be monitored

DeviceNet slave error information (including errors in wireless slave stations) can be assigned to two status channels and monitored from the PLC.

- **Wireless station license not required**

A certificate of conformance with technological standards has been acquired.

- **Abundant number of wireless channels allows the construction of multiple systems in the same area**

Since the wireless region is divided into 34 frequencies from 2,400 to 2,483.5MHz, you can select an unused frequency for building multiple systems.

Using a spectral spread method (DS: direct spread) as a modulation method achieves high-quality communications even in areas of excess noise.

- **Relay functions make possible an extension in communications distances**

Although communications distances vary according to the installation environment, the goal indoors is 60m in line of sight.

The relay functions allow an increase in the communications area (to a maximum of 3 stages).

DeviceNet slaves may also be connected to the relay station.

However, relay station system settings can only be performed from the configurator (wireless setup tool).

- **Diversity functions**

Multi-pass phasing is improved with a diversity system (which requires 2 antennas).

The effects of this function are observed when used in areas where variations in radio waves (such as reflections) occur.

■ Types of units

- **DeviceNet wireless master station (Wireless master station)**
 - Connects to the DeviceNet network and acts as a virtual DeviceNet slave.

- Maximum number of I/O as DeviceNet slave: IN/OUT = 32ch (512 points)/32ch(512 points). However, if Status is selected, IN/OUT = 30ch (480 points)/32ch (512 points).

- As the wireless network master station, it controls a maximum of 32 wireless slave stations and sends remote I/O transmissions.

- The wireless master station was tested at the test laboratories of a third part organization authorized by the ODVA. It is authorized as being in conforming to ODVA conformance software Ver 2.0 - 1.00.

- **DeviceNet wireless slave station (Wireless slave station)**

- As a slave station for the wireless network, it exchanges remote I/O Communications with the wireless master station via the wireless line.

- Acts as a virtual DeviceNet master with DeviceNet slaves.

- Connects with a maximum of 63 DeviceNet slaves and performs a maximum of 64ch (1,024 points) I/O control. (Even if multiple wireless slave stations are used, the maximum number of nodes for DeviceNet slaves is 63.)



Multi-pass phasing

Multi-pass phasing is the phenomenon of a radio wave being transmitted from a single point, passing through multiple propagation paths, and then arriving at a single point.

■ Model list

Type	No. of inputs /outputs	No. of channels in PC I/O memory		I/O connection	Unit voltage	Installation	Model
		IN	OUT				
DeviceNet wireless master station	None	Status 2ch	0CH	None	Supplied by power for external communications	Screws	Model WD30-M
DeviceNet wireless slave station	None	0CH	0CH	None			Model WD30-S

*: When set to "status"

● Accessories

The following accessories are included with purchase of both wireless master station and slave station:

- 2 pencil antennas
- User's manual
- 2 installation screws (with nuts)

● Applicable connectors

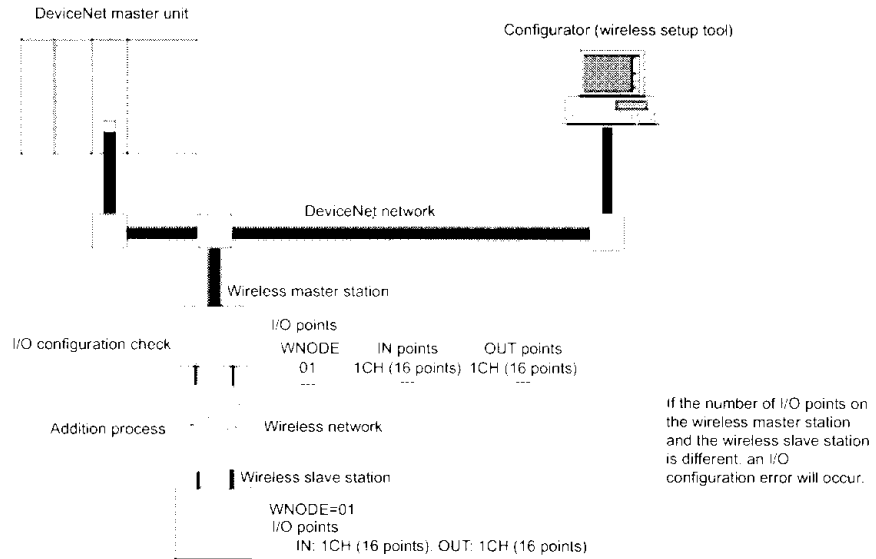
Use DeviceNet micro-connectors for communications connectors. A list of recommended connectors in the appendix.

1-2 Basic Functions of the DeviceNet Wireless Unit

■ Replacing data

● Initializing the wireless master station

When the power supply is turned on, the wireless master station adds each registered wireless slave station. When wireless communication begins with a slave station, if the number of I/O points on the DeviceNet slave connected to the slave station and the I/O points registered for the wireless master station are identical, it is added. If they are not identical, an I/O configuration error will occur.

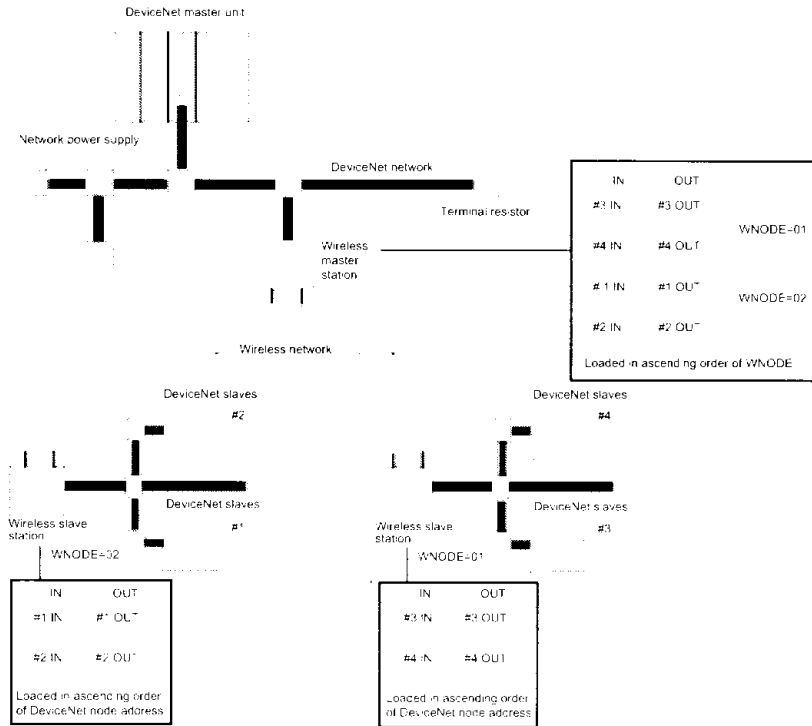


● Processing when an error occurs

Even if an error occurs in the DeviceNet network below a wireless slave station after initialization is complete, the wireless network polling communication will continue as normal. The user should monitor the status at his device (PLC, computer) when an error occurs, and apply the appropriate error processing program for the type of error and the area in which it occurred.

I/O allocation

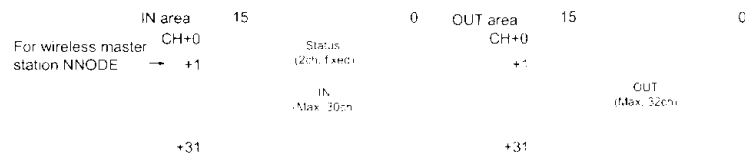
The I/O for wireless slave stations are loaded first by ascending order of DeviceNet node addresses in the wireless slave station, and then by ascending order of wireless node addresses for the slave station (WNODE) in the wireless master station.



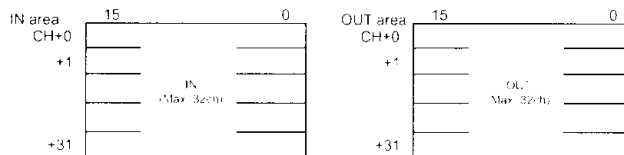
I/O allocations on the wireless master station are as shown below.

- Allocations are made in ascending order of wireless node addresses (WNODE) for registered wireless slave stations for each IN area/OUT area.
- I/O allocations can be switched between Status (status 2ch) and No Status using the DIP switches.

(1) Status 2ch (32 points). I/O IN/OUT = 30ch (480 points)/32ch (512 points)



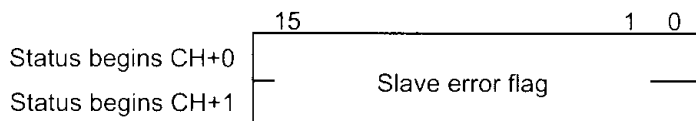
(2) I/O IN/OUT = 32ch (512 points)/32ch (512 points)



The default settings are "(1) Status 2ch. I/O IN/OUT = 30ch (480 points)/32ch (512 points)".

■ DeviceNet wireless unit status

The format for the IN area status area (2ch <32 points>) is shown below. Confirm this status at the CPU unit, and prepare an error processing program for sending commands to (Explicit messages) and obtaining detailed status reports (wireless network status, DeviceNet master status) from wireless master stations showing error flags. (Refer to "Chapter 3 Sample Programs".)



■ Slave error flag

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

Each of the following for the DeviceNet master status of added wireless slave stations is set to an OR value.

- Incorrect switch setting/EEPROM error (bit address 00)
- Repetitive node address/Busoff detection (bit address 01)
- Configuration error (bit address 03)
- Structural error (bit address 04)
- Send error (bit address 05)
- Communication error (bit address 06)
- Verify error (bit address 07)

Also, if a wireless slave station has been registered by not added, the bit will be 1. For example, if a wireless slave station error occurs for WNODE = 16, the uppermost bit for "status begin ch + 0" (16) becomes 1.

Refer to the "DeviceNet User's Manual" (SCCC-308□) for details concerning DeviceNet master status errors.



Master unit I/O point limitations

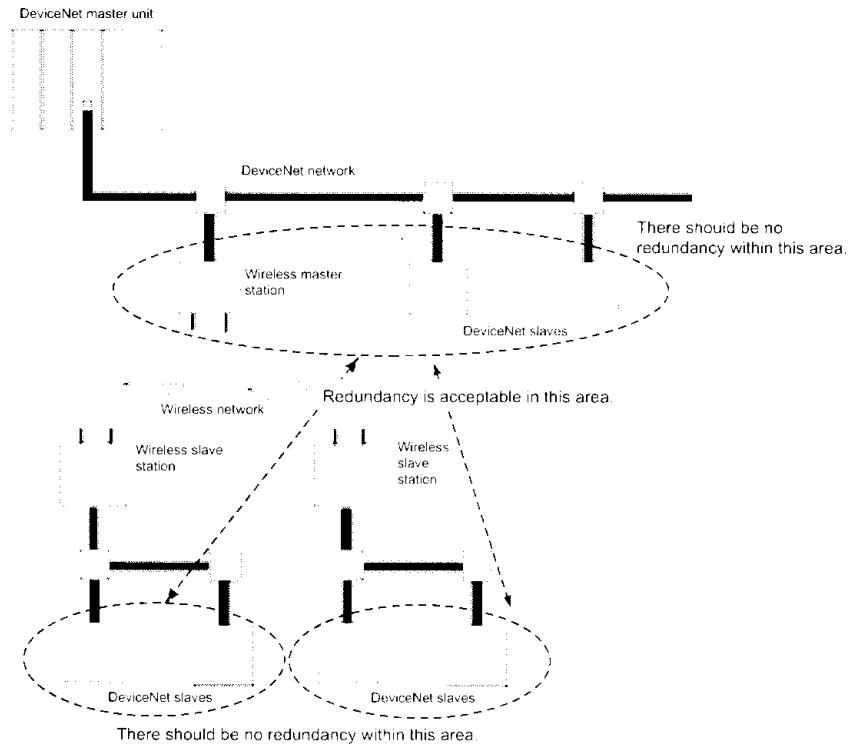
Each wireless master station can control a maximum of 512 I/O points. However, there are limits to the number of I/O points per node for each master unit. For example, the OMRON CVM1/CV series master unit (model CVM1-DRM21-V1) and the SYSMAC α /C200HS master unit (model C200HW-DRM21-V1) are both limited to 512 points for IN and 512 points for OUT per node. Therefore, systems should be designed without exceeding the limitations for the number of I/O points per node for each master unit.

■ DeviceNet node addresses

DeviceNet node addresses (NNODEs) are included in wireless master stations. The master unit controls the assignment of DeviceNet slave I/O data registered with wireless slave stations to areas corresponding to these node addresses.

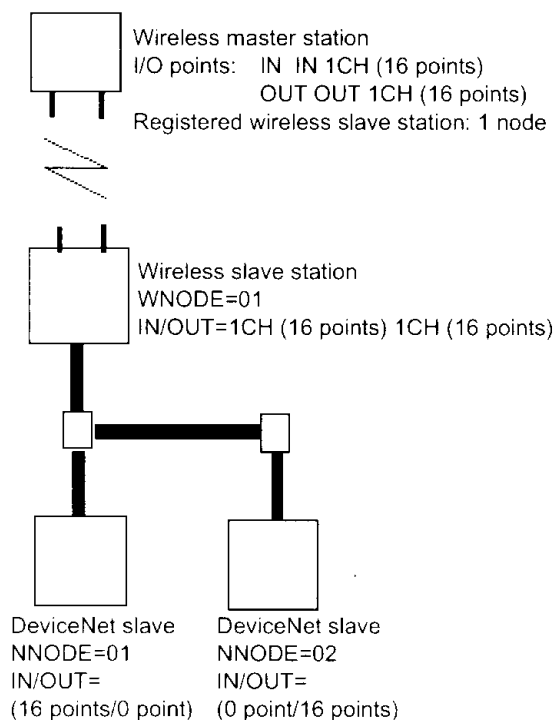
Wireless node addresses (WNODEs) are included in wireless slave stations. These node addresses are used for control by wireless master stations. Therefore, there is no purpose in assigning the wireless slave station DeviceNet node addresses (NNODEs) to I/O. Normally, a 7 segment LED is used to display the DeviceNet node address on wireless slave stations.

Since DeviceNet node addresses are controlled by wireless slave stations, be sure to set the DeviceNet slaves so that there is no redundancy.



■ DeviceNet wireless unit default setting values

Wireless unit network default settings are on a 1:1:2 structure of wireless master station:wireless slave station:DeviceNet slave with IN/OUT = 16 points/16 points, as shown in the figure below.



The default settings can be returned to on both wireless master stations and slave stations using the DIP switches in SET mode. Refer to "2-4 System Initial Setting and Starting Communications" for detailed setting information.

1-3 Application Limitations

The wireless unit is not designed to be compatible with every type of application that uses DeviceNet. Do not use the unit with the following applications.

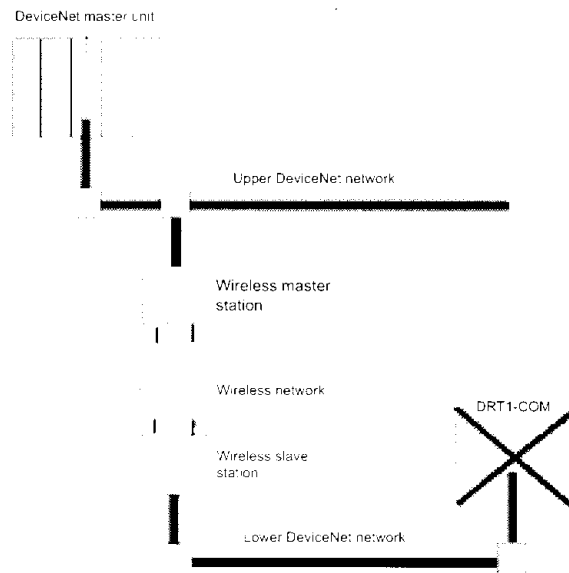
(1) Applications that require real-time control

Do not use the unit with applications that require real-time control. In particular, it cannot be used under conditions that require responsiveness greater than that outlined in "Chapter 9 Communications Timing".

Applications that do not require real-time control, such as indicators, equipment error monitors, and parts picking operation, are recommended.

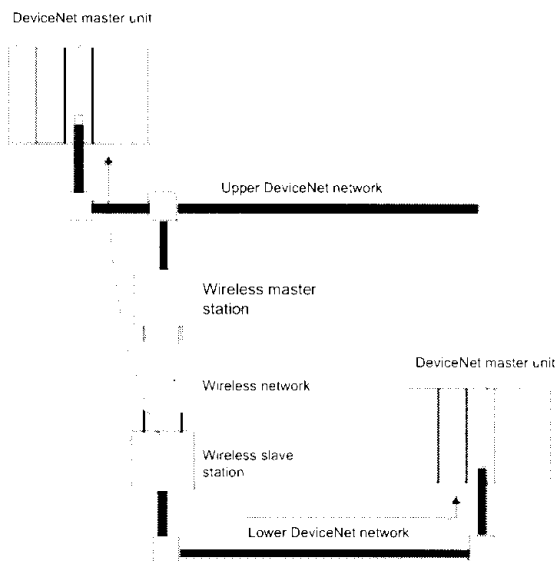
(2) Applications that use DeviceNet slaves that require message communication functions

Messages will not pass through DeviceNet slaves connected to wireless slave stations. Therefore, do not use devices such as model DRT1-232C2 (RS-232C unit).



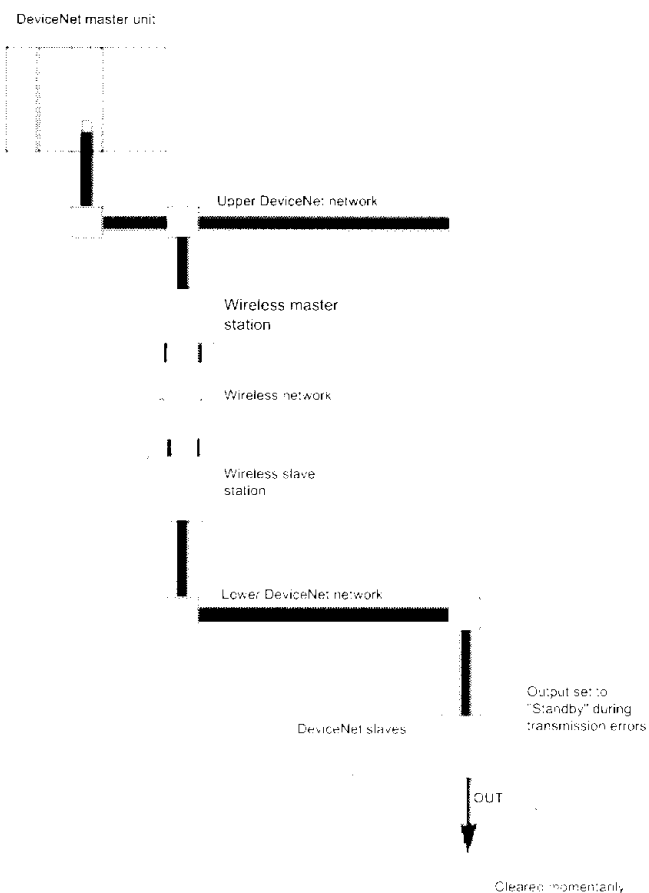
1-3 Application Limitations

- (3) Applications that use Peer to Peer communications between the upper DeviceNet network DeviceNet master and the lower DeviceNet network DeviceNet master.



- (4) Applications that require setting the DeviceNet slave "Communication Error Output" to "Standby"

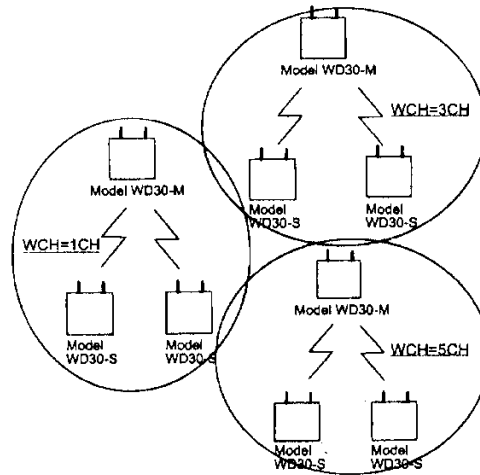
When a wireless slave station is reset from some error, it is possible that the DeviceNet slave output will be momentarily cleared. Therefore, applications that set the output to "Standby" during communication errors can not be used.



1-4 Construction of Multiple Wireless Systems

When constructing a system for using multiple wireless master stations, it is necessary to select frequencies for the wireless channels that are not interfered with by radio waves. (Radio interference can be handled by retry processes between the wireless networks, but will lengthen the system response time.)

The maximum number of wireless frequency channels useable in a single area is 17 systems. With this unit, 34 wireless channels can be selected from. However, since neighboring wireless channels have a large amount of interference, they should not be selected when creating multiple wireless system (a system with multiple wireless master stations).



In addition, if it is believed that radio waves will be emitted from some other SS wireless device on site, the wireless channel monitor function should be used.

SECTION 2

Hardware Settings and
Checking of Operations

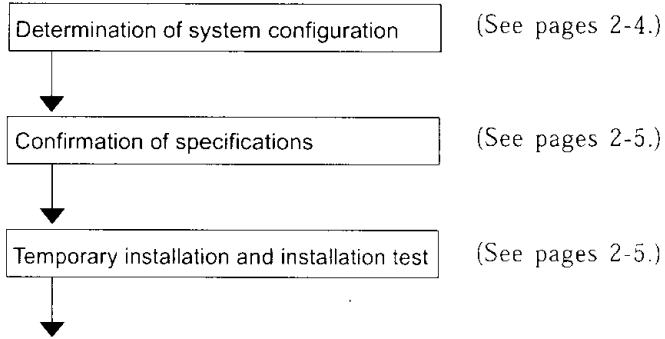
2-1 Basic Operation Procedure

Specific examples illustrating the basic operation procedure of the DeviceNet wireless unit are given in this chapter.

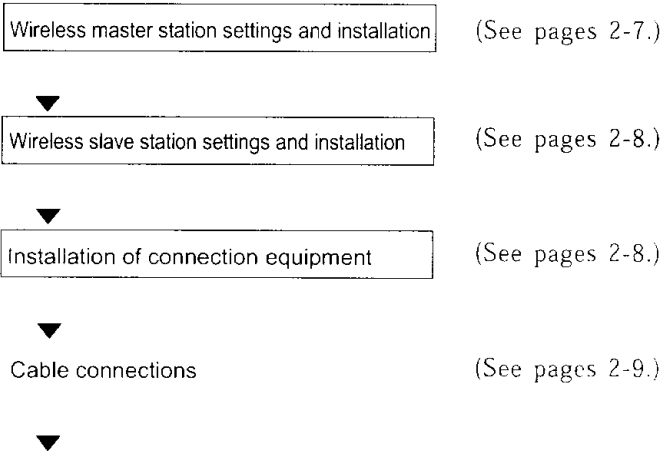
■ Basic operation procedures flowchart

The basic operation procedure is shown below. Refer to the "DeviceNet User's Manual" (SCCC-308□) and the "DeviceNet Slave Manual" (SBCD-305□) for details concerning settings and connections.

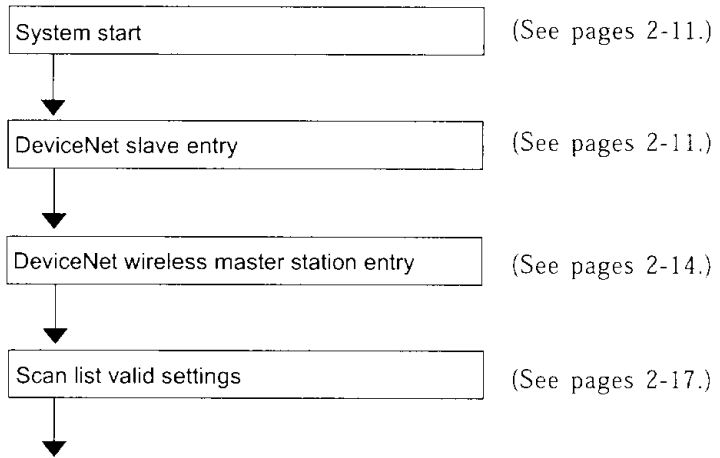
● Pre-work confirmation



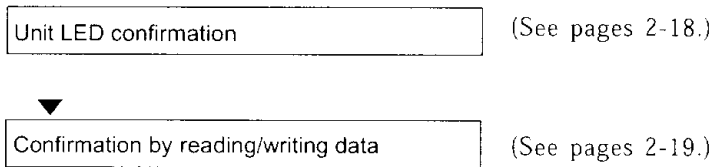
● Hardware settings and wiring



● System initialization and starting communication



● Operation confirmation



2-2 Pre-work Preparations

Items to be checked before performing installation work are explained here.

■ Determination of system configuration

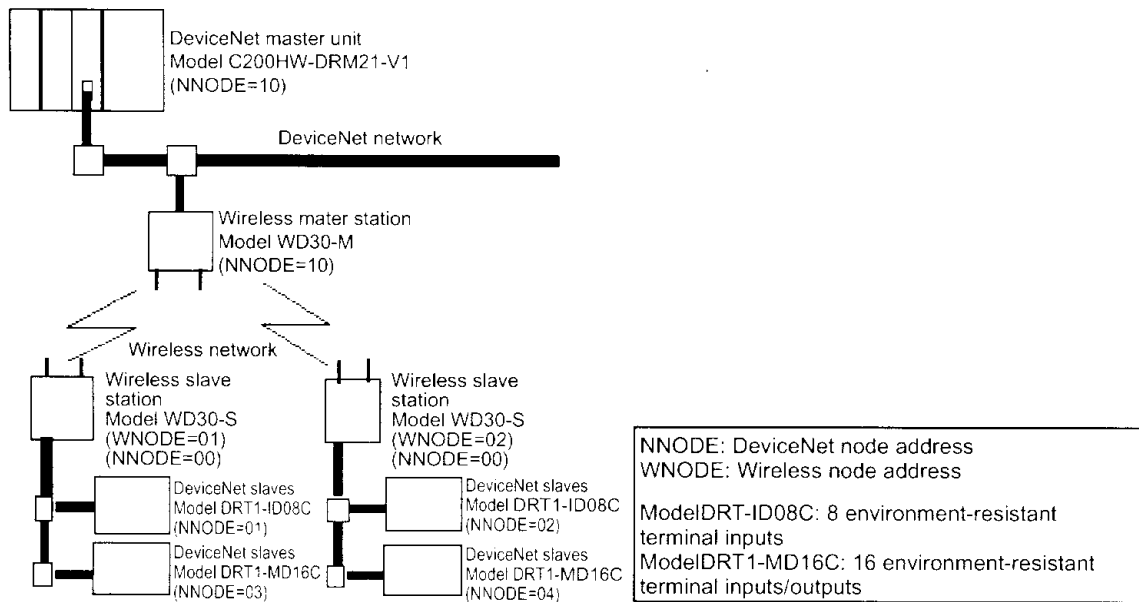
A single wireless master station is limited to a maximum of 1,024 points, 512 points (32ch) each for both IN and OUT.

In addition, the maximum configuration in a wireless network of master stations to slave stations is 1 to 32, and the maximum number of IN/OUT points for the entire system is limited by the DeviceNet master unit. This should be considered carefully when determining system configuration.

● System configuration example

In this section, the operation procedure is explained using the following system configuration as an example.

A communications power supply (Model S82K) has been purposely left out



of the diagram above. It should be connected and supply power to the DeviceNet network (both upper and lower) and should be connected with terminal resistor. In addition, an external power supply should be connected to the environment resistant terminal of the DeviceNet slave.



Master unit I/O limitations

A single wireless master station can control up to 512 points for both input and output, but the number of I/O points per node is limited by the master unit. For example, the Omron CVM1/CV series master unit (Model CVM1-DRM21-V1) and the SYSMAC α /C200HS master unit (Model C200HW-DRM21-V1) are limited to 512 points for both IN and OUT per node. Be careful to not exceed the limit for I/O points per master unit node when constructing your system.

■ Confirmation of specifications

● Confirmation of number of IN/OUT points

Confirm that the number of IN/OUT points for each wireless master station is no more than 512 (32ch).

In the example, the number of IN points is $8 \times 4 = 32$, and the number of OUT points is $8 \times 2 = 16$.

● Confirmation of wiring

A special communications cable is required to connect to the DeviceNet micro connector on the wireless unit.

In addition, if multiple DeviceNet slaves are connected, branch taps should be used as necessary. Terminators for the wireless slave station DeviceNet network should also be prepared. Refer to the "DeviceNet User's Manual" (SCCC 308□) for details.

● Confirmation of communications power supply

Since power is supplied to the wireless unit from an external communications power supply, a communications power connection must be made.

Refer to the "DeviceNet User's Manual" (SCCC 308□) for details concerning power supply restrictions.

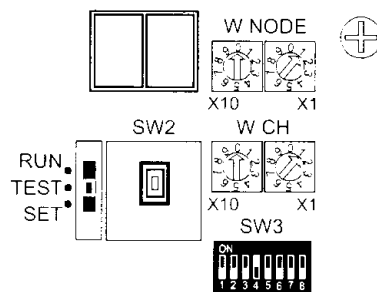
When calculating the amount of current required, both wireless master stations and slave stations should be at 220mA.

■ Temporary installation and installation test

● Temporary installation of wireless master station

Set the switches as shown below, and temporarily fix the master station in the determined location.

Master station



- SW3=bit4 ON (positioning test)
- Mode select switch = TEST
- WNODE = test subject's wireless slave station WNODE (This example starts at WNODE = 01.)
- WCH = 01

Connect a DeviceNet cable prepared for a micro-connector, and connect the DC24V communications power supply.