OMRON

Machine Automation Controller

CJ-series

PROFIBUS Slave Unit

Operation Manual

for NJ-series CPU Unit

CJ1W-PRT21

PROFIBUS Slave Unit

W510-E2-01

Introduction

Thank you for purchasing a CJ-series CJ1W-PRT21 PROFIBUS Slave Unit.
This manual contains information that is necessary to use the CJ-series CJ1W-PRT21 PROFIBUS Slave Unit for an NJ-series CPU Unit. Please read this manual and make sure you understand the functionality and performance of the NJ-series CPU Unit before you attempt to use it in a control system.
Keep this manual in a safe place where it will be available for reference during operation.

Intended Audience

This manual is intended for the following personnel, who must also have knowledge of electrical systems (an electrical engineer or the equivalent).

- Personnel in charge of introducing FA systems.
- Personnel in charge of designing FA systems.
- Personnel in charge of installing and maintaining FA systems.
- Personnel in charge of managing FA systems and facilities.

For programming, this manual is intended for personnel who understand the programming language specifications in international standard IEC 61131-3 or Japanese standard JIS B3503.

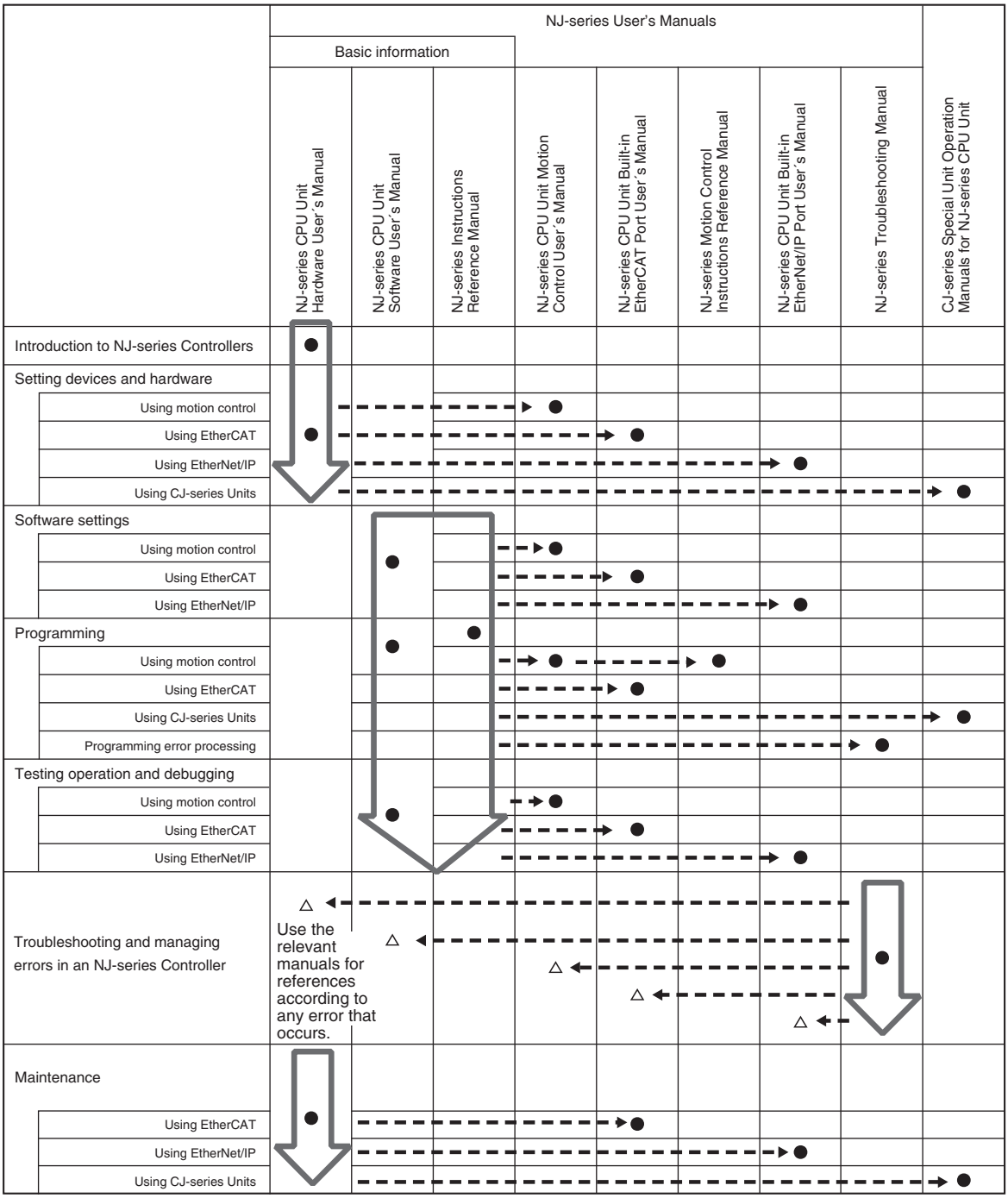
Applicable Products

This manual covers the following products.

CJ-series CJ1W-PRT21 PROFIBUS Slave Unit

Relevant Manuals

There are three manuals that provide basic information on the NJ-series CPU Units: the *NJ-series CPU Unit Hardware User's Manual*, the *NJ-series CPU Unit Software User's Manual* and the *NJ-series Instructions Reference Manual*.
Most operations are performed from the Sysmac Studio Automation Software. Refer to the *Sysmac Studio Version 1 Operation Manual* (Cat. No. W504) for information on the Sysmac Studio.
Other manuals are necessary for specific system configurations and applications.
Read all of the manuals that are relevant to your system configuration and application to make the most of the NJ-series CPU Unit.



Manual Configuration

NJ-series CPU Unit Hardware User's Manual (Cat. No. W500)

Section	Description
Section 1 Introduction	This section provides an introduction to the NJ-series Controllers and their features, and gives the NJ-series Controller specifications.
Section 2 System Configuration	This section describes the system configuration used for NJ-series Controllers.
Section 3 Configuration Units	This section describes the parts and functions of the configuration devices in the NJ-series Controller configuration, including the CPU Unit and Configuration Units.
Section 4 Installation and Wiring	This section describes where and how to install the CPU Unit and Configuration Units and how to wire them.
Section 5 Troubleshooting	This section describes the event codes, error confirmation methods, and corrections for errors that can occur.
Section 6 Inspection and Maintenance	This section describes the contents of periodic inspections, the service life of the Battery and Power Supply Units, and replacement methods for the Battery and Power Supply Units.
Appendices	The appendices provide the specifications of the Basic I/O Units, Unit dimensions, load short-circuit protection detection, line disconnection detection, and measures for EMC Directives.

NJ-series CPU Unit Software User's Manual (Cat. No. W501)

Section	Description
Section 1 Introduction	This section provides an introduction to the NJ-series Controllers and their features, and gives the NJ-series Controller specifications.
Section 2 CPU Unit Operation	This section describes the variables and control systems of the CPU Unit and CPU Unit status.
Section 3 I/O Ports, Slave Configuration, and Unit Configuration	This section describes how to use I/O ports, how to create the slave configuration and unit configuration and how to assign functions.
Section 4 Controller Setup	This section describes the initial settings of the function modules.
Section 5 Designing Tasks	This section describes the task system and types of tasks.
Section 6 Programming	This section describes programming, including the programming languages and the variables and instructions that are used in programming.
Section 7 Simulation, Transferring Projects to the Physical CPU Unit, and Operation	This section describes simulation of Controller operation and how to use the results of simulation.
Section 8 CPU Unit Status	This section describes CPU Unit status.
Section 9 CPU Unit Functions	This section describes the functionality provided by the CPU Unit.
Section 10 Communications Setup	This section describes how to go online with the CPU Unit and how to connect to other devices.
Section 11 Example of Actual Application Procedures	This section describes the procedures that are used to actually operate an NJ-series Controller.
Section 12 Troubleshooting	This section describes the event codes, error confirmation methods, and corrections for errors that can occur.
Appendices	The appendices provide the CPU Unit specifications, task execution times, system-defined variable lists, data attribute lists, CJ-series Unit memory information, CJ-series Unit memory allocation methods, and data type conversion information.

Sysmac Studio Version 1 Operation Manual (Cat. No. W504)

Section	Description
Section 1 Introduction	This section provides an overview and lists the specifications of the Sysmac Studio and describes its features and components.
Section 2 Installation and Uninstallation	This section describes how to install and uninstall the Sysmac Studio.
Section 3 System Design	This section describes the basic concepts for designing an NJ-series System with the Sysmac Studio and the basic operating procedures.
Section 4 Programming	This section describes how to create programs with the Sysmac Studio.
Section 5 Online Connections to a Controller	This section describes how to go online with a Controller.
Section 6 Debugging	This section describes how to debug the programs online on the Controller or debug it offline with the Simulator.
Section 7 Other Functions	This section describes Sysmac Studio functions other than system design functions.
Section 8 Reusing Programming	This section describes how to reuse the programs that you create with the Sysmac Studio.
Section 9 Support Software Provided with the Sysmac Studio	This section describes the Support Software that is provided with the Sysmac Studio.
Section 10 Troubleshooting	This section describes the error messages that are displayed when you check a program on the Sysmac Studio and how to correct those errors.
Appendices	The appendices describe the following: Driver Installation for Direct USB Cable Connection Specifying One of Multiple Ethernet Interface Cards Online Help Simulation Instructions

CJ-series PROFIBUS Master Units Operation Manual for NJ-series CPU Unit (Cat. No. W509)

Section	Description
Section 1 Features and System Configuration	This section provides an introduction to the PROFIBUS Master Units and their features. It also describes the operating procedure and the specifications of the PROFIBUS Master Units.
Section 2 Nomenclature and Installation	This section describes the nomenclature, functionality and installation of the PROFIBUS Master Unit.
Section 3 Configuration Software	This section contains the procedures for installing the configuration software. It also presents an overview of the Configuration software and discusses the main aspects of defining a PROFIBUS configuration.
Section 4 Data Exchange with the CPU Unit	This section describes the data exchange between the CPU Unit and PROFIBUS Master Unit and the definitions of the device variables for CJ-series Unit.
Section 5 Operation	This section describes how to operate the CJ1W-PRM21 PROFIBUS Master Unit in a Network.
Section 6 Message Communications	This section describes the message service communications commands concept sent from the user program in the CPU Unit.
Section 7 Troubleshooting and Maintenance	This section describes the troubleshooting procedure, event logs and maintenance procedure for the PROFIBUS Master Unit.
Appendices	---

CJ-series PROFIBUS Slave Units Operation Manual for NJ-series CPU Unit (Cat. No. W510) (This Manual)

Section	Description
Section 1 Features and System Configuration	This section provides a brief description of PROFIBUS-P. It also addresses the overall specification and the communication performance of the CJ1W-PRT21 PROFIBUS-DP Slave Unit.
Section 2 Nomenclature and Installation	This section describes the nomenclature, functionality and installation of the PROFIBUS Slave Unit.
Section 3 Data Exchange with the CPU Unit	This section describes the data interface and data exchange between the NJ-series CPU and the CJ1W-PRT21 PROFIBUS-DP Slave Unit.
Section 4 Troubleshooting and Maintenance	This section describes the troubleshooting procedure, event logs and maintenance procedure for the CJ1W-PRT21 PROFIBUS Slave Unit.
Appendices	---

SmartSlice GRT1-Series PROFIBUS Communication Unit Operation Manual (Cat. No. W04E)

Section	Description
Section 1 Features and Specifications	This section provides an introductory overview of the GRT1 series SmartSlice I/O Units and the GRT1-PRT PROFIBUS, Communication Unit, its functions and how to setup and configure it for a PROFIBUS network.
Section 2 Installation and Wiring	This section contains the procedures for setting up the PROFIBUS network. It also describes installing and wiring the Communication Unit as well as the GRT1-series SmartSlice I/O Units.
Section 3 Setup and Operation	This section describes the operational aspects of the GRT1-PRT and the SmartSlice I/O system.
Section 4 Troubleshooting and Maintenance	This section describes the troubleshooting procedures and maintenance operations for the PROFIBUS Communication Unit.
Appendices	The appendices describe the following: PROFIBUS Technology Slave Diagnostics Messages Explicit Messages

SmartSlice GRT1-Series Slice I/O Units Operation Manual (Cat. No. W455)

Section	Description
Section 1 Available Units and Features	This section describes the features of GRT1-series Slice I/O Units and lists the available Units.
Section 2 Shared Specifications and Functions	This section describes the specifications and functions that are shared by all of the Slice I/O Units.
Section 3 Installation and Wiring	This section provides information on installing and wiring the Slice I/O Units.
Section 4 Digital I/O Units	This section provides the specifications and shows the components, terminal arrangements, wiring diagrams and dimensions for the Digital I/O Units.
Section 5 Analog I/O Units	This section provides the information required to operate Analog Input Units and Analog Output Units.
Section 6 Temperature Input Units	This section provides the information required to operate Temperature Input Units.
Section 7 Counter Units and Positioning Unit	This section provides the information required to operate Counter Units and the Positioning Unit.

Section	Description
Section 8 Other Units	This section provides the basic specifications for the other Units used in Slice I/O terminals.
Section 9 Troubleshooting	This section describes error processing and troubleshooting procedures needed to keep the Slice I/O Units operating properly.
Appendices	The appendices describe the following: Explicit Messages Standard Models Power Consumption and Weight Tables I/O Current Consumption Table Precautions When Connecting Two-wire DC Sensors

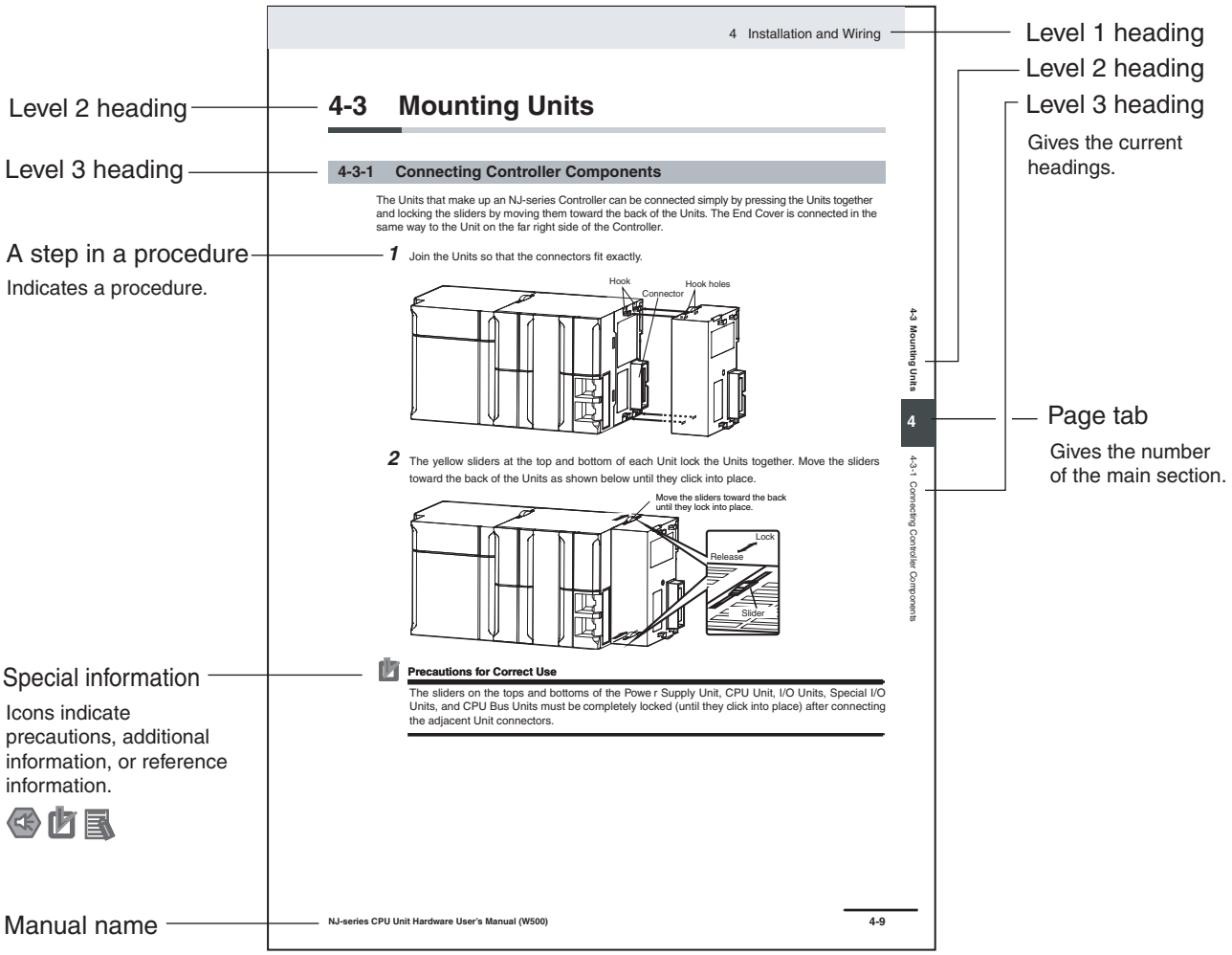
CS/CJ-Series PROFIBUS Master Units Operation Manual (Cat. No. W409)

Section	Description
Section 1 Features and Specifications	This section provides an introductory overview of PROFIBUS, its functions and how to setup and configure a network. It also addresses the PROFIBUS Master Units and the configurator, their features and specifications.
Section 2 Installation and Wiring	This section shows the PROFIBUS device and identifies its controls and indicators. It contains the procedures for installing the CS1/CJ1W-PRM21 PROFIBUS Master Unit and configuring the PROFIBUS network.
Section 3 Configuration Software	This section contains the procedures for installing the configuration software. It also presents an overview of the Configuration software and discusses the main aspects of defining a PROFIBUS configuration.
Section 4 Allocated CIO and DM Words	This section describes the words allocated to the CS1/CJ1W-PRM21 PROFIBUS Master Unit in the CIO and DM Areas.
Section 5 FINS Commands and Responses	This section describes the FINS message service communications commands concept as well as the commands supported by the CS1/CJ1W-PRM21 PROFIBUS Master Units.
Section 6 Operation	This section describes how to operate the CS1/CJ1W-PRM21 PROFIBUS Master Unit in a Network. It will discuss setting up a network, configuring all the connected devices and starting the network. Furthermore, it provides information the I/O data exchange performance and it also provides information on how to monitor a network using the Unit and CX-ConfiguratorFDT.
Section 7 Troubleshooting and Maintenance	This section describes the troubleshooting procedures and maintenance operations for the CS1/CJ1W-PRM21, needed to keep the PROFIBUS network optimally working.
Appendix	The appendices describe the following: Bus Parameters Slave Diagnostics I/O Data Conversions Configuration Error and Warning Messages Memory Card Backup Functions Application Notes C200HW-PRM21 Notes

Manual Structure

Page Structure

The following page structure is used in this manual.



This illustration is provided only as a sample. It may not literally appear in this manual.

Special Information

Special information in this manual is classified as follows:

Precautions for Safe Use

Precautions on what to do and what not to do to ensure safe usage of the product.

Precautions for Correct Use

Precautions on what to do and what not to do to ensure proper operation and performance.

Additional Information

Additional information to read as required.
This information is provided to increase understanding or make operation easier.

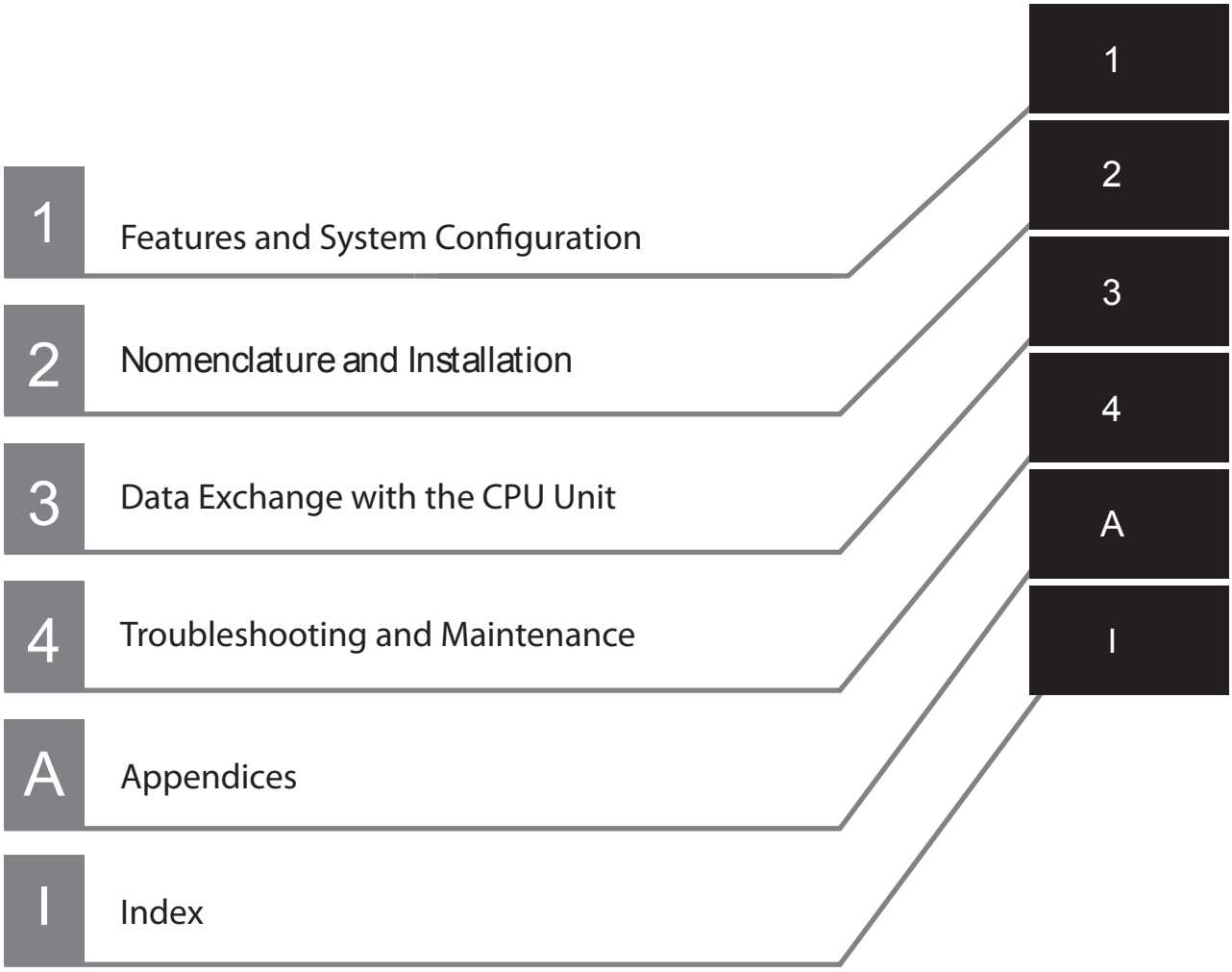
Note References are provided to more detailed or related information.

Precaution on Terminology

In this manual, “download” refers to transferring data from the Sysmac Studio to the physical Controller and “upload” refers to transferring data from the physical Controller to the Sysmac Studio.

In this manual, the CJ1W-PRT21 PROFIBUS Slave Unit may be referred to as the “PROFIBUS Slave Unit” and the CJ1W-PRM21 PROFIBUS Master Unit may be referred to as the “PROFIBUS Master Unit”.

Sections in this Manual



Read and Understand this Manual

Please read and understand this manual before using the product. Please consult your OMRON representative if you have any questions or comments.

Warranty and Limitations of Liability

WARRANTY

OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, REGARDING NON-INFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR PARTICULAR PURPOSE OF THE PRODUCTS. ANY BUYER OR USER ACKNOWLEDGES THAT THE BUYER OR USER ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. OMRON DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED.

LIMITATIONS OF LIABILITY

OMRON SHALL NOT BE RESPONSIBLE FOR SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED ON CONTRACT, WARRANTY, NEGLIGENCE, OR STRICT LIABILITY.

In no event shall the responsibility of OMRON for any act exceed the individual price of the product on which liability is asserted.

IN NO EVENT SHALL OMRON BE RESPONSIBLE FOR WARRANTY, REPAIR, OR OTHER CLAIMS REGARDING THE PRODUCTS UNLESS OMRON'S ANALYSIS CONFIRMS THAT THE PRODUCTS WERE PROPERLY HANDLED, STORED, INSTALLED, AND MAINTAINED AND NOT SUBJECT TO CONTAMINATION, ABUSE, MISUSE, OR INAPPROPRIATE MODIFICATION OR REPAIR.

Application Considerations

SUITABILITY FOR USE

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of products in the customer's application or use of the products.

At the customer's request, OMRON will provide applicable third party certification documents identifying ratings and limitations of use that apply to the products. This information by itself is not sufficient for a complete determination of the suitability of the products in combination with the end product, machine, system, or other application or use.

The following are some examples of applications for which particular attention must be given. This is not intended to be an exhaustive list of all possible uses of the products, nor is it intended to imply that the uses listed may be suitable for the products:

- Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this manual.
- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
- Systems, machines, and equipment that could present a risk to life or property.

Please know and observe all prohibitions of use applicable to the products.

NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCTS ARE PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

PROGRAMMABLE PRODUCTS

OMRON shall not be responsible for the user's programming of a programmable product, or any consequence thereof.

Disclaimers

CHANGE IN SPECIFICATIONS

Product specifications and accessories may be changed at any time based on improvements and other reasons.

It is our practice to change model numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the products may be changed without any notice. When in doubt, special model numbers may be assigned to fix or establish key specifications for your application on your request. Please consult with your OMRON representative at any time to confirm actual specifications of purchased products.

DIMENSIONS AND WEIGHTS

Dimensions and weights are nominal and are not to be used for manufacturing purposes, even when tolerances are shown.

PERFORMANCE DATA

Performance data given in this manual is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of OMRON's test conditions, and the users must correlate it to actual application requirements. Actual performance is subject to the OMRON Warranty and Limitations of Liability.

ERRORS AND OMISSIONS

The information in this manual has been carefully checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical, or proofreading errors, or omissions.

CONTENTS

Section 1 Features and System Configuration

Section 2 Nomenclature and Installation

Section 3 Data Exchange with the CPU Unit

Section 4 Troubleshooting and Maintenance

Appendices

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Safety Precautions

Definition of Precautionary Information

The following notation is used in this manual to provide precautions required to ensure safe usage of an NJ-series Controller. The safety precautions that are provided are extremely important to safety. Always read and heed the information provided in all safety precautions.
The following notation is used.

WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury. Additionally, there may be severe property damage.
Caution	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury, or property damage.

Precautions for Safe Use
Indicates precautions on what to do and what not to do to ensure safe usage of the product.

Precautions for Correct Use
Indicates precautions on what to do and what not to do to ensure proper operation and performance.

Symbols

The circle and slash symbol indicates operations that you must not do.
The specific operation is shown in the circle and explained in text.
This example indicates prohibiting disassembly.

The triangle symbol indicates precautions (including warnings).
The specific operation is shown in the triangle and explained in text.
This example indicates a precaution for electric shock.

The triangle symbol indicates precautions (including warnings).
The specific operation is shown in the triangle and explained in text.
This example indicates a general precaution.

The filled circle symbol indicates operations that you must do.
The specific operation is shown in the circle and explained in text.
This example shows a general precaution for something that you must do.

⚠ WARNING

During Power Supply

Do not touch any of the terminals or terminal blocks while the power is being supplied. Doing so may result in electric shock.

Do not attempt to take any Unit apart. In particular, high-voltage parts are present in the Power Supply Unit while power is supplied or immediately after power is turned OFF. Touching any of these parts may result in electric shock. There are sharp parts inside the Unit that may cause injury.

Fail-safe Measures

Provide safety measures in external circuits to ensure safety in the system if an abnormality occurs due to malfunction of the CPU Unit, other Units, or slaves or due to other external factors affecting operation. Not doing so may result in serious accidents due to incorrect operation.

Emergency stop circuits, interlock circuits, limit circuits, and similar safety measures must be provided in external control circuits.

The Controller outputs may remain ON or OFF due to deposition or burning of the output relays or destruction of the output transistors. As a countermeasure for such problems, external safety measures must be provided to ensure safe operation of the system.

The CPU Unit will turn OFF all outputs from Basic Output Units in the following cases.

- If an error occurs in the power supply
- If the power supply connection becomes faulty
- If a CPU watchdog timer error or CPU reset occurs
- If a major fault level Controller error occurs
- While the CPU Unit is on standby until RUN mode is entered after the power is turned ON

External safety measures must be provided to ensure safe operation of the system even if the outputs turn OFF.

If external power supplies for slaves or other devices are overloaded or short-circuited, the voltage will drop, outputs will turn OFF, and the system may be unable to read inputs. Provide external safety measures in controls with monitoring of external power supply voltage as required so that the system operates safely in such a case.

⚠ WARNING

Fail-safe Measures

Unintended outputs may occur when an error occurs in variable memory or in memory used for CJ-series Units. As a countermeasure for such problems, external safety measures must be provided to ensure safe operation of the system.

Provide measures in the communications system and user program to ensure safety in the overall system even if errors or malfunctions occur in data link communications or remote I/O communications.

If there is interference in remote I/O communications or if a major fault level error occurs, output status will depend on the products that are used. Confirm the operation that will occur when there is interference in communications or a major fault level error, and implement safety measures. Correctly set all of the EtherCAT slaves.

The NJ-series Controller continues normal operation for a certain period of time when a momentary power interruption occurs. This means that the NJ-series Controller may receive incorrect signals from external devices that are also affected by the power interruption. Accordingly, take suitable actions, such as external fail-safe measures and interlock conditions, to monitor the power supply voltage of the external device as required.

You must take fail-safe measures to ensure safety in the event of incorrect, missing, or abnormal signals caused by broken signal lines, momentary power interruptions, or other causes. Not doing so may result in serious accidents due to incorrect operation.

Voltage and Current Inputs

Make sure that the voltages and currents that are input to the Units and slaves are within the specified ranges.
Inputting voltages or currents that are outside of the specified ranges may cause accidents or fire.

Downloading

Always confirm safety at the destination before you transfer a user program, configuration data, setup data, device variables, or values in memory used for CJ-series Units from the Sysmac Studio. The devices or machines may perform unexpected operation regardless of the operating mode of the CPU Unit.

⚠ Caution

Application

Do not touch any Unit when power is being supplied or immediately after the power supply is turned OFF. Doing so may result in burn injury.

Wiring

Be sure that all terminal screws and cable connector screws are tightened to the torque specified in the relevant manuals. The loose screws may result in fire or malfunction.

Online Editing

Execute online editing only after confirming that no adverse effects will be caused by deviations in the timing of I/O. If you perform online editing, the task execution time may exceed the task period, I/O may not be refreshed with external devices, input signals may not be read, and output timing may change.

Precautions for Safe Use

Disassembly and Dropping

- Do not attempt to disassemble, repair, or modify any Units. Doing so may result in malfunction or fire.
- Do not drop any Unit or subject it to abnormal vibration or shock. Doing so may result in Unit malfunction or burning.

Mounting

- The sliders on the tops and bottoms of the Power Supply Unit, CPU Unit, I/O Units, Special I/O Unit, and CPU Bus Units must be completely locked (until they click into place) after connecting the adjacent Unit connectors.

Installation

- Always connect to a ground of 100 Ω or less when installing the Units. A ground of 100 Ω or less must be installed when shorting the GR and LG terminals on the Power Supply Unit.

Wiring

- Follow the instructions in this manual to correctly perform wiring.
  Double-check all wiring and switch settings before turning ON the power supply.
- Use crimp terminals for wiring.
  Do not connect bare stranded wires directly to terminals.
- Do not pull on the cables or bend the cables beyond their natural limit.
  Do not place heavy objects on top of the cables or other wiring lines. Doing so may break the cables.
- Mount terminal blocks and connectors only after checking the mounting location carefully.
- Be sure that the terminal blocks, expansion cables, and other items with locking devices are properly locked into place.
- Always remove any dust proof labels that are on the top of the Units when they are shipped before you turn ON the power supply. If the labels are not removed, heat will accumulate and malfunctions may occur.
- Before you connect a computer to the CPU Unit, disconnect the power supply plug of the computer from the AC outlet. Also, if the computer has an FG terminal, make the connections so that the FG terminal has the same electrical potential as the FG (GR) terminal on the Power Supply Unit. A difference in electric potential between the computer and Controller may cause failure or malfunction.
- If the external power supply to an Output Unit or slave has polarity, connect it with the correct polarity. If the polarity is reversed, current may flow in the reverse direction and damage the connected devices regardless of the operation of the Controller.

Power Supply Design

- Do not exceed the rated supply capacity of the Power Supply Units in the NJ-series Controller. The rated supply capacities are given in the *NJ-series CPU Unit Hardware User's Manual* (Cat. No. W500).
  If the capacity is exceeded, operation may stop, malfunctions may occur, or data may not be backed up normally for power interruptions.
  Use NJ-series Power Supply Units for both the NJ-series CPU Rack and Expansion Racks.
  Operation is not possible if a CJ-series Power Supply Unit is used with an NJ-series CPU Unit or an NJ-series Power Supply Unit is used with a CJ-series CPU Unit.

- Do not apply voltages or connect loads to the Output Units or slaves in excess of the maximum ratings.
- Surge current occurs when the power supply is turned ON. When selecting fuses or breakers for external circuits, consider the above precaution and allow sufficient margin in shut-off performance. Refer to the relevant manuals for surge current specifications. Refer to the *NJ-series CPU Unit Hardware User's Manual* (Cat. No. W500) for surge current specifications.
- If the full dielectric strength voltage is applied or turned OFF using the switch on the tester, the generated impulse voltage may damage the Power Supply Unit. Use the adjustment on the tester to gradually increase and decrease the voltage.
- Apply the voltage between the Power Supply Unit's L1 or L2 terminal and the GR terminal when testing insulation and dielectric strength. You do not have to disconnect the LG and GR terminals to perform these tests.
- Do not supply AC power from an inverter or other device with a square-wave output. Internal temperature rise may result in smoking or burning. Always input a sinusoidal wave with the frequency that is given in the *NJ-series CPU Unit Hardware User's Manual* (Cat. No. W500).
- Install external breakers and take other safety measures against short-circuiting in external wiring.

Turning ON the Power Supply

- It takes up to approximately 10 to 20 s to enter RUN mode after the power is turned ON. During that time, outputs will be OFF or will be the values specified in the Unit or slave settings, and external communications cannot be performed. Use the RUN output on the Power Supply Unit, for example, to implement fail-safe circuits so that external devices do not operate incorrectly.
- Configure the external circuits so that the power supply to the control system turns ON only after the power supply to the Controller has turned ON. If the power supply to the Controller is turned ON after the control power supply, temporary errors may result in incorrect control system signals because the output terminals on Output Units may momentarily turn ON when power supply is turned ON to the Controller.

Actual Operation

- Check the user program, data, and parameter settings for proper execution before you use them for actual operation.

Turning OFF the Power Supply

- Never turn OFF the power supply to the Controller when the BUSY indicator is flashing. While the BUSY indicator is lit, the user program and settings in the CPU Unit are being backed up in the built-in non-volatile memory. This data will not be backed up correctly if the power supply is turned OFF. Also, a major fault level Controller error will occur the next time you start operation, and operation will stop.
- Do not turn OFF the power supply or remove the SD Memory Card while SD Memory Card access is in progress (i.e., while the SD BUSY indicator flashes). Data may become corrupted, and the Controller will not operate correctly if it uses corrupted data. To remove the SD Memory Card from the CPU Unit while the power supply is ON, press the SD Memory Card power supply switch and wait for the SD BUSY indicator to turn OFF before you remove the SD Memory Card.
- Do not disconnect the cable or turn OFF the power supply to the Controller when downloading data or the user program from Support Software.
- Always turn OFF the power supply to the Controller before you attempt any of the following.
  - Mounting or removing I/O Units or the CPU Unit
  - Assembling the Units
  - Setting DIP switches or rotary switches
  - Connecting cables or wiring the system
  - Connecting or disconnecting the connectors

The Power Supply Unit may continue to supply power to the rest of the Controller for a few seconds after the power supply turns OFF. The PWR indicator is lit during this time. Confirm that the PWR indicator is not lit before you perform any of the above.

Operation

- Confirm that no adverse effect will occur in the system before you attempt any of the following.
  - Changing the operating mode of the CPU Unit (including changing the setting of the Operating Mode at Startup)
  - Changing the user program or settings
  - Changing set values or present values
  - Forced refreshing
- Always sufficiently check the safety at the connected devices before you change the settings of an EtherCAT slave or Special Unit.
- If two different function modules are used together, such as when you use CJ-series Basic Output Units and EtherCAT slave outputs, take suitable measures in the user program and external controls to ensure that safety is maintained in the controlled system if one of the function modules stops. The relevant outputs will stop if a partial fault level error occurs in one of the function modules.
- Always confirm safety at the connected equipment before you reset Controller errors with an event level of partial fault or higher for the EtherCAT Master Function Module.
  When the error is reset, all slaves that were in any state other than Operational state due to a Controller error with an event level of partial fault or higher (in which outputs are disabled) will go to Operational state and the outputs will be enabled.
  Before you reset all errors, confirm that no Controller errors with an event level of partial fault have occurred for the EtherCAT Master Function Module.
- Always confirm safety at the connected equipment before you reset Controller errors for a CJ-series Special Unit. When a Controller error is reset, the Unit where the Controller error with an event level of observation or higher will be restarted.
  Before you reset all errors, confirm that no Controller errors with an event level of observation or higher have occurred for the CJ-series Special Unit. Observation level events do not appear on the Controller Error Tab Page, so it is possible that you may restart the CJ-series Special Unit without intending to do so.
  You can check the status of the *_CJB_UnitErrSta[0,0]* to *_CJB_UnitErrSta[3,9]* error status variables on a Watch Tab Page to see if an observation level Controller error has occurred.

Battery Backup

- The user program and initial values for the variables are stored in non-volatile memory in the CPU Unit. The present values of variables with the Retain attribute and the values of the Holding, DM, and EM Areas in the memory used for CJ-series Units are backed up by a Battery. If the Battery is not connected or the Battery is exhausted, the CPU Unit detects a Battery-backup Memory Check Error. If that error is detected, variables with a Retain attribute are set to their initial values and the Holding, DM, and EM Areas in memory used for CJ-series Units are cleared to all zeros. Perform thorough verifications and provide sufficient measures to ensure that the devices perform safe operation for the initial values of the variables with Retain attributes and the resulting operation.

Debugging

- Forced refreshing ignores the results of user program execution and refreshes I/O with the specified values. If forced refreshing is used for inputs for which I/O refreshing is not supported, the inputs will first take the specified values, but they will then be overwritten by the user program. This operation differs from the force-set/reset functionality of the CJ-series PLCs.

- You cannot upload or download information for forced refreshing with the Sysmac Studio.
  After downloading data that contains forced refreshing, change to RUN mode and then use the Sysmac Studio to perform the operation for forced refreshing.
  Depending on the difference in the forced status, the control system may operate unexpectedly.
- Do not specify the same address for the AT specification for more than one variable.
  Doing so would allow the same entity to be accessed with different variable names, which would make the user program more difficult to understand and possibly cause programming mistakes.

General Communications

- When you use data link communications, check the error information given in the status flags to make sure that no error has occurred in the source device. Write the user program to use the received data only if there is no error. If there is an error in the source device, the data for the data link may contain incorrect values.
- Unexpected operation may result if inappropriate data link tables are set. Even if appropriate data link tables have been set, confirm that the controlled system will not be adversely affected before you transfer the data link tables. The data links start automatically after the data link tables are transferred.
- All CPU Bus Units are restarted when routing tables are transferred from Support Software to the CPU Unit. Restarting these Units is required to read and enable the new routing tables. Confirm that the system will not be adversely affected by restarting before you transfer the routing tables.
- Tag data links will stop between related nodes while tag data link parameters are transferred during Controller operation. Confirm that the system will not be adversely affected before you transfer the tag data link parameters.

EtherNet/IP Communications

- All related EtherNet/IP nodes are reset when you transfer settings for the built-in EtherNet/IP port (including IP addresses and tag data links settings). This is performed to read and enable the settings. Confirm that the system will not be adversely affected by resetting nodes before you transfer the settings.
- If EtherNet/IP tag data links (cyclic communications) are used with a repeating hub, the communications load on the network will increase. This will increase collisions and may prevent stable communications. Do not use repeating hubs on networks where tag data links are used. Use an Ethernet switch instead.

EtherCAT Communications

- Make sure that the communications distance, number of nodes connected, and method of connection for EtherCAT are within specifications.
  Do not connect EtherCAT communications to EtherNet/IP, a standard in-house LAN, or other networks. An overload may cause the network to fail or malfunction.
- Malfunctions or unexpected operation may occur for some combinations of EtherCAT revisions of the master and slaves. If you disable the revision check in the network settings, use the Sysmac Studio to check the slave revision settings in the master and the actual slave revisions, and then make sure that functionality is compatible in the slave manuals or other references. You can check the actual slave revisions from the Sysmac Studio or on slave nameplates.
- After you transfer the user program, the CPU Unit is restarted. Communications with the EtherCAT slaves are cut off for up to 45 seconds. During that period, the slave outputs behave according to the slave settings.
  Before you transfer the user program, confirm that the system will not be adversely affected.
- If the Fail-soft Operation parameter is set to stop operation, process data communications will stop for all slaves when an EtherCAT communications error is detected in a slave. For this reason, if Servo Drives are connected, the Servos for all axes will be turned OFF. Make sure that the Fail-soft Operation parameter setting results in safe operation when a device error occurs.

- EtherCAT communications are not always established immediately after the power supply is turned ON. Use the system-defined variables in the user program to confirm that communications are established before attempting control operations.
- If frames sent to EtherCAT slaves are lost due to noise or other causes, slave I/O data is not communicated, and the intended operation is sometimes not achieved. If noise countermeasures are required, use the *_EC_InDataInvalid* (Input Data Disable) system-defined variable as an interlock condition in the user program.
  Refer to the *NJ-series CPU Unit Built-in EtherCAT Port User's Manual* (Cat. No. W505) for details.
  The slave outputs behave according to the slave settings. Refer to the manuals for the slaves for details.
- When an EtherCAT slave is disconnected, communications will stop and control of the outputs will be lost not only for the disconnected slave, but for all slaves connected after it. Confirm that the system will not be adversely affected before you disconnect a slave.
- If you disconnect the cable from an EtherCAT slave to disconnect it from the network, any current communications frames may be lost. If frames are lost, slave I/O data is not communicated, and the intended operation is sometimes not achieved. Perform the following processing for a slave that needs to be replaced.
  Program the *_EC_InDataInvalid* (Input Data Disable) system-defined variable as an interlock condition.
  Set the Impermissible Number of Continuous Timeouts setting in the EtherCAT master to at least 2.
  Refer to the *NJ-series CPU Unit Built-in EtherCAT Port User's Manual* (Cat. No. W505) for details.

Motion Control

- Confirm the axis number carefully before you perform an MC Test Run.
- The motor is stopped if communications are interrupted between the Sysmac Studio and the CPU Unit during an MC Test Run. Connect the communications cable between the computer and CPU Unit securely and confirm that the system will not be adversely affected before you perform an MC Test Run.
- Always execute the Save Cam Table instruction if you change any of the cam data from the user program in the CPU Unit or from the Sysmac Studio. If the cam data is not saved, the previous condition will be restored when the power is turned ON again, possibly causing unexpected machine operation.
- The positive drive prohibit input (POT), negative drive prohibit input (NOT), and home proximity input (DEC) of the Servo Drive are used by the MC Function Module as the positive limit input, negative limit input, and home proximity input. Make sure that the signal widths for all of these input signals are longer than the control period of the MC Function Module. If the input signal widths are shorter than the control period, the MC Function Module may not be able to detect the input signals, resulting in incorrect operation.

Battery Replacement

- The Battery may leak, rupture, heat, or ignite. Never short-circuit, charge, disassemble, heat, or incinerate the Battery or subject it to strong shock.
- Dispose of any Battery that has been dropped on the floor or otherwise subjected to excessive shock. Batteries that have been subjected to shock may leak if they are used.
- UL standards require that only an experienced engineer replace the Battery. Make sure that an experienced engineer is in charge of Battery replacement.
- Apply power for at least five minutes before changing the Battery. Install a new Battery within five minutes (at 25°C) of turning OFF the power supply. If power is not supplied for at least 5 minutes, the saved data may be lost.

Unit Replacement

- We recommend replacing the Battery with the power turned OFF to prevent the CPU Unit's sensitive internal components from being damaged by static electricity and to prevent malfunctions. The Battery can be replaced without turning OFF the power supply. To do so, always touch a grounded piece of metal to discharge static electricity from your body before you start the procedure.
  After you replace the Battery, connect the Sysmac Studio and clear the Low Battery Voltage error.
- Make sure that the required data, including the user program, configurations, settings, variables, and memory used for CJ-series Units, is transferred to a CPU Unit that was replaced and to externally connected devices before restarting operation.
  Be sure to include the routing tables, network parameters, and other CPU Bus Unit data, which are stored in the CPU Unit.

Disposal

- Dispose of the product and Batteries according to local ordinances as they apply.

- The following information must be displayed for all products that contain primary lithium batteries with a perchlorate content of 6 ppb or higher when shipped to or transported through the State of California, USA.
  Perchlorate Material - special handling may apply.
  See www.dtsc.ca.gov/hazardouswaste/perchlorate.
- The CPU Unit contains a primary lithium battery with a perchlorate content of 6 ppb or higher. Place the above information on the individual boxes and shipping boxes when shipping finished products that contain a CPU Unit to the State of California, USA.

Precautions for Correct Use

Storage, Mounting, and Wiring

- Do not operate or store the Controller in the following locations. Operation may stop or malfunctions may occur.
  - Locations subject to direct sunlight
  - Locations subject to temperatures or humidity outside the range specified in the specifications
  - Locations subject to condensation as the result of severe changes in temperature
  - Locations subject to corrosive or flammable gases
  - Locations subject to dust (especially iron dust) or salts
  - Locations subject to exposure to water, oil, or chemicals
  - Locations subject to shock or vibration
- Take appropriate and sufficient countermeasures when installing the Controller in the following locations.
  - Locations subject to strong, high-frequency noise
  - Locations subject to static electricity or other forms of noise
  - Locations subject to strong electromagnetic fields
  - Locations subject to possible exposure to radioactivity
  - Locations close to power lines
- Before touching a Unit, be sure to first touch a grounded metallic object in order to discharge any static build-up.
- Install the Controller away from sources of heat and ensure proper ventilation. Not doing so may result in malfunction, in operation stopping, or in burning.
- An I/O bus check error will occur and the Controller will stop if an I/O Connecting Cable's connector is disconnected from the Rack. Be sure that the connectors are secure.
- Do not allow foreign matter to enter the openings in the Unit. Doing so may result in Unit burning, electric shock, or failure.
- Do not allow wire clippings, shavings, or other foreign material to enter any Unit. Otherwise, Unit burning, failure, or malfunction may occur. Cover the Units or take other suitable countermeasures, especially during wiring work.
- For EtherCAT and EtherNet/IP, use the connection methods and cables that are specified in the *NJ-series CPU Unit Built-in EtherCAT Port User's Manual* (Cat. No. W505) and the *NJ-series CPU Unit Built-in EtherNet/IP Port User's Manual* (Cat. No. W506). Otherwise, communications may be faulty.
- Use the rated power supply voltage for the Power Supply Units. Take appropriate measures to ensure that the specified power with the rated voltage and frequency is supplied in places where the power supply is unstable.
- Make sure that the current capacity of the wire is sufficient. Otherwise, excessive heat may be generated. When cross-wiring terminals, the total current for all the terminals will flow in the wire. When wiring cross-overs, make sure that the current capacity of each of the wires is not exceeded.
- Do not touch the terminals on the Power Supply Unit immediately after turning OFF the power supply. Residual voltage may cause electrical shock.
- If you use reed switches for the input contacts for AC Input Units, use switches with a current capacity of 1 A or greater.
  If the capacity of the reed switches is too low, surge current may fuse the contacts.

Error Processing

- In applications that use the results of instructions that read the error status, consider the affect on the system when errors are detected and program error processing accordingly. For example, even the detection of a minor error, such as Battery replacement during operation, can affect the system depending on how the user program is written.

Unit Replacement

- If you replace a CPU Bus Unit or Special I/O Unit, refer to operation manual for the Unit for information on the data required for individual Units and redo the necessary settings.
- The absolute encoder home offset is backed up with a Battery in the CPU Unit.
  When you change the combination of the CPU Unit and Servomotor, e.g., when you add or replace a Servomotor, define home again.
  To restore the information without changing the CPU Unit-Servomotor combination, remove the absolute encoder home offset from the data to restore.

Task Settings

- If a Task Period Exceeded error occurs, shorten the programs to fit in the task period or increase the setting of the task period.

Motion Control

- Use the system-defined variable in the user program to confirm that EtherCAT communications are established before you attempt to execute motion control instructions. Motion control instructions are not executed normally if EtherCAT communications are not established.
- Use the system-defined variables to monitor for errors in communications with the slaves that are controlled by the motion control function module. Motion control instructions are not executed normally if an error occur in slave communications.
- Before you start an MC Test Run, make sure that the operation parameters are set correctly.
- Do not download motion control settings during an MC Test Run.

EtherCAT Communications

- Do not disconnect the EtherCAT slave cables during operation. The outputs will become unstable.
- Set the Servo Drives to stop operation if an error occurs in EtherCAT communications between the Controller and a Servo Drive.

Battery Replacement

- Be sure to install a replacement Battery within two years of the production date shown on the Battery label.
- Turn ON the power after replacing the Battery for a CPU Unit that has been unused for a long time. Leaving the CPU Unit unused again without turning ON the power even once after the Battery is replaced may result in a shorter Battery life.
- When you replace the Battery, use the CJ1W-BAT01 Battery Set.

SD Memory Cards

- Insert the SD Memory Card all the way.
- Do not turn OFF the power supply to the Controller during SD Memory Card access. The files may be corrupted.
  If there is a corrupted file in the SD Memory Card, the file is automatically deleted by the restoration function when the power supply is turned ON.

Regulations and Standards

Conformance to EC Directives

Applicable Directives

- EMC Directives
- Low Voltage Directive

Concepts

● EMC Directive

OMRON devices that comply with EC Directives also conform to the related EMC standards so that they can be more easily built into other devices or the overall machine. The actual products have been checked for conformity to EMC standards.*
Whether the products conform to the standards in the system used by the customer, however, must be checked by the customer. EMC-related performance of the OMRON devices that comply with EC Directives will vary depending on the configuration, wiring, and other conditions of the equipment or control panel on which the OMRON devices are installed. The customer must, therefore, perform the final check to confirm that devices and the overall machine conform to EMC standards.

* Applicable EMC (Electromagnetic Compatibility) standards are as follows:
EMS (Electromagnetic Susceptibility): EN 61131-2 and EN 61000-6-2
EMI (Electromagnetic Interference): EN 61131-2 and EN 61000-6-4 (Radiated emission: 10-m regulations)

● Low Voltage Directive

Always ensure that devices operating at voltages of 50 to 1,000 VAC and 75 to 1,500 VDC meet the required safety standards. The applicable directive is EN 61131-2.

● Conformance to EC Directives

The NJ-series Controllers comply with EC Directives. To ensure that the machine or device in which the NJ-series Controller is used complies with EC Directives, the Controller must be installed as follows:

- The NJ-series Controller must be installed within a control panel.
- You must use reinforced insulation or double insulation for the DC power supplies connected to DC Power Supply Units and I/O Units.
- NJ-series Controllers that comply with EC Directives also conform to the Common Emission Standard (EN 61000-6-4). Radiated emission characteristics (10-m regulations) may vary depending on the configuration of the control panel used, other devices connected to the control panel, wiring, and other conditions.
  You must therefore confirm that the overall machine or equipment complies with EC Directives.

Conformance to Shipbuilding Standards

The NJ-series Controllers comply with the following shipbuilding standards. Applicability to the shipbuilding standards is based on certain usage conditions. It may not be possible to use the product in some locations. Contact your OMRON representative before attempting to use a Controller on a ship.

Usage Conditions for NK and LR Shipbuilding Standards

- The NJ-series Controller must be installed within a control panel.
- Gaps in the door to the control panel must be completely filled or covered with gaskets or other material.
- The following noise filter must be connected to the power supply line.

Noise Filter

Manufacturer	Model
Cosel Co., Ltd.	TAH-06-683

Trademarks

- Sysmac and SYSMAC are trademarks or registered trademarks of OMRON Corporation in Japan and other countries for OMRON factory automation products.
- Windows, Windows 98, Windows XP, Windows Vista, and Windows 7 are registered trademarks of Microsoft Corporation in the USA and other countries.
- EtherCAT® is a registered trademark of Beckhoff Automation GmbH for their patented technology.
- The SD logo is a trademark of SD-3C, LLC. 

Other company names and product names in this document are the trademarks or registered trademarks of their respective companies.

Unit Versions

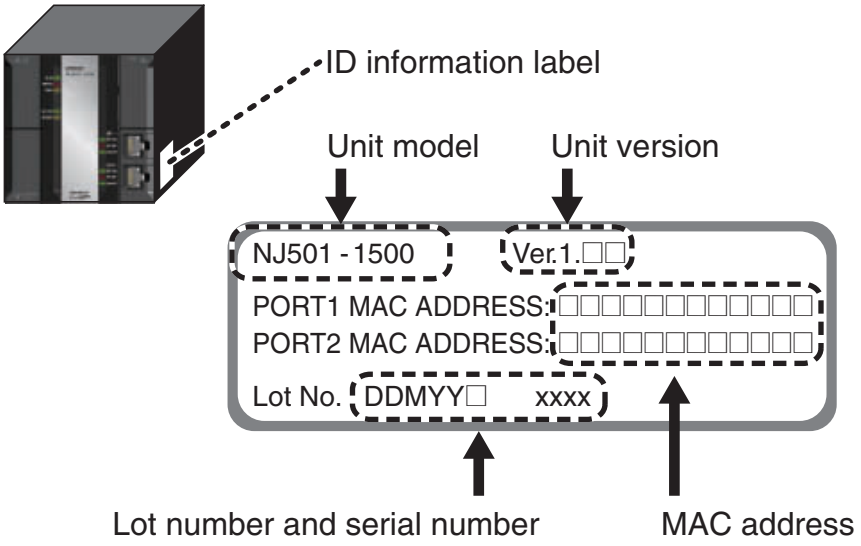
Unit Versions

A “unit version” has been introduced to manage CPU Units in the NJ Series according to differences in functionality accompanying Unit upgrades.

Notation of Unit Versions on Products

The unit version is given on the ID information label of the products for which unit versions are managed, as shown below.

Example for NJ-series NJ501- ☐☐☐☐ CPU Unit:



The following information is provided on the ID information label.

Item	Description
Unit model	Gives the model of the Unit.
Unit version	Gives the unit version of the Unit.
Lot number and serial number	Gives the lot number and serial number of the Unit. DDMYY: Lot number, @: For use by OMRON, xxxx: Serial number “M” gives the month (1 to 9: January to September, X: October, Y: November, Z: December)
MAC address	Gives the MAC address of the built-in port on the Unit.

Confirming Unit Versions with Sysmac Studio

You can use the Unit Production Information on the Sysmac Studio to check the unit version of the CPU Unit, CJ-series Special I/O Units, CJ-series CPU Bus Units, and EtherCAT slaves. The unit versions of CJ-series Basic I/O Units cannot be checked from the Sysmac Studio.

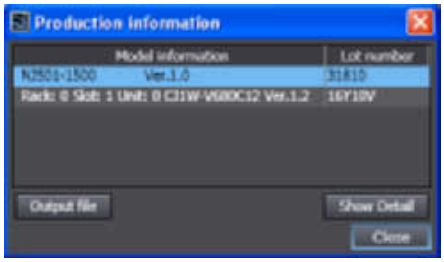
● CPU Unit and CJ-series Units

1 Double-click **CPU/Expansion Racks** under **Configurations and Setup** in the Multiview Explorer. Or, right-click **CPU/Expansion Racks** under **Configurations and Setup** and select ***Edit*** from the menu.

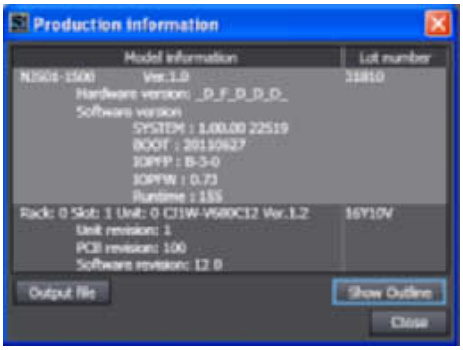
The Unit Editor is displayed for the Controller Configurations and Setup layer.

2 Right-click any open space in the Unit Editor and select ***Production Information***.

The Production Information Dialog Box is displayed.



Simple Display



Detailed Display

In this example, “Ver.1.0” is displayed next to the unit model.

The following items are displayed.

CPU Unit	CJ-series Units
Unit model	Unit model
Unit version	Unit version
Lot number	Lot number
	Rack number, slot number, and unit number

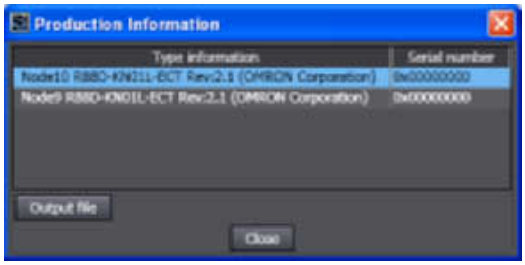
● EtherCAT Slaves

1 Double-click **EtherCAT** under **Configurations and Setup** in the Multiview Explorer. Or, right-click **EtherCAT** under **Configurations and Setup** and select ***Edit*** from the menu.

The EtherCAT Configuration Tab Page is displayed for the Controller Configurations and Setup layer.

2 Right-click the master in the EtherCAT Configurations Editing Pane and select **Display Production Information**.

The Production Information Dialog Box is displayed.



The following items are displayed.
Node address
Type information*
Serial number

* If the model number cannot be determined (such as when there is no ESI file), the vendor ID, product code, and revision number are displayed.

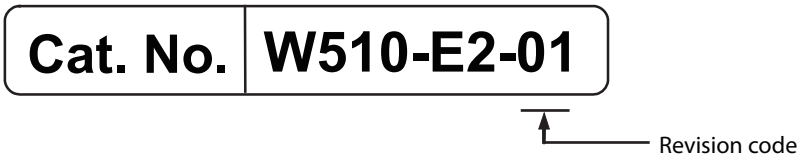
Related Manuals

The following manuals are related to the NJ-series Controllers. Use these manuals for reference.

Manual name	Cat. No.	Model numbers	Application	Description
NJ-series CPU Unit Hardware User's Manual	W500	NJ501-□□□□	Learning the basic specifications of the NJ-series CPU Units, including introductory information, designing, installation, and maintenance. Mainly hardware information is provided.	An introduction to the entire NJ-series system is provided along with the following information on a Controller built with an NJ501 CPU Unit. • Features and system configuration • Introduction • Part names and functions • General specifications • Installation and wiring • Maintenance and inspection Use this manual together with the *NJ-series CPU Unit Software User's Manual* (Cat. No. W501).
NJ-series CPU Unit Software User's Manual	W501	NJ501-□□□□	Learning how to program and set up an NJ-series CPU Unit. Mainly software information is provided.	The following information is provided on a Controller built with an NJ501 CPU Unit. • CPU Unit operation • CPU Unit features • Initial settings • Programming based on IEC 61131-3 language specifications Use this manual together with the *NJ-series CPU Unit Hardware User's Manual* (Cat. No. W500).
Sysmac Studio Version 1 Operation Manual	W504	SYSMAC-SE2□□□	Learning about the operating procedures and functions of the Sysmac Studio.	Describes the operating procedures of the Sysmac Studio.
CJ-series PROFIBUS Master Units Operation Manual for NJ-series CPU Unit	W509	CJ1W-PRM21	Learning about the functions and operating procedures when the CJ-series PROFIBUS Master Unit is used in an NJ-series system configuration.	The functions and operating procedures when the CJ-series PROFIBUS Unit is used in an NJ-series system configuration are described as well as the operation of CX-ConfiguratorFDT.
SmartSlice GRT1-series Communication Unit Operation Manual	W04E	GRT1-PRT	Learning about the GRT1-series SmartSlice PROFINET Communication Unit.	Describes the GRT1-PRT PROFIBUS Communications Unit for OMRON's SmartSlice I/O Units. It also describes how to install and operation the Unit.
SmartSlice GRT1 Series Slice I/O Units	W455	GRT1-series Digital I/O Units, Analog I/O Units, Counter and Positioning Units, System Units	Learning about the various SmartSlice I/O Units that work with the GRT1-PRT-series Communication Unit.	Describes the models, specifications, functions, operating procedures, and applications of GRT1-series Slice I/O Units.
CS/CJ Series PROFIBUS Master Unit Operation Manual	W409	CS1/CJ1W-PRM21	Learning about the CS1/CJ1W-PRM21 PROFIBUS Master Units.	Describes the operation and configuration details of the CS1W-PRM21 and CJ1W PRM21 PROFIBUS DP and PROFIBUS DP-V1 Master Units when used in CS/CJ series systems.

Revision History

A manual revision code appears as a suffix to the catalog number on the front and back covers of the manual.



Revision code	Date	Revised content
01	September 2011	Original production

1

Features and System Configuration

This section provides a brief description of PROFIBUS-DP. It also addresses the overall specification and the communication performance of the PROFIBUS-DP CJ1W-PRT21 Slave Unit.

1-1 Overview of PROFIBUS

1-1-1 Introduction

- **Standard EN50170**

  PROFIBUS (PROcess FIeldBUS) is an open fieldbus standard for a wide range of applications in manufacturing, processing and building automation. The Standard, EN 50170 (the Euronorm for field communications), to which PROFIBUS adheres, guarantees vendor independence and transparency of operation. It enables devices of various manufacturers to intercommunicate without having to make any special interface adaptations.

  The PROFIBUS family comprises three mutually compatible versions: PROFIBUS FMS, PROFIBUS DP and PROFIBUS PA.

- **PROFIBUS FMS**

  FMS means Fieldbus Message Specification. This version is the general-purpose solution for high-level extensive and complex communication tasks. Powerful services open up a wide range of applications and provide great flexibility. It can also be used for extensive and complex communication tasks.

- **PROFIBUS DP**

  DP means Decentralized Periphery. PROFIBUS DP is optimized for high speed and low-cost interfacing. It is specially designed for communication between automation control systems and distributed I/O at the device level.

- **PROFIBUS PA**

  PA means Process Automation. It permits sensors and actuators to be connected to one common bus even in areas where intrinsically safe products are required. It also permits data and power to be supplied over the bus using 2-wire technology according the international standard IEC 1158-2.

- **Uniform Bus Access Protocol**

  PROFIBUS DP and PROFIBUS FMS use the same transmission technology and uniform bus access protocol. Consequently, both versions can be operated simultaneously on the same bus. FMS field devices, however, cannot be controlled by DP masters and vice versa.

Precautions for Safe Use

Confirm safety at the destination node before transferring a program to another node or changing contents of the I/O memory area. Doing either of these without confirming safety may result in injury.

Precautions for Correct Use

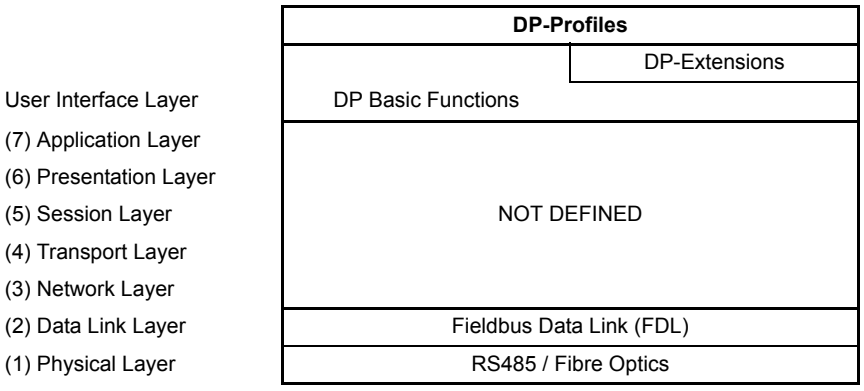
It is not possible to exchange one of these family members by another family member. This will cause faulty operation.

1-1-2 PROFIBUS Communication Protocol

OSI Reference Model ISO-7498

In general, the PROFIBUS communication protocol is based on the Open System Interconnection (OSI) reference model in accordance with the international standard ISO-7498 (see the following illustration). The model defines 7 layers of communication functions, three of which - layers 1, 2, and 7 - are used in PROFIBUS.

- Layer 1, the Physical Layer of this model, defines the physical transmission characteristics.
- Layer 2, the Data Link Layer of this model, defines the bus access protocol. This protocol also includes data security and the handling of transmission protocols and telegrams.
- Layer 7, the Application Layer of this model, defines the application functions. This layer is only applicable to PROFIBUS FMS.



OSI Layer 1, 2 and User Interface

PROFIBUS DP uses layers 1 and 2, and the user interface. Layers 3 to 7 are not defined for PROFIBUS DP. The user interface Layer defines the interface functions for specific application areas, i.e. the PROFIBUS DP basic functions and communication profiles. This streamlined architecture ensures fast and efficient data transmission. The application functions which are available to the user, as well as the system and device behavior of the various PROFIBUS DP device types, are specified in the user interface.

OSI Layer 1: Transmission Medium

RS-485 transmission technology or fibre optics are available for transmission. RS-485 transmission is the most frequently used transmission technology. Its application area includes all areas in which high transmission speed and simple inexpensive installation are required. PROFIBUS modules are interconnected by single twisted-pair shielded copper wires.

RS-485 Technology

The RS-485 transmission technology is very easy to handle. Installation of the twisted pair cable does not require expert knowledge. The bus structure permits addition and removal of devices or step-by step commissioning of the system without influencing the other devices. Later expansions have no effect on devices which are already in operation.

● RS-485 Transmission Speed

Transmission speeds between 9.6 kbps and 12 Mbps can be selected. One unique transmission speed must selected for all devices on the bus when the system is commissioned.

● Cable Length

The maximum cable length depends on the transmission speed. The specified cable lengths are based on type-A cable (see *2-3 Network Installation*). The length can be increased by the use of repeaters. The use of more than 3 repeaters in series is not recommended.

1-1-3 GSD File Technology

To achieve straightforward configuration of a PROFIBUS-DP network, the characteristic features of a device are specified in a file. This file is called a GSD-file (Gerätestammdaten file).

GSD files are usually supplied with each unit. Alternatively, GSD files can be downloaded from the Internet, either from the manufacturer's site, or from the GSD library of the PROFIBUS Nutzerorganisation at the following web site:

http://www.profibus.com

The device data base file of each device is loaded in CX-ConfiguratorFDT and downloaded to the master device. Refer to the *CJ-series PROFIBUS Master Unit Operation Manual or NJ-series CPU Unit* (Cat. No. W509) for usage of the GSD file in the master's configuration software.

● GSD File Language

The language used in the GSD file is indicated by the last letter of the file extension, *.GS?:

Default = GSD

English = GSE

German = GSG

Italian = GSI

Portuguese = GSP

Spanish = GSS

The GSD files are prepared individually by the vendor for each type of device, according to a fixed format. Some parameters are mandatory, some have a default value and some are optional. The device data base file is divided into three sections

1 General Section; this section contains the vendor name, the device name, hardware- and software release versions, device type and identification number, protocol specification and supported baud rates.

2 DP-master Section; this section contains all parameters which only apply to DP master devices (e.g. maximum memory size for the master parameter set, maximum number of entries in the list of active devices, or the maximum number of slaves the master can handle).

3 DP-slave Section; this section contains all specification related to slaves (e.g. minimum time between two slave poll cycles, specification of the inputs and outputs, and consistency of the I/O data).

1-1-4 Device Types

PROFIBUS distinguishes between master devices and slave devices. The CJ1W-PRT21 is a PROFIBUS slave device.

Master Devices

Master devices determine the data communication on the bus. A Master can send messages without an external request, as long as it holds the bus access right (the token). Masters are also referred to as active devices in the PROFIBUS standard.

● DPM1 and DPM2

There are two types of master devices: DP master class 1 (DPM1) and DP master class 2 (DPM2).

A DPM1 is a central controller which exchanges information with the decentralised stations (i.e. DP slaves) within a specified message cycle.

DPM2 devices are programmers, configuration devices or operator panels. They are used during commissioning, for configuration of the DP system, or for operation and monitoring purposes.

Slave Devices

Slave devices are peripheral devices. Typical slave devices include input/output devices, valves, drives, and measuring transmitters. They do not have bus access rights and they can only acknowledge received messages or send messages to the master when requested to do so. Slave devices are also called passive devices.

1-1-5 Bus Access Protocol

● OSI Layer 2: Bus Access Protocol

The PROFIBUS bus access protocol is implemented by OSI layer 2. This protocol also includes data security and the handling of the transmission protocols and messages.

● Medium Access Control

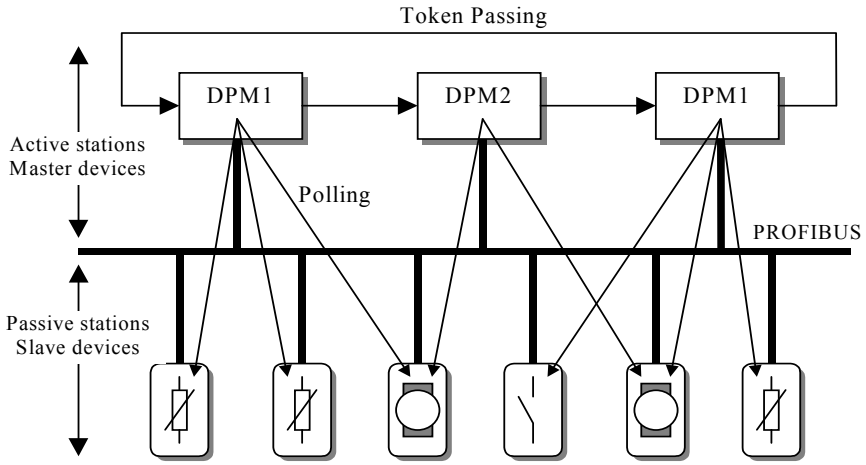
The Medium Access Control (MAC) specifies the procedures which determine when a device is permitted to transmit data. A token passing procedure is used to handle the bus access between master devices, and a polling procedure is used to handle the communication between a master device and its assigned slave device(s).

● Token Passing

The token passing procedure guarantees that the bus access right (the token) is assigned to each master within a precisely defined time frame. The token message, a special message for passing access rights from one master to the next master, must be passed around the logical token ring (once to each master) within a specified target rotation time. Each master executes this procedure automatically. A user can only change the target rotation time, but this is not recommended.

● Polling Procedure

The polling or master-slave procedure permits the master, currently in possession of the token, to access its assigned slaves. The figure below shows a possible configuration The configuration shows three active devices (masters) and six passive devices (slaves).



The three masters form a logical token ring. When an active device receives the token message, it can perform its master role for a certain period of time. During this time it can communicate with all assigned slave devices in a master- slave communication relationship, and a DPM2 master can take the initiative to communicate with DPM1 master devices in a master-master communication relationship.

● Multi-peer Communication

In addition to logical peer-to-peer data transmission, PROFIBUS-DP provides multi-peer communication (broadcast and multicast).

● Broadcast Communication

An active station sends an unacknowledged message to all other stations (masters and slaves).

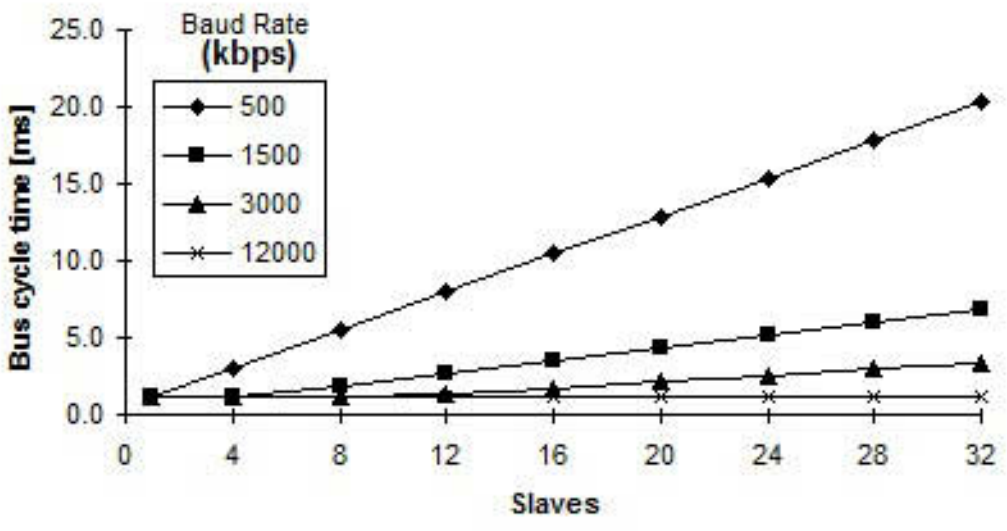
● Multicast Communication

An active station sends an unacknowledged message to a predetermined group of stations (masters and slaves).

1-1-6 Data Throughput

Transmission Time

At 12 Mbps, PROFIBUS-DP requires only about 1 ms for the transmission of 512 bits of input data and 512 bits of output data distributed over 32 stations. The figure below shows the typical PROFIBUS-DP transmission time depending on the number of stations and the transmission speed. The data throughput will decrease when more than one master is used.



1-1-7 Diagnostic Functions

Extensive Diagnostics

The extensive diagnostic functions of PROFIBUS-DP enable fast location of faults. The diagnostic messages are transmitted over the bus and collected at the master. These messages are divided into three levels:

1 Device Related Diagnostics

These messages concern the general operational status of the whole device (e.g. over temperature or low voltage).

2 Module Related Diagnostics

These messages indicate that a fault is present in a specific I/O range (e.g. an 8-bit output module) of a station.

3 Channel Related Diagnostics

These messages indicate an error at an individual input or output (e.g. short circuit on output 5).

1-1-8 Protection Mechanisms

Time Monitoring

PROFIBUS-DP provides effective protection functions against parameterisation errors or failure of the transmission equipment. Time monitoring is provided at the master and at the slaves. The monitoring interval is specified during the configuration.

● Monitoring at the Master

The DPM1 master monitors data transmission of its active slaves with the Data_Control_Timer. A separate control timer is used for each slave. This timer expires when correct data transmission does not occur within the monitoring interval.

If the master's Auto_Clear mode is enabled, the DPM1 exits the Operate state, switches the outputs of all assigned slaves to fail-safe status and changes to its Clear state (see *1-2 Configuring the CJ1W-PRT21 Slave Unit*).

● Monitoring at the Slave

The slave uses the watchdog control to detect failures of the master or the transmission line. If no data communication with the master occurs within the watchdog control interval, the slave automatically switches its outputs to the fail-safe status. This mechanism can be enabled or disabled for each individual slave.

Also, access protection is available for the inputs and outputs of the DP slaves operating in multi-master systems. This ensures that direct access can only be performed by the authorised master. For other masters, the slaves offer an image of their inputs and outputs, which can be read by any master, even without access rights.

1-1-9 Network Operation Modes

PROFIBUS-DP distinguishes four different network states.

● OFFLINE

Communication between all DP participants is stopped.

● STOP

Communication between DPM1 and DP slaves is stopped. Only communication between DPM1 and DPM2 is possible.

● CLEAR

DPM1 master attempts to set parameters, check the configuration, and subsequently perform data exchange with its associated DP-slaves. The data exchange comprises reading the inputs of the DP-slaves and writing zero's to the outputs of the DP-slaves.

● OPERATE

DPM1 master exchanges data with its assigned slaves, inputs are read and outputs are written. Beside this, the DPM1 cyclically sends its local status to all assigned DP slaves (with a multicast message) at a configurable time interval.

Auto_Clear

When an error occurs during the data transfer phase of the DPM1, the ‘Auto_Clear’ configuration setting determines the subsequent actions. If this parameter is set to false, the DPM1 remains in the 'Operate' state. If set to true, the DPM1 switches the outputs of all assigned DP slaves to the fail-safe state and the network state changes to the 'Clear' state (see *3-6-2 Status Flags (*_SlvSta)*).

1-2 Configuring the CJ1W-PRT21 Slave Unit

After making the physical connections of the network (see *2-3 Network Installation*), the PROFIBUS-DP system needs to be configured. For each master and its assigned slaves, a configuration has to be defined using a dedicated configuration program called CX-ConfiguratorFDT. This program provides the master with information about

- The slaves that are connected to the master.
- The assignment of slaves to groups for broadcast / multicast messages.
- The mapping of the slaves into the memory of the master.
- The bus parameters (e.g. baud rate, target rotation time etc.).

To configure a master unit to communicate with the CJ1W-PRT21, the Unit's device database file OC_0602.GSD is required. Based on the contents of this file, the configuration program for the master unit will allow the user to specify the amount of input and output data to be exchanged. The sizes of the in and the output block can both be set in 1 word increments from 0 to 100 words.

Additional Information

For more information on CX-ConfiguratorFDT, refer to *CJ-series PROFIBUS Master Unit Operation Manual for NJ-series CPU unit* (Cat. No. W509).

Modular Slave

The CJ1W-PRT21 is characterized as a modular slave. The following types of data exchange modules are pre-defined:

- IN: modules of 1, 2, 4, 8, and 16 words
- OUT: modules of 1, 2, 4, 8, and 16 words
- IN/OUT: modules of 1+1, 2+2, 4+4, 8+8, and 16+16 words

By concatenating up to 32 modules, any desired size of input and output block can be created (multiple selections of any module type are allowed). The sequence in which the modules are entered is irrelevant. Only the resulting total lengths of the input and output areas are of significance.

Check Configuration

Upon startup of the PROFIBUS-DP communication, the master unit will send a Chk_Cfg message so that the slave can verify that the master's expected I/O configuration for the slave is correct.

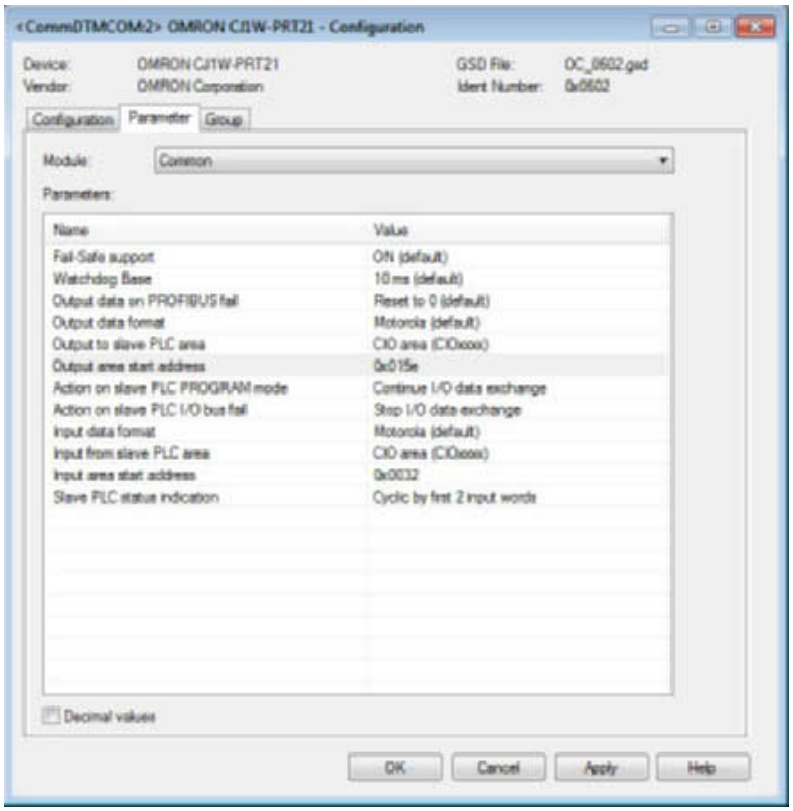
The CJ1W-PRT21 Slave Unit will accept any in/out words up to 100 input, 100 output words. The maximum of input + outputs must be 180 words or less.

Parameter Data

The Set_Prm telegram will provide the following information at system startup, after a restart and in data exchange mode:

- Start address of the area in the host CPU where to read and to send to the master.
- Format (Motorola/Intel) of the data to be sent to the master.
- Actions to be taken in case of CPU status change or fatal errors.
- Inclusion of 2 words CPU status information or not.

The setting and descriptions found in CX-Configurator FDT are shown below.

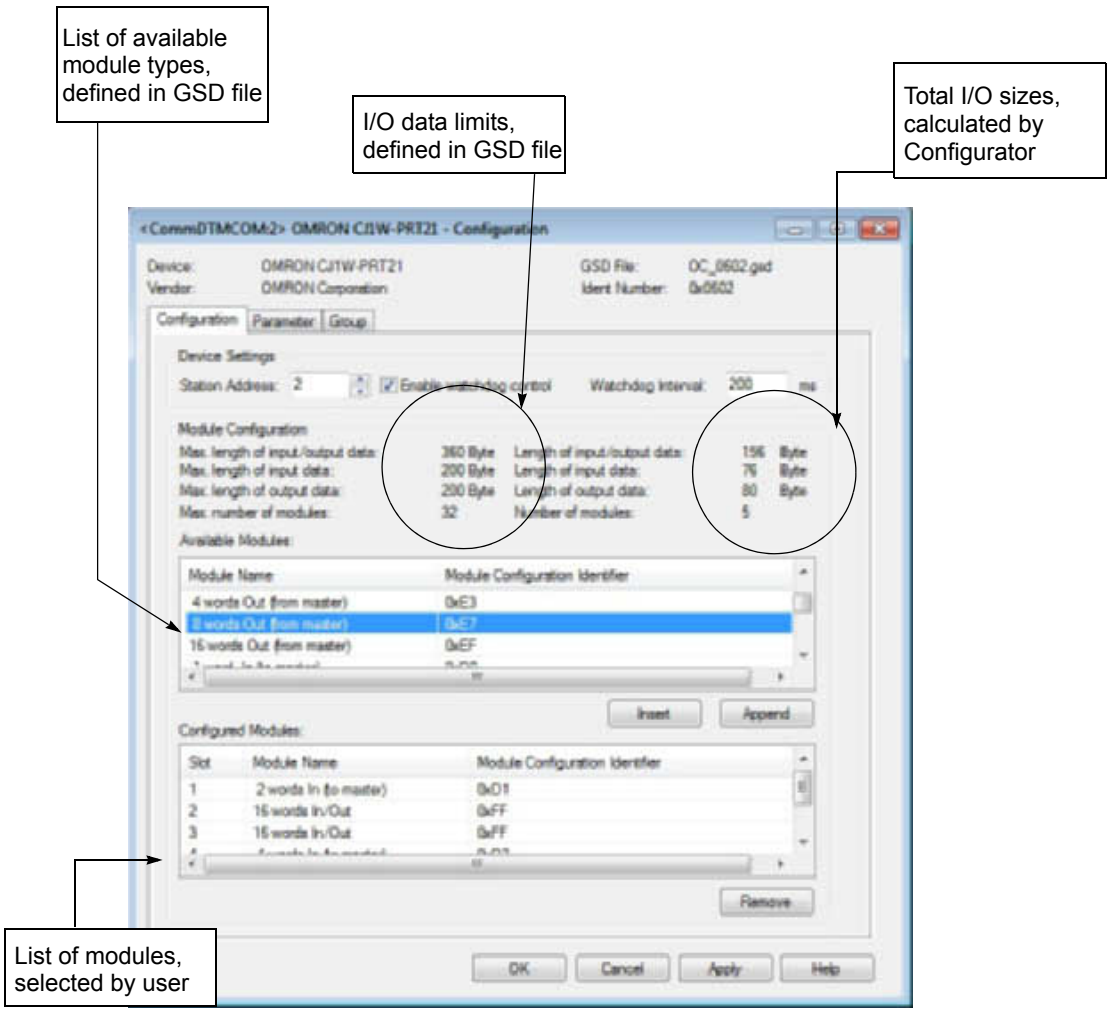


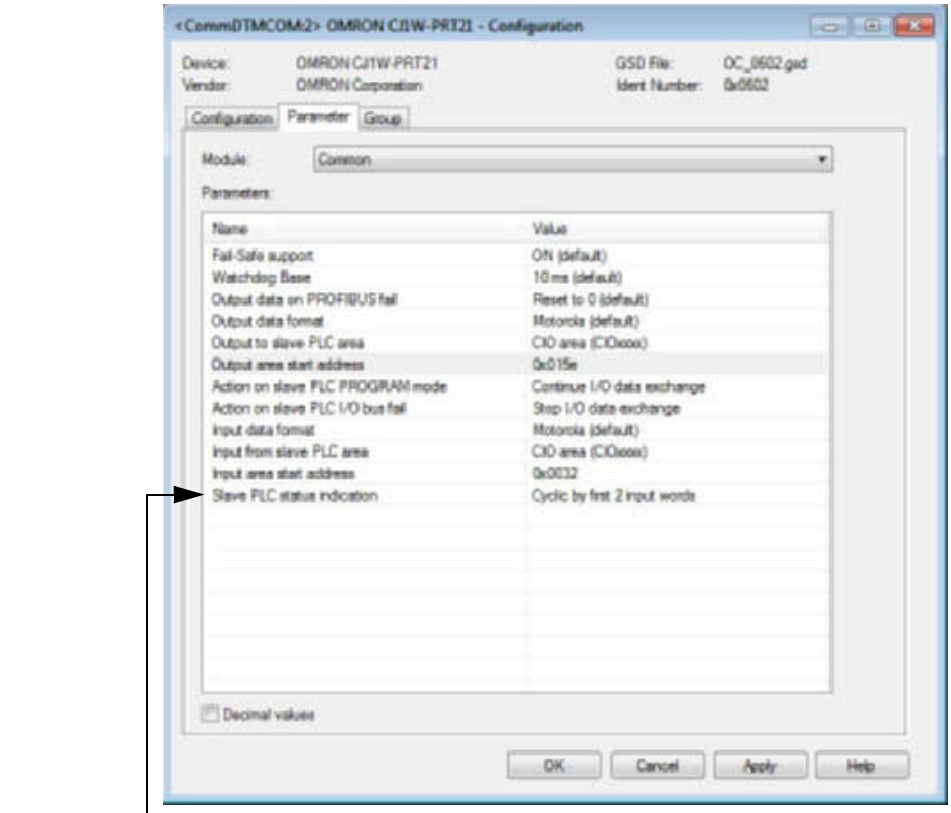
Name	Description
Fail-Safe Support	ON: After the master sends a global control command 'CLEAR', the slave can accept data telegrams containing no data, while still remaining in data exchange mode OFF: After the master sends a global control command 'CLEAR', the slave requires data telegram containing 0000 as data in order to remain in data exchange mode.
Watchdog Base	The slave uses the watchdog control to detect failures of the master or the transmission line. If no data communication with the master occurs within the watchdog control interval, the slave automatically switches its outputs to the fail-safe status. The watchdog control time can be specified in intervals of 1 ms or 10 ms.
Output data on PROFIBUS fail	The user can select how the slave will behave on the host CPU's I/O bus in the event the PROFIBUS data exchange communications fails • Clear data to Host CPU • Hold data to Host CPU
Output data format	The user can select how the data bytes of a PROFIBUS data exchange telegram are mapped to the host CPU data words. • Motorola • Intel See *3-3 I/O Data Format* for details
Output to slave PLC area	The user can select the area to which the unit will write PROFIBUS output data received from its master.
Output area start address	Sets the start address in the host CPU to which the PROFIBUS output data, received from the master, will be written.
Action on slave PLC PROGRAM mode	Defines how the slave will behave on PROFIBUS in the event the host CPU is in PROGRAM mode (as opposed to RUN mode).
Action on slave PLC I/O bus fail	Defines how the slave will behave on PROFIBUS in the event the host CPU has a fatal error (CPU ERC indicator ON) or communication with the host CPU is lost e.g. I/O refresh timeout.

Name	Description
Input data format	Defines how the Host CPU data words are mapped to a PROFIBUS data exchange telegram. • Motorola • Intel See *3-3 I/O Data Format* for details.
Input from slave PLC area	Selects the area from which the unit will read PROFIBUS input data to be sent to the master.
Input area start address	Sets the start address in the host CPU from which the PROFIBUS input data to be sent to the master will be read.
Slave PLC status indication	Selects if the CPU status information should occupy the first word of input data to the PROFIBUS Master (see *3-8 CPU Status Information*)

Example Configuration

The example below shows a slave configuration screen. The CJ1W-PRT21 is configured as a slave with 2 words input for status information and (16+16+4) 36 words input data and (16+16+8) 40 words output data. The terms input and output are to be interpreted as seen from the PROFIBUS-DP master unit.





If the Slave CPU status indication is configured as Cyclic by first 2 input words then the connections between master and slave are as follows:

Master	Slave
1st IN word	1st Slave CPU status word
2nd IN word	2nd Slave CPU status word
3rd IN word	CIO 50
4th IN word	CIO 51
...	
38th IN word	CIO 85
1st OUT word	CIO 350
2nd OUT word	CIO 351
...	
40th OUT word	CIO 389

1-3 PROFIBUS Slave Unit

1-3-1 Specifications

Model Code		CJ1W-PRT21
Installation	**Maximum number of Units per CPU system**	40
	Current consumption	400 mA (maximum) at 5 VDC from CPU power supply
	Weight	90 g (typical)
	Storage temperature	-20ºC to +70ºC
Environment	**Operating temperature**	0ºC to +55ºC
	Operating humidity	10 to 90% (non-condensing)
	Conformance to EMC- and environmental standards	EN50081-2 EN61131-2
	Switch settings	Special I/O Machine number (00-95) by 2 rotary switch PROFIBUS-DP node address (00-99) by 2 rotary switches
User Interface	**Indicators**	Unit status: RUN (green indicator), ERC (red indicator) Network status: COMM (green indicator), BF (red indicator) CPU status: ERH (red indicator)
	No. of CIO words allocated	CPU -> Unit: 1 word control data Unit -> CPU: 1 word status data
CPU Interface	**No. of DM words allocated**	Unit -> CPU: 8 words of Unit setup information
	Amount of I/O data per Unit	Fixed: 2 words CIO area (one in, one out) for Unit status + Software Switches. 1 word status information from the host CPU, containing operation status and (see *3-8 CPU Status Information*). This information will be sent to the PROFIBUS master: • as extended diagnostics, only at a change of data content. • optionally, attached to the I/O data, each PROFIBUS cycle. Variable: 2 user-defined areas for PROFIBUS I/O data, with the following restrictions: • Up to 100 words input in one CPU area (CIO, H, D, EM). • Up to 100 words output in one CPU area (CIO, H, D, EM). • Inputs+outputs must be 180 words or less

Model Code		CJ1W-PRT21	
Profibus Interface	**Applicable standard**	EN50170 Vol. 2	
	Conformance to PROFIBUS standard	Certificate No. Z01033	
	Bus connector	9-pin female sub-D connector (RS-485 PROFIBUS connector)	
	Bus address	0 to 99, Remote setting *not supported*	
	Baud rate (auto-detect)	9.6 kbps, 19.2 kbps, 45.45 kbps, 93.75 kbps, 187.5 kbps, 500 kbps, 1.5 Mbps, 3 Mbps, 6 Mbps, 12 Mbps	
	Supported functions (as responder)	to DPM1 + DPM2 masters	Data_Exchange Slave_Diag Set_Prm Chk_cfg Global_Control (SYNC/FREEZE/CLEAR)
		to DPM2 master only	RD_Inp RD_outp Get_cfg
	Station type	Modular station, max. 32 modules Configurable with In-, Out-, and I/O-modules of 1, 2, 4, 8, and 16 words Total of 0 to 100 words in + 0 to 100 words out. Sum of Input and Output size can be up to 180 words	
	GSD file	OC_0602.GSD, supplied with the unit	

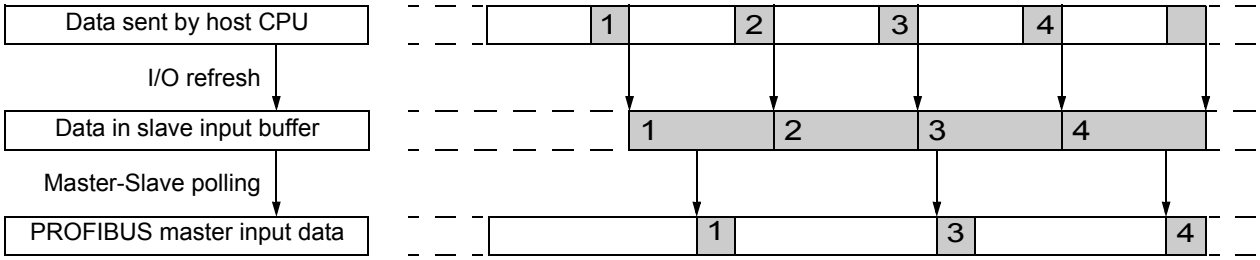
1-3-2 Performance

The task of the CJ1W-PRT21 is to exchange predetermined amounts of data between the host CPU system and a PROFIBUS-DP master unit. Its performance in terms of data transfer rate is therefore mainly governed by two factors external to the Unit: the PROFIBUS-DP cycle time and the host CPU's cycle time.

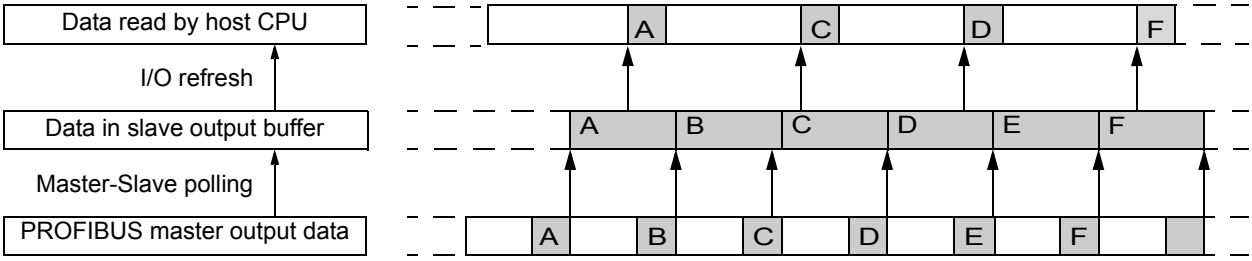
The CPU cycle and the PROFIBUS-DP cycle will generally be:

- independent,
- of unequal length,
- more or less variable,
- and therefore fundamentally asynchronous.

In case the PROFIBUS-DP cycle time is longer than the host CPU cycle time, it may occur that slave input data, sent by the Unit's host CPU only during a single CPU cycle, cannot be read in time by the PROFIBUS master.



In case the PROFIBUS-DP cycle time is shorter than the host CPU cycle time, it may occur that slave output data, sent by the PROFIBUS master only during a single fieldbus cycle, cannot be read in time by the Unit's host CPU.



If it is necessary that each different set of transmitted data is acknowledged by the receiving side, the user will have to implement a verification mechanism in the CPU programs on both the master and the slave CPU. An example is to reserve one byte/word in the master's data block for a transmission counter, which is copied back by the slave in its reply. The master may only transmit the next data if the received counter value equals the sent value, indicating that the previous data was received by the slave.

● Consistency

The CJ1W-PRT21 guarantees consistency over the full length of the PROFIBUS data message, i.e. all I/O data in one PROFIBUS message is transferred to the host CPU in one I/O refresh and vice versa. There are added modules without consistency which simplify communication with Siemens S7 masters.

● PROFIBUS-DP Cycle Time

The overall PROFIBUS-DP communication cycle time will depend on the number and types of PROFIBUS-DP master(s) and other slaves connected to the network, and the overall bus parameters defined in the configuration of the master unit(s).

The time required to exchange I/O data between the CJ1W-PRT21 and its master will depend on the number of input and output words defined in the master's configuration, the selected baud rate and on the performance of the master unit itself.

The minimum time interval between subsequent I/O data exchanges with the CJ1W-PRT21 (minimum slave interval) is 0.5 ms as defined in the Unit's GSD file.

1-4 Basic Operating Procedures

1-4-1 Overview

The following diagram provides an overview of the installation procedures. For experienced installation engineers, this may provide sufficient information. For others, cross-references are made to various sections of this manual where more explicit information is given.

Mount the PROFIBUS Slave Unit to the NJ-series controller (See *2-2-2 Mounting*) installing the CJ1W-PRM21 Unit.

↓

Select a unique Machine Number (0 - 95) for the Unit using the rotary switch on the front of the Unit (See section *2-1-3 Switch Settings*)

↓

Connect the PROFIBUS Slave unit to the PROFIBUS network (See section *2-3 Network Installation*).

↓

Switch ON the power supply for the CPU. Configure the CPU and allocate the Unit in Sysmac Studio. Refer to *NJ-series CPU Unit Software User's Manual* (Cat. No. W501).

↓

Configure the PROFIBUS Slave Unit using CX-ConfiguratorFDT on the PC (See sections *1-2 Configuring the CJ1W-PRT21 Slave Unit*).

↓

Download configuration data to PROFIBUS Master Unit. (See *CJ-series PROFIBUS Master Unit Operation Manual for NJ-series CPU Unit,* Cat. No. W509).

↓

PROFIBUS DP starts communicating confirmed by the COMM indicator continuously lit. Check status of other indicators (See sections *4-1-1 Determining Operating Status from the Indicators*).

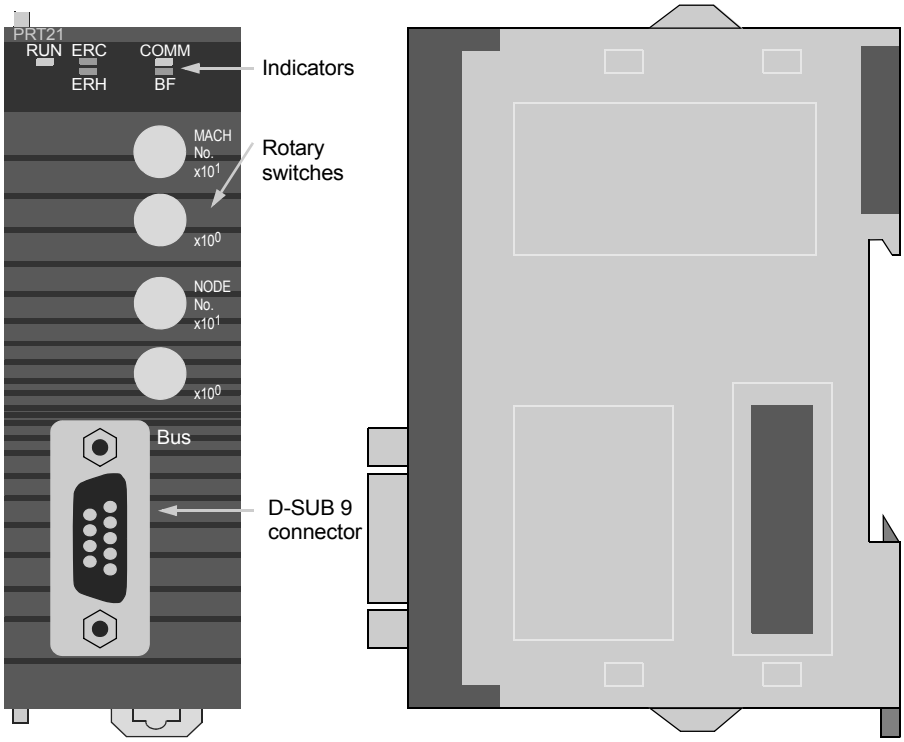
2

Nomenclature and Installation

This section describes the nomenclature and installation of the PROFIBUS Slave Unit.

2-1 Unit Components

2-1-1 Nomenclature

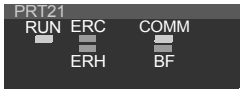


The front view shows the indicators, the rotary switches, and the 9-pin female sub-D PROFIBUS-DP connector.

2-1-2 Indicators

The CJ1W-PRT21 has 5 indicators.

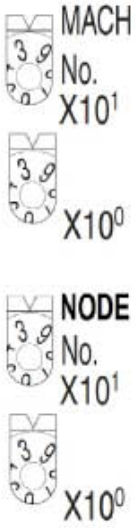
Three indicators (RUN, ERC and ERH) give a status indication of the Unit in general.



Two indicators (COMM and BF) are related to the status of the PROFIBUS-DP network.

During normal operation, the RUN and COMM indicators (green) should be ON, while the ERC, ERH and BF indicators (red) should be OFF. Refer to *4-1-1 Determining Operating Status from the Indicators*.

2-1-3 Switch Settings



The CJ1W-PRT21 has 4 rotary switches to

- set its Special I/O Unit number or Machine No. (00-95)
- set the PROFIBUS-DP node address (00-99)

Precautions for Safe Use

Always turn off the power to the CPU before changing a rotary switch setting.

The Unit only reads the settings during the initialization after power-on. Use a small flat-blade screwdriver to turn the rotary switches; be careful not to damage the switches.

● Machine Number

The MACH No. rotary switches are used to select the CJ1 Special I/O Unit number or so called “Machine No.”.

The Special I/O number setting determines which words in the CIO Area and Data Memory Area are allocated to the CJ1W-PRT21 (see *3-5-1 Data Flow*).

Any Machine number in the setting range is allowed as long as it has not been set on another Special I/O Unit connected to the CPU. If the same number is used for the CJ1W-PRT21 and another Special I/O Unit, an error will occur in the CPU and it will not be possible to start up the PROFIBUS-DP Slave communication (see *A-1-2 Differences in Access Methods from a User Program*).

● Node Address

Two switches, marked Node No. x10^1 and x10^0, are used to set the PROFIBUS-DP node address of the Unit. Addresses in the range of 00 through 99 are valid. Be sure the node address on the unit is equal to the station address in the PROFIBUS master configuration.

2-1-4 PROFIBUS Connector

The fieldbus connector is a 9-pin female sub-D connector, as recommended in the PROFIBUS standard EN50170 Vol.2.

Pin No.	Signal	Description
1	Shield	Shield / functional ground
2	-	-
3	B-line	Data signal
4	RTS	Direction control signal for repeaters (TTL)
5	DGND	Data ground
6	VP	Supply voltage for terminator resistance (+5 VDC)
7	-	-
8	A-line	Data signal
9	-	-

● Data Signal

The PROFIBUS User Group recommends the following color coding for the data signal lines:

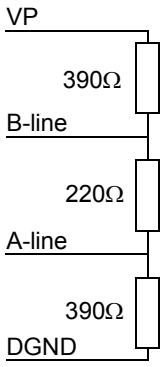
A-line = Green **B-line = Red**

These data signal lines must be connected to the corresponding signal terminals or pins at the master unit and other stations (i.e. A to A, B to B). For detailed PROFIBUS-DP cable requirements (see *2-3 Network Installation*).

● RTS

The signal RTS (TTL signal relative to DGND) is meant for the direction control of repeaters in case repeaters without self control capability are used

● VP, DGND



The signals VP and DGND are meant to power an externally mounted bus terminator.

The powering of the 220 Ω termination resistor ensures a defined idle state potential on the data lines. To ensure proper functioning up to the highest baud rate, each bus segment has to be terminated at both ends of the cable.

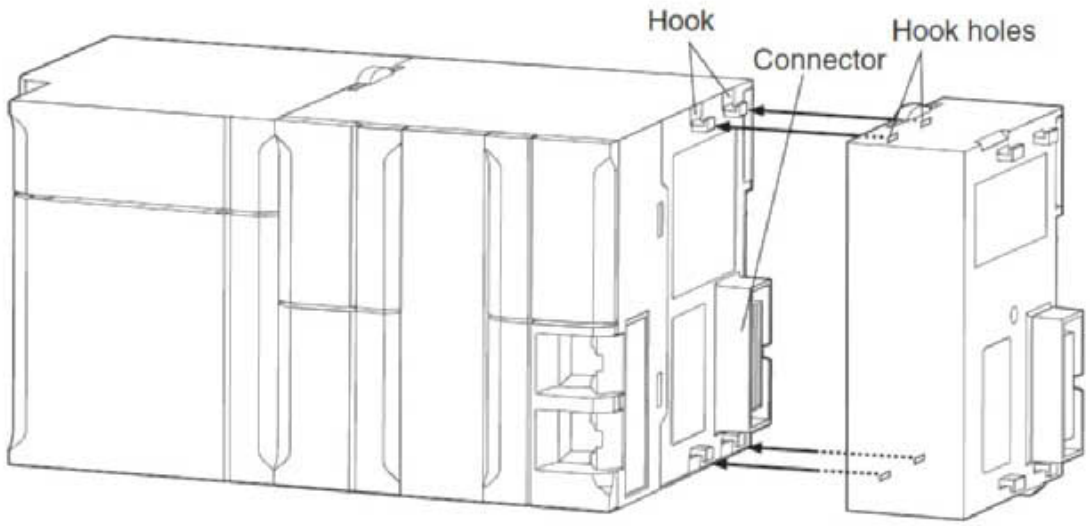
2-2 Installing the PROFIBUS-DP Slave Unit

2-2-1 System Configuration Precautions

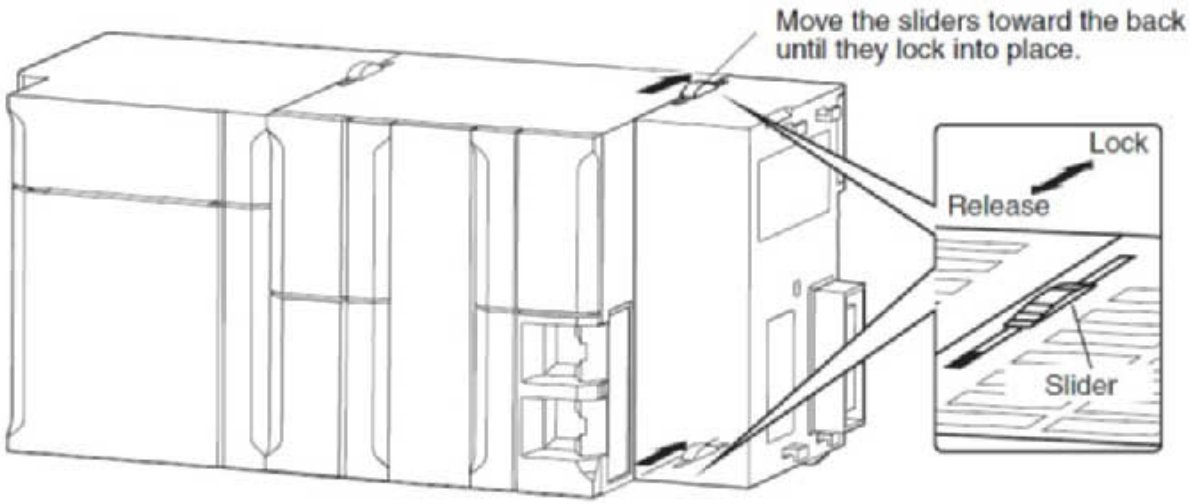
You can mount up to 16 Units on the CPU Rack or an Expansion Rack per CPU (but no more than 10 Units on one Rack).

2-2-2 Mounting

1 Carefully align the connectors to mount the PROFIBUS-DP Slave Unit.



2 Move the yellow sliders on the top and bottom of the Unit until they click into position, to lock.



Precautions for Safe Use

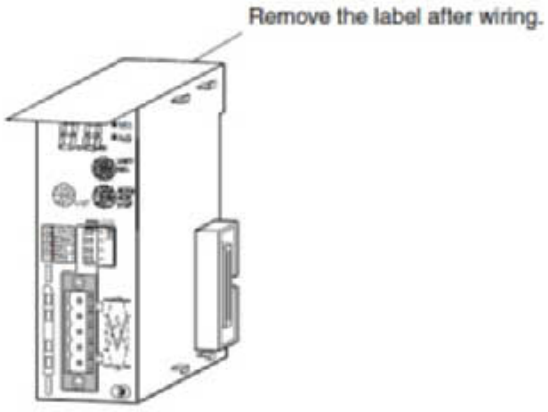
If the sliders are not securely locked, the PROFIBUS Slave Unit may not operate sufficiently.

To dismount the Unit, move the sliders to the “Release” direction.

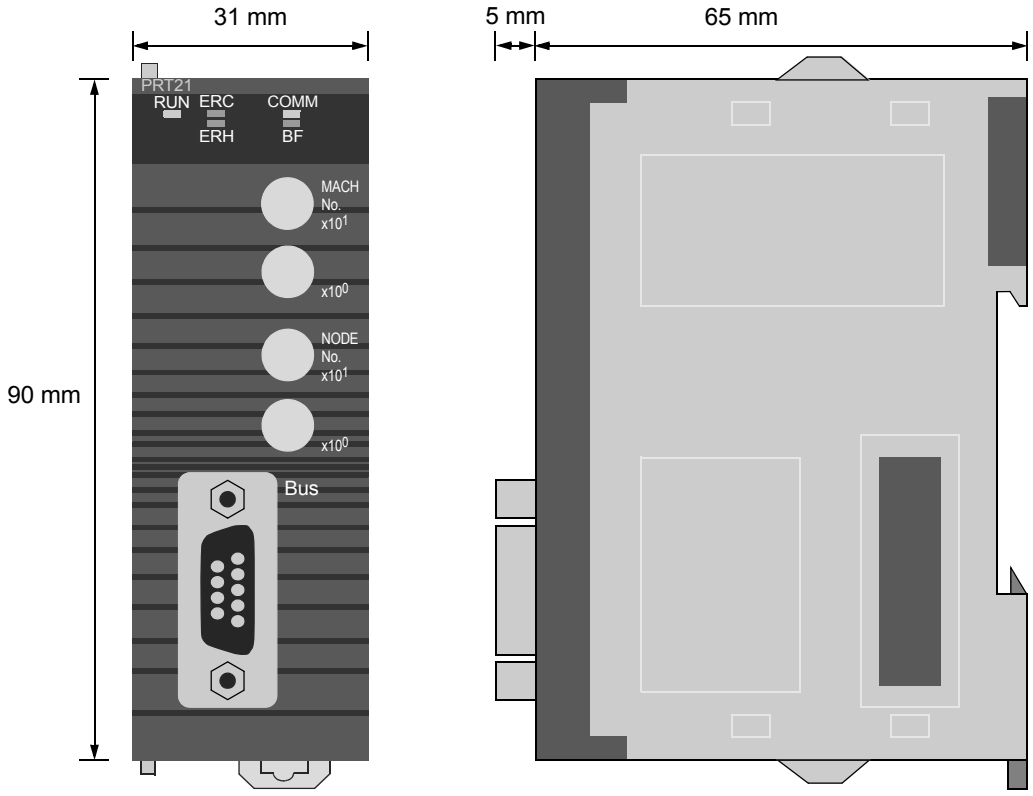
2-2-3 Handling Precautions

- Always turn OFF the power supply to the Controller before you mount or dismount a Unit or connect or disconnect cables.
- Provide separate conduits or ducts for the I/O lines to prevent noise from high-tension lines or power lines.
- Prevent wire clippings, cutting chips or other materials from getting inside the Unit. They could cause scorching, failure and malfunction. Pay particular attention to this during installation and take measures such as covering the unit.

If the Unit was shipped from the factory with the dust protection label on top of the unit, be sure to remove that label before switching ON the power. The label prevents heat dissipation and could cause a malfunction.



2-2-4 External Dimensions



2-3 Network Installation

2-3-1 Network Structure

● Communication Medium

The PROFIBUS standard defines the use of EIA RS-485 as the main communication transport medium. The PROFIBUS Slave Unit is designed to interface directly to this type of medium. This section will discuss the setup of networks based on this medium.

Note The other communication medium specified for PROFIBUS is optical fiber. The PROFIBUS Slave Units does not provide a direct interface to this type of medium. However, by using third party couplers an interface between EIA RS-485 and optical fiber networks can be made.

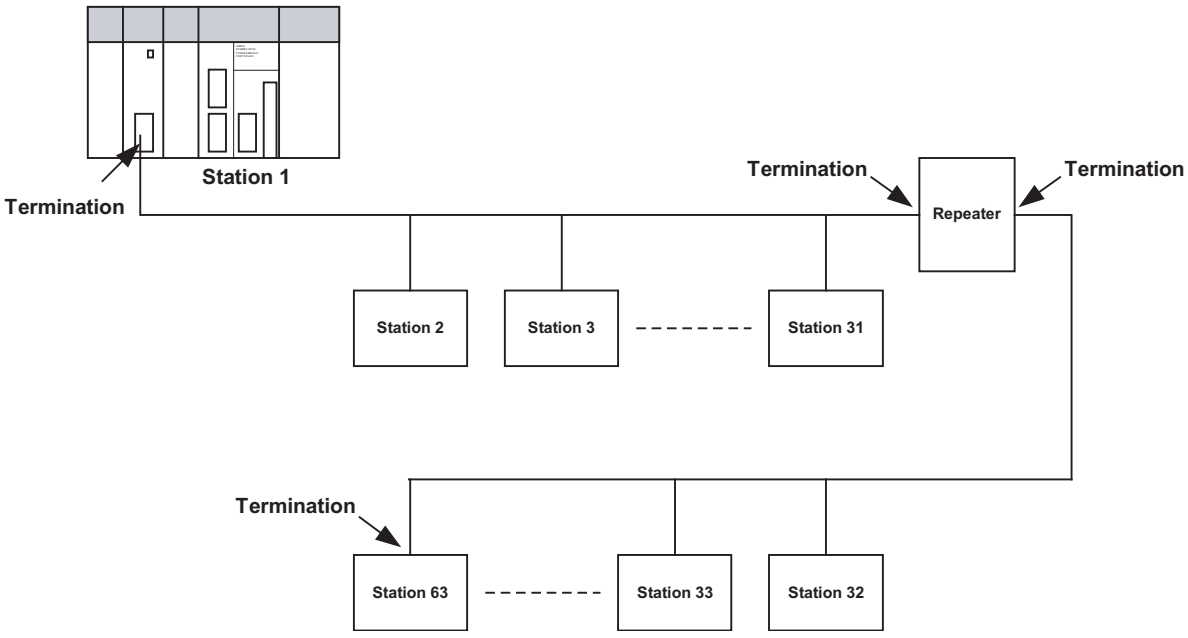
● Linear Bus Topology

PROFIBUS DP defines the use of the Linear Bus Network Topology. The Bus must be terminated at both ends and must not contain network branches. The total cable length of the bus depends on the cable and the selected baud rate. Also, RS-485 specifies a maximum of up to 32 devices (master and slave devices) per line segment. If more than 32 devices are to be connected or if the total length of the segment must be extended beyond its maximum, repeaters must be used to link the separate segments.

Note Repeaters are devices which connect two segments. They do not have a device address of their own but they do count in the total number of devices in a segment.

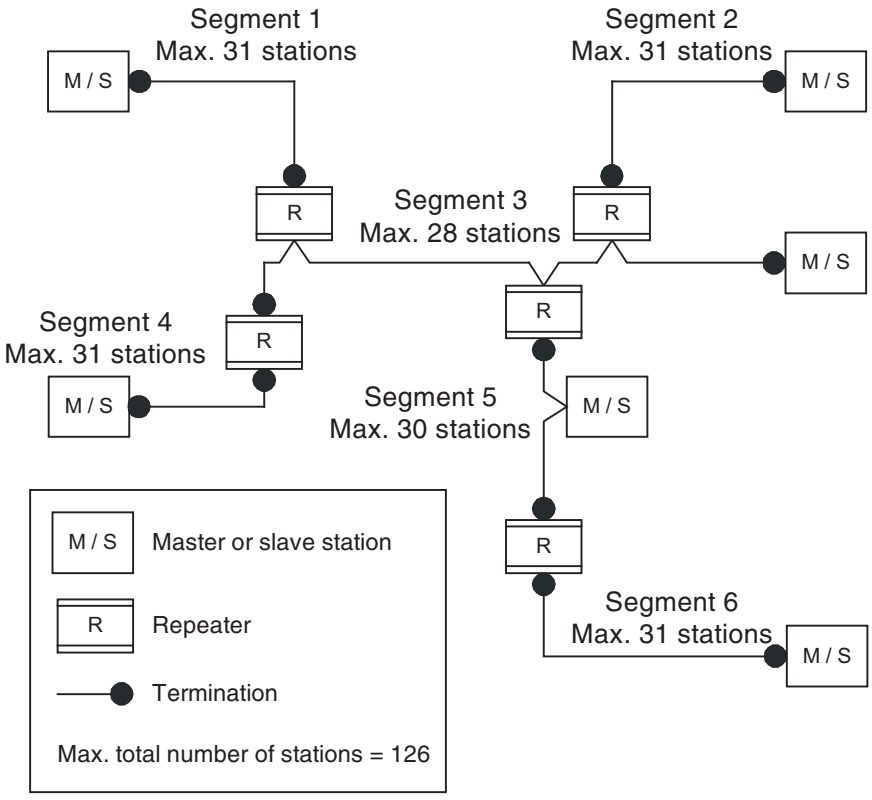
● Repeaters

A maximum of up to three repeaters between two devices in a network can be used, i.e. a network can consist of up to 4 segments. The maximum number of PROFIBUS devices in such a network is then 122. The figure below shows an example of a two-segment network.



Tree Topology

The use of repeaters allows the extension of three or more Linear Bus segments into a tree topology. In a tree topology more than three repeaters are allowed, provided that there are no more than three repeaters between any two devices in the network. The following figure presents an example of a network with more than three segments and repeaters



Cable Type

The PROFIBUS standard EN 50170 specifies Type A shielded, twisted-pair cable as the recommended cable type for use in an RS-485 based PROFIBUS network. This cable type has the following characteristics.

Characteristic	Value
Impedance	135 - 165 Ωs
Capacitance per unit length	< 30pF/m
Loop resistance	110 Ω/km
Core diameter	0.64 mm
Core cross section	0.34 mm^2

Note The PROFIBUS standard EN 50170 also specifies a Type B cable with different cable characteristics. Use of Type B cable is no longer recommended.

Maximum PROFIBUS Cable Length

The transmission speed defines the maximum advised cable distance or cable segment in metres before the use of a repeater is recommended. The cable lengths specified in the following table are based on PROFIBUS type A cable.

Baud Rate (kbps)	Distance/segment (m)
9.6	1200
19.2	1200
45.45	1200
93.75	1200
187.5	1000
500	400
1500	200
3000	100
6000	100
12000	100

Note 1 If network extension beyond the range of the advised cable length is required, the use of fibre optic cable to cross the larger distance should be considered.

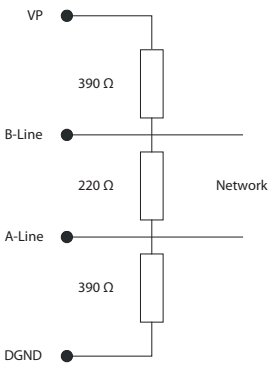
2 The recommended minimum cable length is 1 m.

● Stub Lines

Passive Stub lines (branches from the main line) should be avoided for data transmission speeds of more than 500 kbps. Except at end devices with termination, it is recommended to always use plug connectors that permit two data cables to be connected directly to the plug. This method allows the bus connector to be plugged and unplugged at all times without interrupting data communication between other devices.

2-3-2 Bus Termination

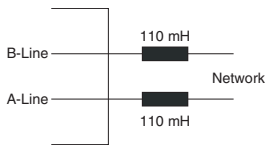
● Termination Resistors



In order to minimize cable reflections and ensure a defined signal level on the data lines, the data transfer cable must be terminated at both ends with a terminating resistor combination. The bus termination diagram is shown on the left.

The bus terminator connects the two data lines via a 220 Ω resistor which, in turn, is connected to VP 5 VDC and DGND via two 390 Ω resistors. Powering the terminator resistor via VP 5 VDC and DGND ensures a defined idle state potential on the data lines.

To ensure the correct functioning up to the highest baud rate, the bus cable must be terminated at both its ends.



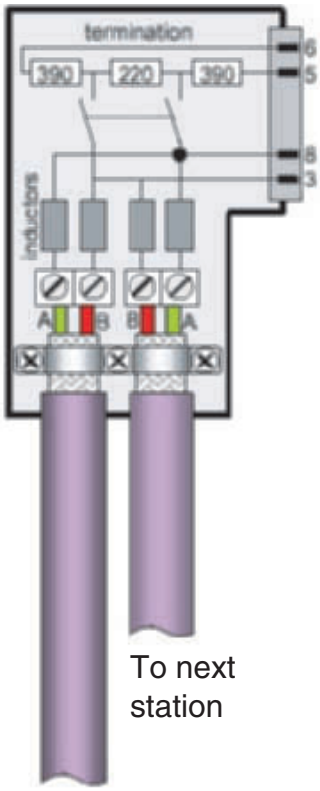
A missing bus termination can cause errors during data transfer. Problems can also arise if too many bus terminators are fitted, since each bus terminator represents an electrical load and reduces the signal levels and thus the signal-to-noise ratio. Too many or missing bus terminators can also cause intermittent data transfer errors, particularly if the bus segment is operated close to the specified limits for maximum numbers of devices, maximum bus segment length and maximum data transfer rate.

In addition to the bus termination, additional precautions must be taken to ensure proper operation at high baud rates, i.e. baud rates of 500 kbps and higher. Due to the capacitive load of the device and the resulting cable reflections, bus connectors must be provided with built-in series inductors, of 110 mH each, as shown in the figure on the left.

Installing the inductors applies to all devices on the network, and not only to the devices at both ends of the bus cable.

2-3-3 PROFIBUS Cable Connector

● Bus Cable Connector



To next station

From previous station

The plug connector to be used on the CJ-series PROFIBUS-DP Slave Unit is a 9-pin male sub-D type, preferably encased in metal and having a facility to connect the shield of the cable to the case or to pin 1. The cable should be connected to the receive / transmit lines, pin 3 (B-line) and pin 8 (A-line).

The use of special PROFIBUS-DP cable connectors, which are available from several manufacturers, is highly recommended. Various models are widely available, with or without the bus termination and inductors built-in. If provided in the connector, the Bus termination can often be enabled or disabled through a switch on the connector.

The special PROFIBUS DP cable connectors often provide a convenient way of connecting the cables. The figure on the left, provides an example of such a bus cable connector.

A standard 9-pin sub-D plug can only be used if the PROFIBUS-DP Slave Unit is not at the start or the end of a bus segment, or on a stub line at a baud rate of 500 kbps or less.

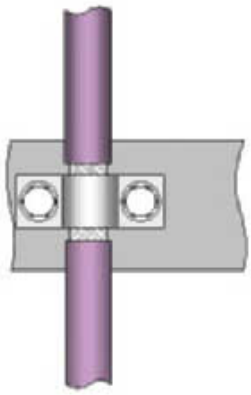
The two PROFIBUS data lines are designated A and B. There are no regulations on which cable core color should be connected to which of the two data terminals on each PROFIBUS device; the sole requirement is to ensure that the same core color is connected to the same terminal (A or B) for all devices throughout the entire system (across all devices and bus segments). The PROFIBUS Organization recommends the following rule for data line color codes: PROFIBUS cables in general will use the colors red and green for the data lines, with the following assignment:

- Data cable wire A - green
- Data cable wire B - red

This rule applies to both the incoming and the outgoing data lines.

2-3-4 Shielding Precautions

● Bus Cable Connector



To ensure electro-magnetic compatibility (EMC), the shield of the cable should be connected to the metal case of the plug connector.

If the Unit is installed in a control cabinet, the bus cable shield should be brought into physical contact with a grounding rail using a grounding clamp or similar device. The cable shield should continue in the cabinet right up to the PROFIBUS device.

Ensure that the CPU and the control panel in which it is mounted have the same ground potential by providing a large-area metallic contact to ground, e.g. galvanized steel to ensure a good electrical connection. Grounding rails should not be attached to painted surfaces.

For further information regarding PROFIBUS network installation, please refer to “Installation Guideline for PROFIBUS DP/FMS” (PNO Order No. 2.112), which is available at every regional PROFIBUS Organization. The information covers:

- Test run of PROFIBUS equipment.
- Testing the PROFIBUS cable and bus connectors.
- Determining loop resistance.
- Testing for correct bus termination.
- Determining the segment length and cable route.
- Other test methods.
- Example of an equipment report in the PROFIBUS guideline.

3

Data Exchange with the CPU Unit

This section describes the interface and data exchange between the NJ-series CPU and the PROFIBUS-DP CJ1W-PRT21 Slave Unit.

3-1 Input and Output Data

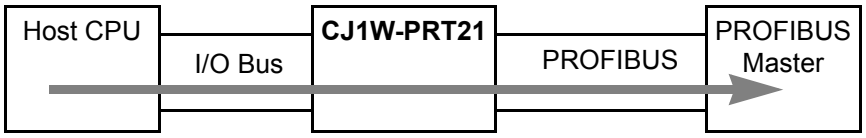
The CJ1W-PRT21 forms a link between two bus systems: the host CPU's I/O bus and the PROFIBUS-DP Master. The Unit can be considered as a slave to both systems: the I/O bus communication is controlled by the host CPU Unit and the PROFIBUS-DP communication is controlled by a PROFIBUS-DP Master.

- **Definitions**

  Being a slave of two systems may cause confusion as to which data should be considered 'input data' and which is 'output data'. In this manual all I/O data communication is defined from the point of view of the PROFIBUS-DP system.

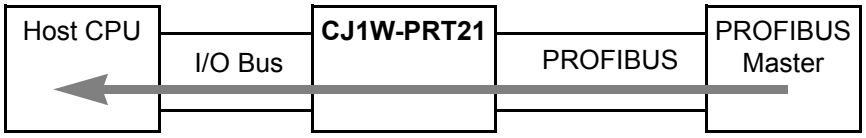
Slave Input Data

Slave INPUT Data is process data which the CJ1W-PRT21 reads from the assigned areas of the host CPU. The CJ1W-PRT21 sends this data to the PROFIBUS-DP master unit.



Slave Output Data

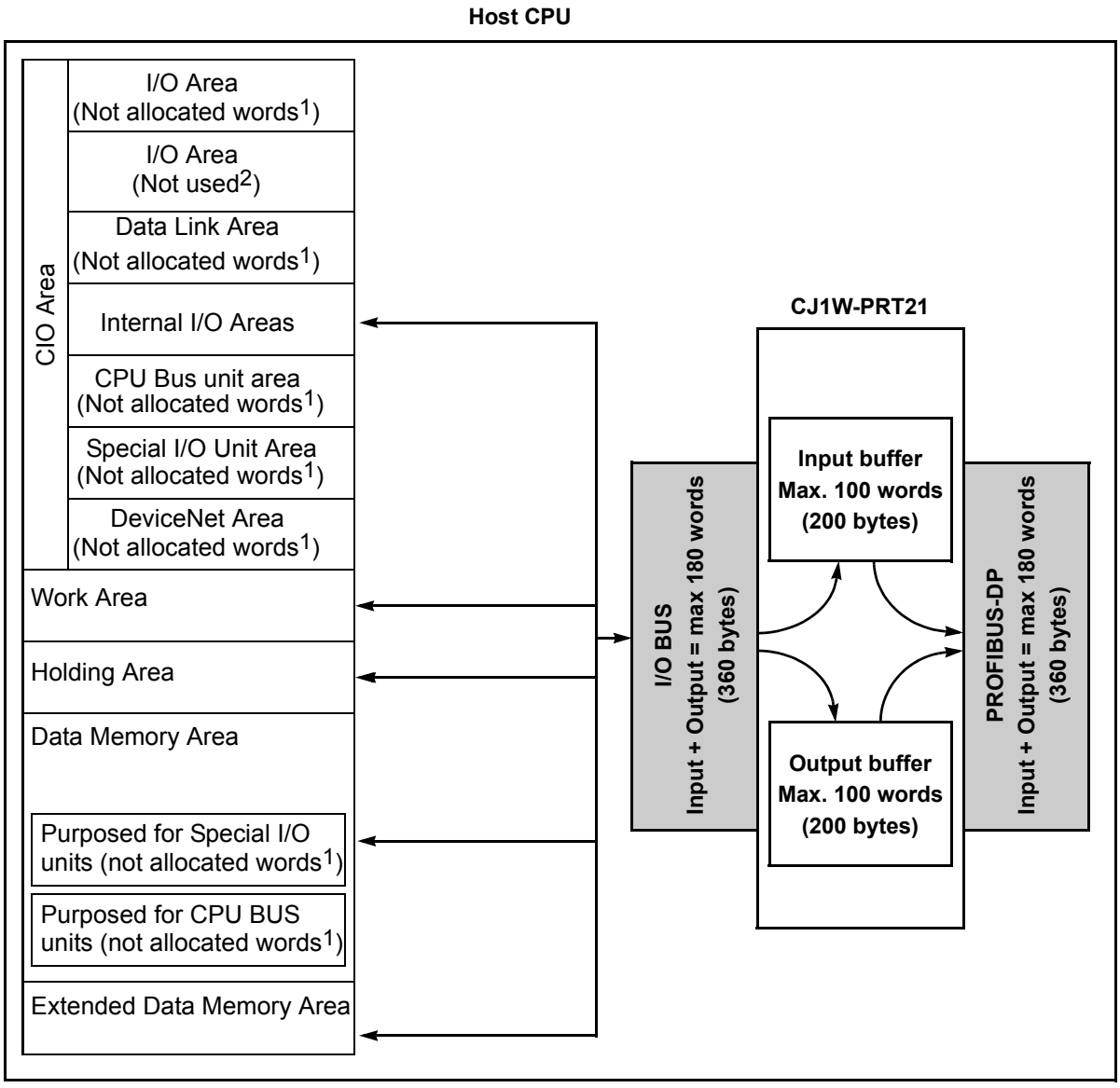
Slave OUTPUT Data is process data which the CJ1W-PRT21 receives from the PROFIBUS-DP master unit. The CJ1W-PRT21 writes this data to the assigned areas of the host CPU.



3-2 I/O Data Mapping

Data flow

The figure below shows the flow of remote I/O data in the CPU system. It is necessary to map the PROFIBUS-DP I/O data to the areas of the CPU memory. The input and output areas can be assigned independently. User-defined variables can be created and implemented in the User program to access this data (see section *3-5 Data Exchange with the CPU Unit*).



Note **1** Words that are not allocated can be used

2 Unused words can be used, but those areas may be used in future for expanding functions.

Slave input data is transferred via the I/O bus to the input buffer of the Unit. During each PROFIBUS-DP cycle this data is transmitted to the master over PROFIBUS. Slave output data received from PROFIBUS is first stored in the output buffer of the Unit. During an I/O refresh, this data is transferred to the memory of the host CPU via the I/O Bus.

Additional Information

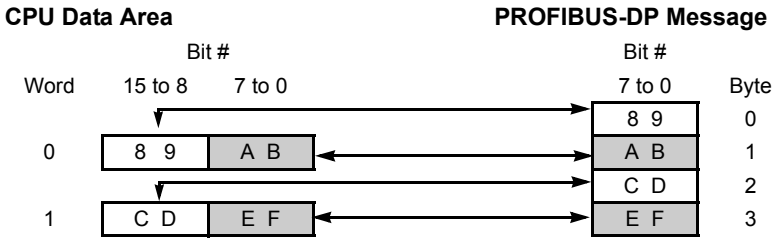
- For details on CJ Unit memory, variable allocation and user-defined variable registration, refer to section *How to Create Device Variables for CJ-series Unit* and Sysmac Studio (Ver. 1.0) Operation Manual (Cat. No. W504).
- For CJ1W-PRT21, the maximum amount of mapped I/O data is 100 words input + 100 words output with the following restrictions that inputs + outputs must be 180 words or less.

3-3 I/O Data Format

The CJ1W-PRT21 allows the user to select between two methods to map the word-oriented CPU data to the essentially byte-oriented PROFIBUS-DP messages. The default method is Motorola format (Big-Endian), which allows easy data exchange with other OMRON PROFIBUS-DP devices. For communication with other manufacturers' devices, in some cases it may be more convenient to select Intel format (Little-Endian).

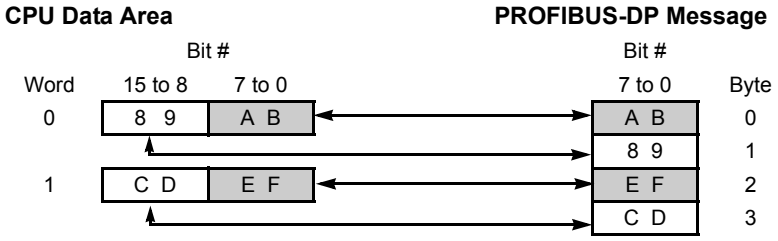
● Motorola (Big-Endian)

By default, the most significant byte of a CPU data word will be mapped to an even byte in the PROFIBUS-DP message, the least significant byte is mapped to an odd byte, e.g.



● Intel (Little-Endian)

Alternatively, selecting Intel format will result in:



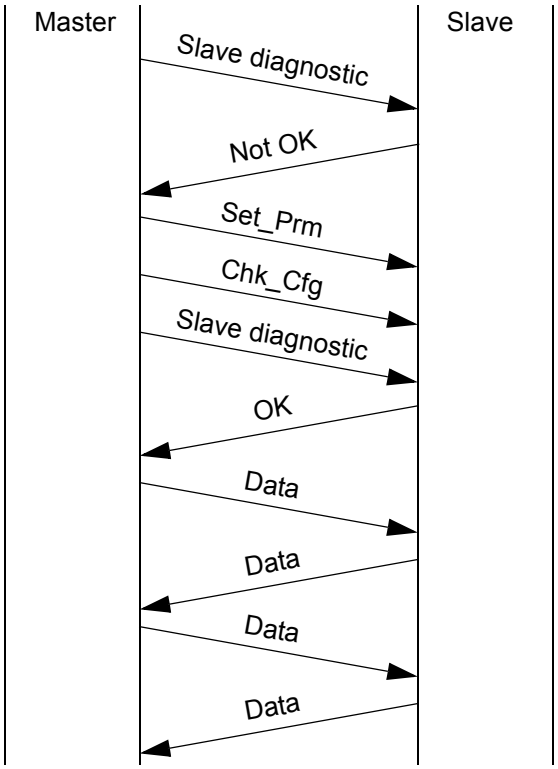
Additional Information

Variable **_SlavOutEndianMdSta* indicates how the data bytes of a PROFIBUS data telegram are mapped to Host CPU data words (see section *3-7-2 Slave Output Data (*_SlvOutSta)*)

- 0: Motorola (high byte first),
- 1: Intel (low byte first).

3-4 PROFIBUS Startup Data

The mapping of PROFIBUS I/O data to the host CPU is controlled by the Set_Prm (set parameter) and Chk_Cfg (check configuration) telegrams sent by the PROFIBUS Master. At startup of the PROFIBUS communication the following commands are sent



- **Set_Prm**

  At system startup, after a restart and in data exchange mode the Set_Prm telegram will provide the following information:

  - Start address of the area in the host CPU where to read and to send to the master.
  - Format (Motorola/Intel) of the data to be sent to the master.
  - Actions to be taken in case of CPU status change or fatal errors.
  - Inclusion of 2 words CPU status information or not.

- **Chk_Cfg**

  The Chk_Cfg telegram will provide the number of words to be read from the host CPU and to be sent to the Master plus the number of words to be received from the Master and to be written to the host CPU.

Additional Information

- Until the Set_Prm and Chk_Cfg have been accepted by the Unit, only the control and status words are exchanged with the host CPU. The status information will indicate that no I/O data is exchanged.
- After the Set_Prm telegram is received by the Unit, it will check if the specified data areas in the host CPU exist. If not, this will be indicated as a Parameter Fault to the PROFIBUS master, and in variable **_SlvSta*.
- In case the parameters specify to include CPU status information in the input data, the amount of input data read from the CPU will be 2 words less than the PROFIBUS input data length. If the input data length is less than 2 words, this is also indicated as a Configuration Fault.

3-5 Data Exchange with the CPU Unit

Data exchange between this Unit and the CPU Units uses the I/O port and memory for CJ-series Unit allocated to the PROFIBUS Slave Unit.

3-5-1 Data Flow

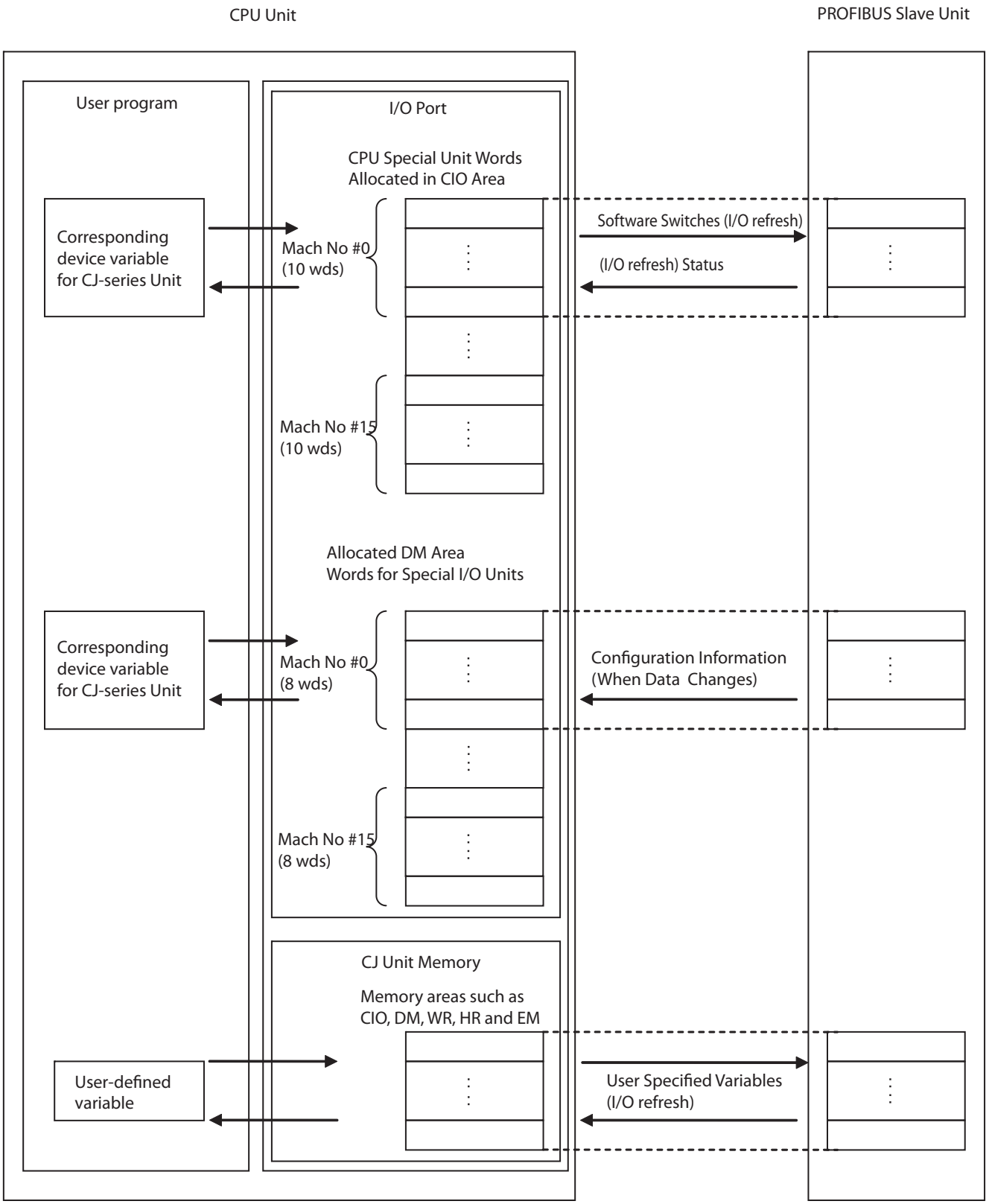
The CPU Unit and CJ-series PROFIBUS Slave Unit exchange various types of information at each I/O refresh via the memory for CJ-series Units within the CPU Unit.

From the user program, various types of information are exchanged using device variables and user-defined variables. Device Variables are positioned internally in the CPU Bus Unit words allocated in CIO and DM areas. User-defined variables are created by the user and can be allocated to specific memory areas used for CJ-series Units allocated to slaves.

Data type		CJ Unit memory	Access method
Control and Status Area, Configuration Information Area	Software Switches, Status flags	Allocated CIO Area	Device Variable for CJ-series Unit
	Configuration Information Area	Allocated DM Area	
Data Mapping	User-set allocation controller by PROFIBUS Master Unit	Any area of CIO, DM, WR, HR and EM	User-defined Variables

Additional Information

By using these variables, the user can program without the need to be aware of the configuration of the memory used for CJ-series Units.


CPU Unit
PROFIBUS Slave Unit
User program
I/O Port
CPU Special Unit Words
Allocated in CIO Area
Corresponding
device variable
for CJ-series Unit
Mach No #0
(10 wds)
Mach No #15
(10 wds)
Software Switches (I/O refresh)
(I/O refresh) Status
Allocated DM Area
Words for Special I/O Units
Corresponding
device variable
for CJ-series Unit
Mach No #0
(8 wds)
Mach No #15
(8 wds)
Configuration Information
(When Data Changes)
CJ Unit Memory
Memory areas such as
CIO, DM, WR, HR and EM
User-defined
variable
User Specified Variables
(I/O refresh)

Device Variables for CJ-series Unit

Device variables for CJ-series Units are variables for which AT is specified for the I/O port explained below. The user program uses device variables for CJ-series Units to access the Configuration for a unit such as the CJ1W-PRT21.

For allocation of the device variables for CJ-series Unit to the I/O port, refer to *How to Create Device Variables for CJ-series Unit* on page 11.

These variables are used to set this Unit and reference statuses from a user program.

Device Variables for CJ-series Unit are positioned internally in the CPU Bus Unit words allocated in CIO/DM areas shown below.

- CPU Bus Unit words allocated in CIO area (software switches, statuses)
- CPU Bus Unit words allocated in DM area (configuration information)

● I/O Port

An "I/O port" is a logical interface for data exchange by a CPU Unit with a PROFIBUS Slave Unit or other Configuration Unit.

An I/O port has a unique pre-defined name for each unit model and function.

An I/O port is automatically created by preparing the Unit Configuration with Sysmac Studio.

For details on the I/O ports defined for PROFIBUS Slave Unit, refer to *3-6 Device Variables for CJ-series Unit (Software Switches, Statuses)* and *3-7 Device Variables for CJ-series Unit (Configuration)*.

● Software Switches, Status Area

Software switches (execution instructions of each function from the CPU Unit to the PROFIBUS Slave Unit) and statuses are allocated.

They are allocated in the memory used for CJ-series Unit according to the machine number as shown below.

Allocated CIO words (Start address CIO Area = 2000 + MACH No. x 10)

MACH No.	CIO Area	MACH No.	CIO Area
00	CIO 2000 to CIO 2009	06	CIO 2060 to CIO 2069
01	CIO 2010 to CIO 2019	07	CIO 2070 to CIO 2079
02	CIO 2020 to CIO 2029	08	CIO 2080 to CIO 2089
03	CIO 2030 to CIO 2039	09	CIO 2090 to CIO 2099
04	CIO 2040 to CIO 2049	10..	CIO 2100 to CIO 2109
05	CIO 2050 to CIO 2059	..95	CIO 2940 to CIO 2949

Allocated DM words (Start address DM Area = 20000 + MACH No. x 100):

MACH No.	CIO Area	MACH No.	CIO Area
00	DM 20000 to DM 20007	06	DM 20600 to DM 20607
01	DM 20100 to DM 20107	07	DM 20700 to DM 20707
02	DM 20200 to DM 20207	08	DM 20800 to DM 20807
03	DM 20300 to DM 20307	09	DM 20900 to DM 20907
04	DM 20400 to DM 20407	10..	DM 21000 to DM 21007
05	DM 20500 to DM 20507	..95	DM 29500 to DM 29507

User-defined Variable

These variables are defined by the user and can be used to exchange data with PROFIBUS slave devices from a user program. User-defined Variables are specified to access user-allocated areas designated with CX-ConfiguratorFDT for slave devices.

To use this area from the user program, you need to create user-defined variables of AT specification.

3-5-2 Accessing From the User Program

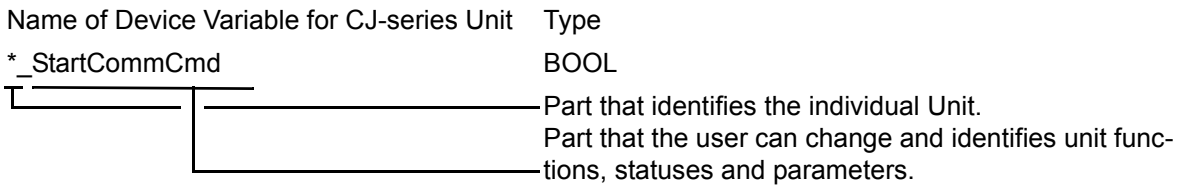
From the user program, various types of information are exchanged using AT specified device variables for CJ-series Unit that are allocated to the I/O ports, and AT specified user-defined variables that are allocated to slave allocation areas.

How to Create Device Variables for CJ-series Unit

Use I/O Map in Sysmac Studio to allocate device variables for CJ-series Unit to the I/O port. Specify variable names using one of the methods shown below.

1. Select and allocate existing variables.
2. Input a new variable name.
3. Automatically create with "Device variable creation".

The following shows the structure of a variable name created automatically with method 3.



For details on Device Variables for CJ-series Unit, refer to the following:

- *3-6 Device Variables for CJ-series Unit (Software Switches, Statuses)*
- *3-7 Device Variables for CJ-series Unit (Configuration)*

In the explanations throughout this manual, the default device name automatically created is used as the device variable name for CJ-series Unit, for example *_StartCommCmd.

For details on the CJ Unit memory, refer to *NJ-series CPU Unit Software User's Manual* (Cat. No. W501)

How to Create User-defined Variables

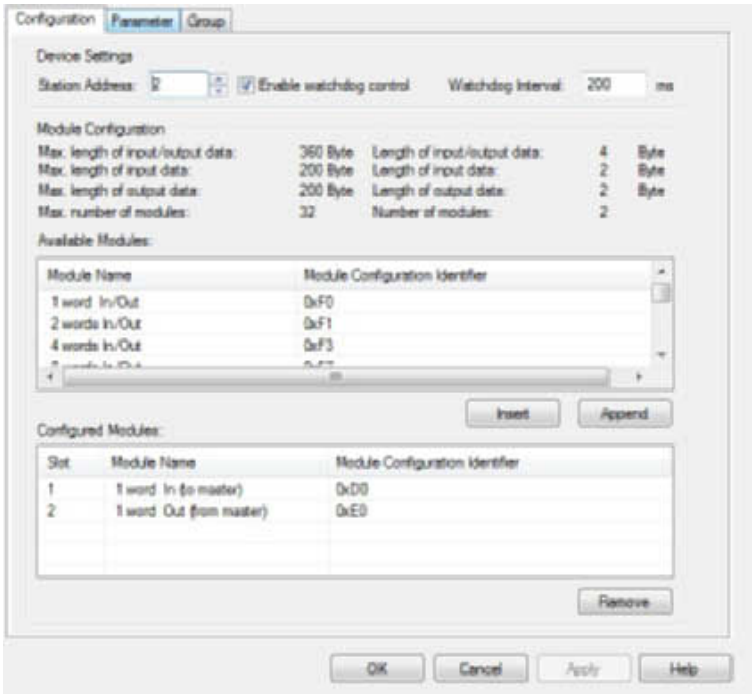
Sysmac Studio is used to register user-defined variables to the variable table. Specify the user-defined variables in memory used for CJ-series Unit to which slaves can be allocated.

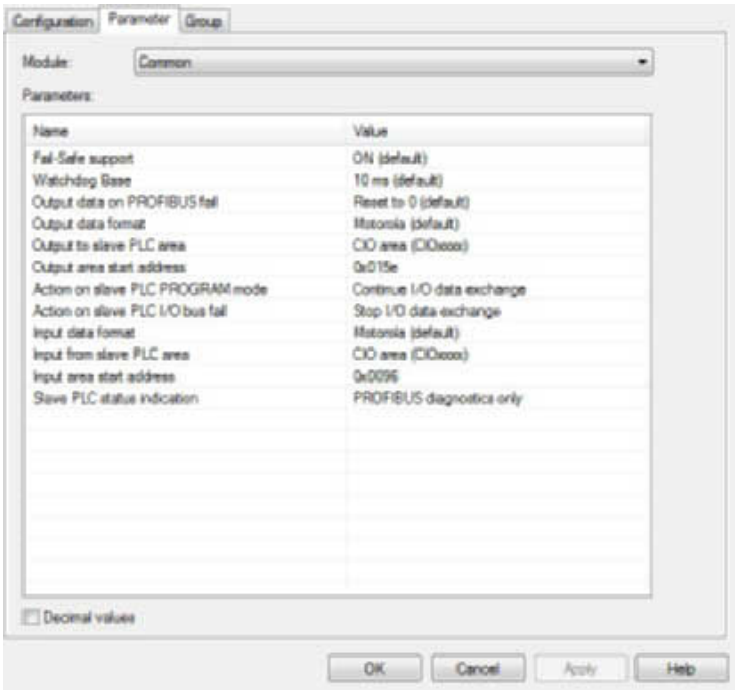
Below is an example of allocation to user-defined variables.

● CJ1W-PRT21 Slave Unit Configuration

- Machine Number 1
- Station Address 2
- 1 Word In (to master) from host CPU memory area CIO 150

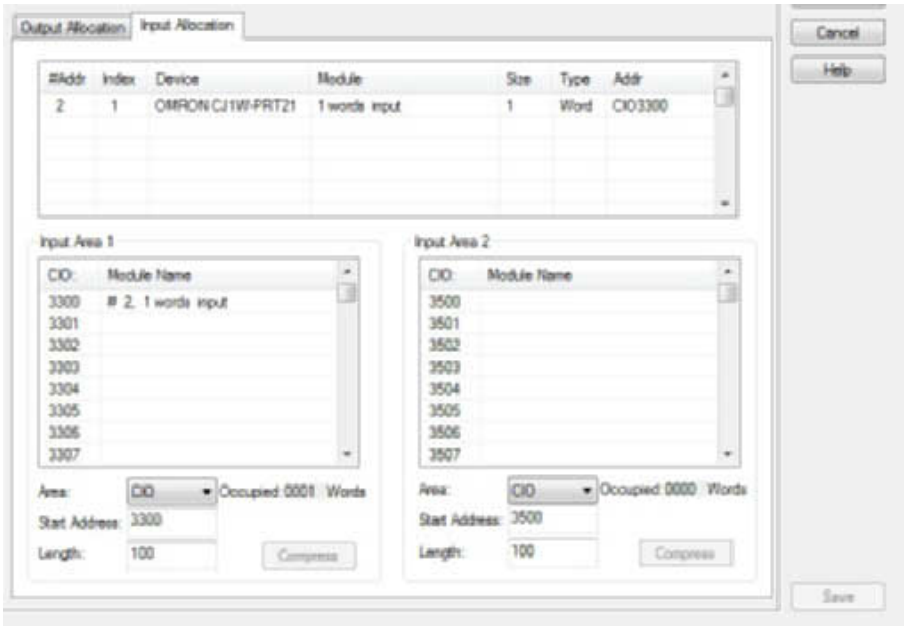
- 1 Word Out (from master) to host CPU memory area CIO 350
- CX-ConfiguratorFDT configuration (downloaded to Master Unit):

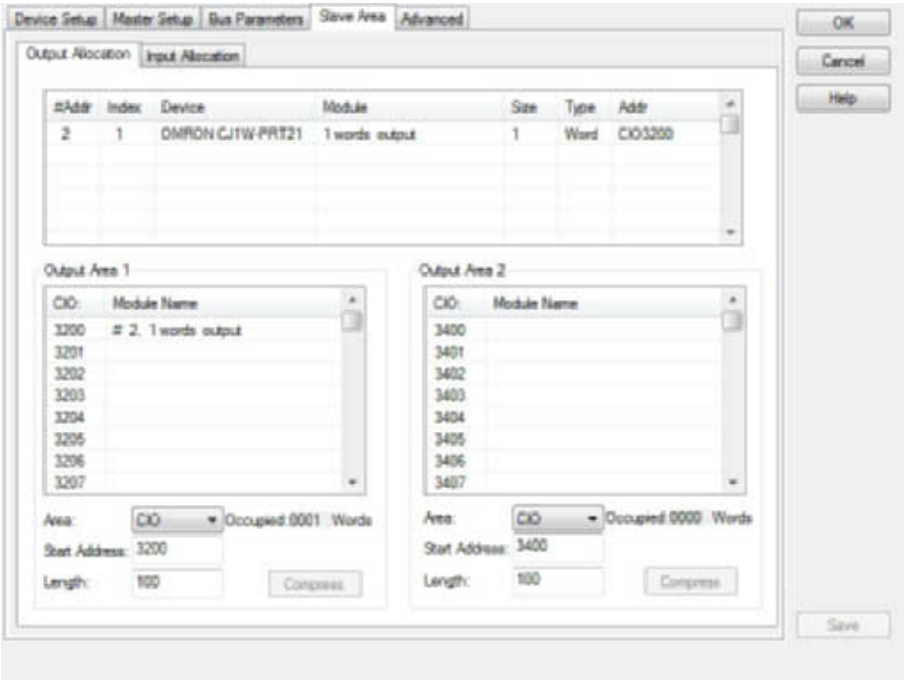




● CJ1W-PRM21 Master Unit Configuration

- Unit Number 1
- Station Address 1
- 1 Word Input Allocation (from slave) to CPU area CIO 3300
- 1 Word Output Allocation (to slave) from CPU area CIO 3200
- CX-ConfiguratorFDT configuration (downloaded to Master Unit):





Allocate the I/O data to the user-defined variables as shown in the example below.

Additional Information

For details on CJ Unit memory, variable allocation and user-defined variable registration, refer to *Sysmac Studio (Ver. 1.0) Operation Manual* (Cat. No. W504).

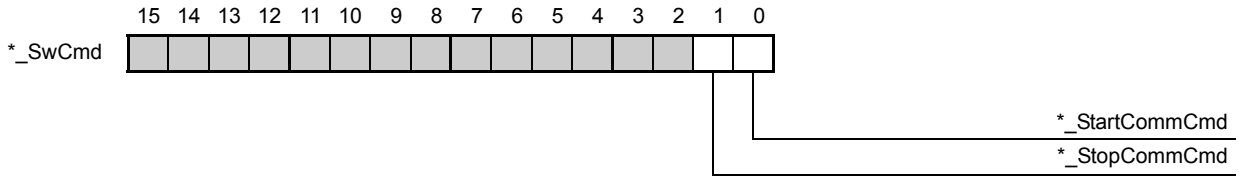
3-6 Device Variables for CJ-series Unit (Software Switches, Statuses)

When you operate and reference the control and status area, use the following Device Variables allocated to the I/O port of this Unit.

Name of Device Variable for CJ-series Unit	Type	R/W	Description
*_SwCmd	WORD	RW	Software Switches (see section *3-6-1*)
*_StartCommCmd	BOOL	RW	Bit 00: Start communication
*_StopCommCmd	BOOL	RW	Bit 01: Stop communication
*_SlvSta	WORD	R	Status flags (see section *3-6-2*)
*_DatXchgActSta	BOOL	R	Bit 00: Data exchange active
*_ClearSta	BOOL	R	Bit 01: CLEAR
*_FreezeSta	BOOL	R	Bit 02: FREEZE
*_SyncSta	BOOL	R	Bit 03: SYNC
*_WdtDsblSta	BOOL	R	Bit 04: Watchdog disabled
*_WdtTmBaseSta	BOOL	R	Bit 05: Watchdog timebase 1 ms
*_FailSafeEnblSta	BOOL	R	Bit 06: Fail-safe enabled
*_ParamErr	BOOL	R	Bit 08: Parameter/configuration error
*_StartAdrInErr	BOOL	R	Bit 12: Incorrect start address for slave input area
*_EndAdrInErr	BOOL	R	Bit 13: Incorrect end address for slave input area
*_StartAdrOutErr	BOOL	R	Bit 14: Incorrect start address for slave output area
*_EndAdrOutErr	BOOL	R	Bit 15: Incorrect end address for slave output area

3-6-1 Software Switches (*_SwCmd)

The PROFIBUS-DP communication status of CJ1W-PRT21 can be controlled through the first CIO word (device variable *_*SwCmd*) allocated via the Machine No. setting. The communication status set by these bits is retained until the Unit is restarted (Power-on or reset). After a restart, PROFIBUS-DP communication is enabled by default.



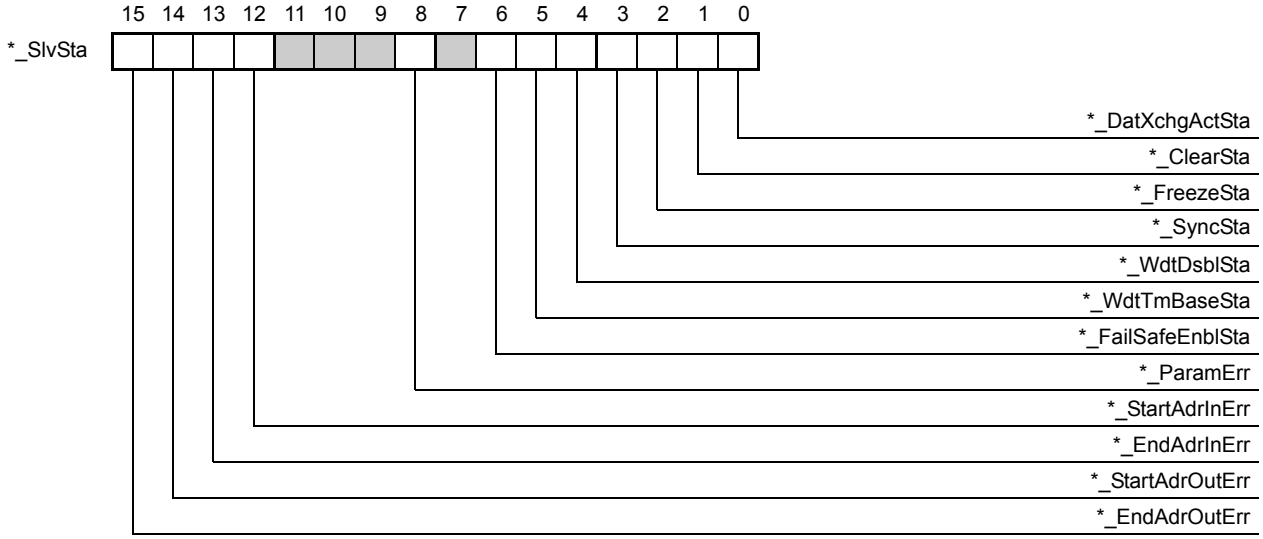
Name of Device Variable for CJ-series Unit	Type	R/W	Description	Function
*_StartCommCmd	BOOL	RW	Start Communication	FALSE→TRUE: PROFIBUS-DP communication will be enabled. If the communication is already enabled, no specific action is taken. TRUE→FALSE: No action.
*_StopCommCmd	BOOL	RW	Stop Communication	FALSE→TRUE: PROFIBUS-DP communication will be disabled (Slave Offline). If the communication is already disabled, no specific action is taken. TRUE→FALSE: No action.

Additional Information

In the event start communication and stop communication are both set from 0 to 1 at the same moment, communication will be enabled (default value).

3-6-2 Status Flags (*_SlvSta)

The CJ1W-PRT21 indicates its status in the second CIO word (device variable *_*Sta*) allocated via the Machine No. setting. The lower byte shows the PROFIBUS-DP related status information and the higher byte indicates configuration errors. At power-on, or after a reset of the unit, the initial value shall be 0000. During normal operation only the data exchange active flag (*_*DatXchgActSta*) will be TRUE.



Name of Device Variable for CJ-series Unit	Type	R/W	Description	Function
*_DatXchgActSta	BOOL	R	Data exchange active	FALSE: The slave unit is not in data exchange mode. TRUE: The slave unit is exchanging I/O data with the master. When this flag is TRUE, the assigned slave output area of the Host CPU contains data sent by the PROFIBUS master. When the flag is FALSE, the user should not process the data from this area since its validity cannot be guaranteed. This does not necessarily mean that slave outputs are updated cyclically: • If the communication watchdog timer is disabled by the master (*_*WdtDsblSta*), the I/O data refresh interval may be of indefinite length. • In 'Clear' mode (*_*WdtDsblSta*), only the slave inputs are read, while all slave outputs are forced to FALSE.
*_ClearSta	BOOL	R	CLEAR	FALSE: Not in CLEAR mode. TRUE: The master has sent a global control command CLEAR, which resets all outputs of all the addressed slaves on the network.
*_FreezeSta	BOOL	R	FREEZE	FALSE: Not in FREEZE mode. TRUE: The slave has accepted a global control command FREEZE from its master. The slave input data from the CPU is not updated at the PROFIBUS-DP interface until the next FREEZE command to this slave, or until the slave receives an UNFREEZE command.
*_SyncSta	BOOL	R	SYNC	FALSE: Not in SYNC mode. TRUE: The slave has accepted a global control command SYNC from its master. The slave output data to the CPU is not updated at the CPU I/O bus interface until the next SYNC command to this slave, or until the slave receives an UNSYNC command
*_WdtDsblSta	BOOL	R	Watchdog disabled	FALSE: The slave's watchdog is enabled by the PROFIBUS-DP master, and the actual watchdog time is indicated in Watchdog Factors (see section *3-7-1 Slave Parameter Data (*_SlvParamSta)*). TRUE: The master has disabled the slave's watchdog. If the Master-Slave communication fails, the slave will not exit data exchange mode, and its outputs will keep their state as received in the last data exchange telegram.
*_WdtTmBaseSta	BOOL	R	Watchdog timebase 1 ms	FALSE: The slave's watchdog uses the default timebase of 10 ms. The product of the two Watchdog Factors is multiplied by 10 ms to give the actual watchdog time (see section *3-7-1 Slave Parameter Data (*_SlvParamSta)*). TRUE: The slave's watchdog uses the optional timebase of 1 ms. The product of the two Watchdog Factors is multiplied by 1 ms to give the actual watchdog time (see section *3-7-1 Slave Parameter Data (*_SlvParamSta)*).

Name of Device Variable for CJ-series Unit	Type	R/W	Description	Function
*_FailSafeEnblSta	BOOL	R	Fail-safe enabled	FALSE: After the master sends a global control command CLEAR, the slave requires data telegrams containing 0000 as data, in order to remain in data exchange mode. TRUE: After the master sends a global control command CLEAR, the slave can accept data telegrams containing no data, while still remaining in data exchange mode
*_ParamErr	BOOL	R	Parameter/configuration error	FALSE: The slave unit has received and accepted Set_Prm and Chk_Cfg telegrams from its master. TRUE: The slave has not received, or received incorrect parameter and/or configuration telegrams from a master unit. I/O data exchange over PROFIBUS-DP will not take place. Parameter Error can be caused by: • Invalid standard parameter settings (valid settings are described in the PROFIBUS standard). • Invalid user parameter settings (allowed settings are described in the GSD file of the Unit). • Incorrect start addresses for I/O data in the host CPU system. If one of them is invalid, parameter error is indicated, plus *_*StartAdrInErr* and/or *_*StartAdrOutErr* will be set. Configuration Error can be caused by: • Input - or output length > 100 words • Input + output length > 180 words • Input length < 2 words while CPU status should be included. • Input - or output length causing errors indicated by *_*EndAdrInErr, *_*EndAdrOutErr* *See Note
*_StartAdrInErr	BOOL	R	Incorrect start address for slave input area	FALSE: No error TRUE: There is an error in the slave input area mapping. The start address of the area as specified in the Set_Prm telegram is invalid for this CPU type. The BF indicator is BLINKING to indicate a configuration- or parameterisation error; no I/O data is transferred between master and slave units.

Name of Device Variable for CJ-series Unit	Type	R/W	Description	Function
*_EndAdrInErr	BOOL	R	Incorrect end address for slave input area	FALSE: No error TRUE: There is an error in the slave input area mapping. The end address of the area as specified by the start address in the Set_Prm telegram, plus the data length in the Chk_Cfg telegram, is invalid for this CPU. The BF indicator is BLINKING to indicate a configuration or parameterisation error; no I/O data is transferred between master and slave units.
*_StartAdrOutErr	BOOL	R	Incorrect start address for slave output area	FALSE: No error TRUE: There is an error in the slave output area mapping. The start address of the area as specified in the Set_Prm telegram is invalid for this CPU. The BF indicator is BLINKING to indicate a configuration or parameterisation error; no I/O data is transferred between master and slave units.
*_EndAdrOutErr	BOOL	R	Incorrect end address for slave output area	FALSE: No error TRUE: There is an error in the slave output area mapping. The end address of the area as specified by the start address in the Set_Prm telegram, plus the data length in the Chk_Cfg telegram, is invalid for this CPU. The BF indicator is BLINKING to indicate a configuration or parameterisation error; no I/O data is transferred between master and slave units.

Note When the Parameter/Configuration flag is TRUE, the status of **_FreezeSta, *_FailSafeEnblSta* and **_ParamErr* are not updated.

3-7 Device Variables for CJ-series Unit (Configuration)

The CJ1W-PRT21 provides 8 consecutive DM words to indicate configuration and parameterisation data received from the PROFIBUS-DP master unit. These words are not part of the cyclic refresh, but the unit writes this information to the Host CPU when the data in the unit changes. At power-on, or at a reset of the unit, all data will be set to 0. The DM words are in the area assigned to the Special I/O unit, depending on the Machine No (see section *3-5-1 Data Flow*).

Name of Device Variable for CJ-series Unit	Type	R/W	Description
*_SlvParamSta	DWORD	R	Slave parameter data (see section *3-7-1*)
*_SlvMstrAdr	USINT	R	Bits 00-07: Master address
*_SlvGrp1	BOOL	R	Bit 08: Slave assigned to Group 1
*_SlvGrp2	BOOL	R	Bit 09: Slave assigned to Group 2
*_SlvGrp3	BOOL	R	Bit 10: Slave assigned to Group 3
*_SlvGrp4	BOOL	R	Bit 11: Slave assigned to Group 4
*_SlvGrp5	BOOL	R	Bit 12: Slave assigned to Group 5
*_SlvGrp6	BOOL	R	Bit 13: Slave assigned to Group 6
*_SlvGrp7	BOOL	R	Bit 14: Slave assigned to Group 7
*_SlvGrp8	BOOL	R	Bit 15: Slave assigned to Group 8
*_SlvWdtFact1	USINT	R	Bits 00 to 07: Watchdog factor 1
*_SlvWdtFact2	USINT	R	Bits 08 to 15: Watchdog factor 2
*_SlvOutSta	LWORD	R	Slave Output Data (see section *3-7-2*)
*_SlvOutAreaCode	USINT	R	Bits 00 to 07: Output area code
*_SlvOutHoldBusErr	BOOL	R	Bit 08: Data hold on PROFIBUS fail
*_SlvOutIntelMd	BOOL	R	Bit 12: Outputs Intel mode
*_SlvOutStartAdr	UINT	R	Output start address
*_SlvOutDatLen	UINT	R	Output data length
*_SlvInSta	LWORD	R	Slave Input Settings (see section *3-7-3*)
*_SlvInAreaCode	USINT	R	Bits 00 to 07: Input area code
*_SlvInProgCont	BOOL	R	Bit 08: Continue in PROGRAM mode
*_SlvInProgExit	BOOL	R	Bit 09: Exit in PROGRAM mode
*_SlvInFatlCont	BOOL	R	Bit 10: Continue on fatal error
*_SlvInFatlExit	BOOL	R	Bit 11: Exit on fatal error
*_SlvInIntelMd	BOOL	R	Bit 12: Inputs Intel mode
*_SlvInclPLCSta	BOOL	R	Bit 15: Include PLC status in input data
*_SlvInStartAdr	UINT	R	Input start address
*_SlvInDatLen	UINT	R	Input data length

Precautions for Correct Use

The contents will only change

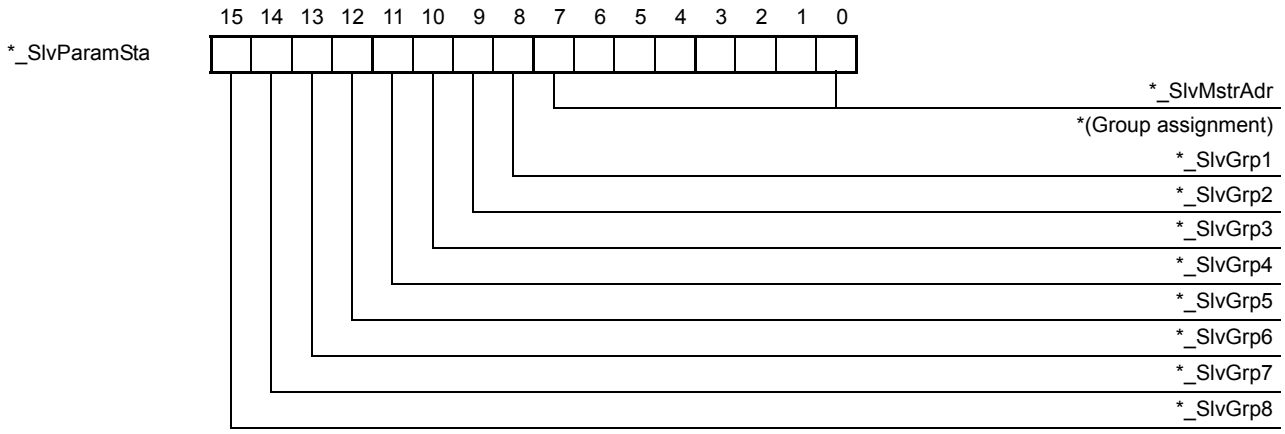
- When the unit has accepted a Set_Prm and a Chk_Cfg telegram from a master.
- When the slave exits 'data_exchange' state (resets all data to FALSE, except Master address = 255).

The user should make sure not to overwrite this information by the CPU program.

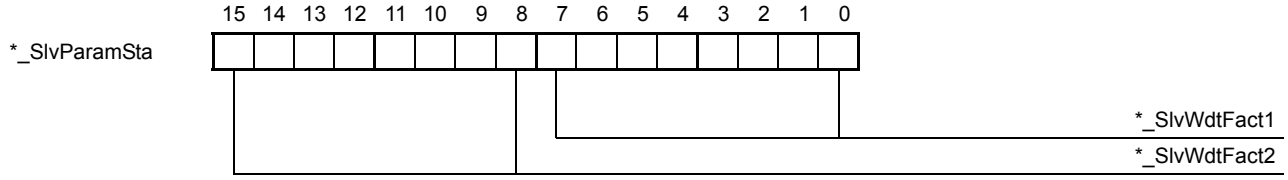
DM indication is not synchronised with the CPU refresh cycle, this information is intended for debugging purposes.

3-7-1 Slave Parameter Data (*_SlvParamSta)

The CJ1W-PRT21 unit indicates slave parameter data information in the first two words of the allocated Dm and Dm+1 area (*_*SlvParamSta*) allocated via the Machine No. setting.



Name of Device Variable for CJ-series Unit	Type	R/W	Description	Function
*_SlvMstrAdr	USINT	R	Master Address	Low byte: Integer value (00 to 125) indicating the node address of the PROFIBUS-DP Master from which the Unit has received and accepted the Chk_Cfg and Set_Prm telegrams. 255 indicates that the slave has not been configured by a master.
*_SlvGrp1	BOOL	R	Slave assigned to Group 1	Indicates to which groups (numbered 1-8) the slave has been assigned by the PROFIBUS-DP master / configurator. When receiving a global control command, the slave will decide if the command is intended for a group of slaves to which it has been assigned. The value is provided by the PROFIBUS master's Set_Prm telegram, and indicated in D m after both the Set_Prm and Chk_Cfg telegrams have been accepted.
*_SlvGrp2	BOOL	R	Slave assigned to Group 2	
*_SlvGrp3	BOOL	R	Slave assigned to Group 3	
*_SlvGrp4	BOOL	R	Slave assigned to Group 4	
*_SlvGrp5	BOOL	R	Slave assigned to Group 5	
*_SlvGrp6	BOOL	R	Slave assigned to Group 6	
*_SlvGrp7	BOOL	R	Slave assigned to Group 7	
*_SlvGrp8	BOOL	R	Slave assigned to Group 8	



Name of Device Variable for CJ-series Unit	Type	R/W	Description	Function
*_SlvWdtFact1	USINT	R	Watchdog Factor 1	The master's parameterisation telegram contains the value to which the slave's communication watchdog timer will be set. The actual watchdog control time is set with *_WDfact1, *_WDfact2, *_WD timebase. The WD timebase can be either 10 ms (default) or 1 ms (optional). This selection is made by the PROFIBUS master and indicated in *_WdtTmBaseSta The actual watchdog control time can have any value from 2 ms (2*1*1) to 650250 ms (255*255*10). A value of 00 means that the slave has not been parameterized. The values are provided by the PROFIBUS master's Set_Prm telegram, and indicated in *_SlavOutStartAdrSta after both the Set_Prm and Chk_Cfg telegrams have been accepted.
*_SlvWdtFact2	USINT	R	Watchdog Factor 2	

Precautions for Correct Use

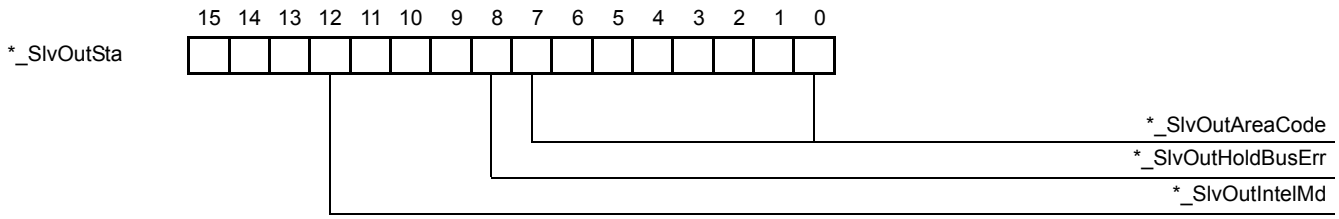
The Slave will exit data exchange mode if the communication watchdog is enabled, and the time between two PROFIBUS-DP messages received from the master exceeds **Twd** + $\theta_{WDtimebase}$ ms.

For example, if the Watchdog timeout (T_{WD}) has been set to 100 ms and the Watchdog timebase has been set to 10 ms, two PROFIBUS-DP messages received from the master should not be more than 90 ms apart.

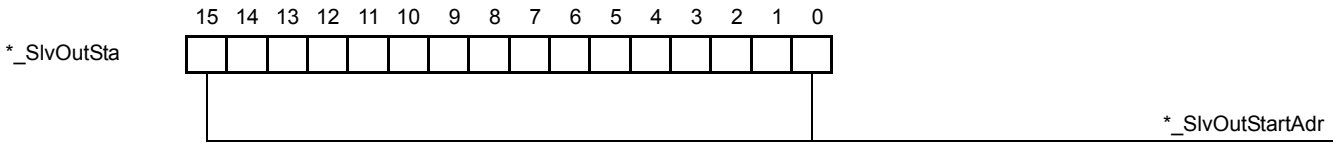
In this state, the Data exchange active flag (*_DatXchgActSta) will be off, and all slave output data to the host CPU will be 0000. The slave needs to receive the correct Set_Prm and Chk_Cfg messages from the master to re-enter data exchange mode.

3-7-2 Slave Output Data (*_SlvOutSta)

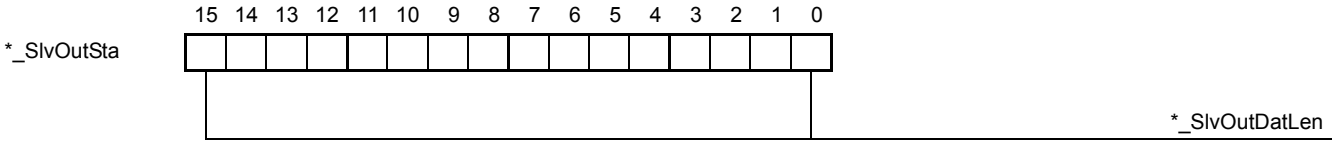
The CJ1W-PRT21 unit indicates configuration information and operational behavior settings for slave output data from the master to the slave (Dm+2, Dm+3 and Dm+4).



Name of Device Variable for CJ-series Unit	Type	R/W	Description	Function
*_SlvOutAreaCode	USINT	R	Output area code	Output area code (data from Master to Slave CPU). Indicates the area to which the unit will write PROFIBUS output data received from its master. 00: No assignment made 01: CIO area (CIOxxxx) 03: DM area (Dxxxxx) 04: Work area (Wxxx) 05: Holding area (Hxxx) 08: EM bank 0 (E0-xxxxx) 09: EM bank 1 (E1-xxxxx) 10: EM bank 2 (E2-xxxxx) 11: EM bank 3 (E3-xxxxx) 12: EM bank 4 (E4-xxxxx) 13: EM bank 5 (E5-xxxxx) 14: EM bank 6 (E6-xxxxx) 15: EM bank 7 (E7-xxxxx) 16: EM bank 8 (E8-xxxxx) 17: EM bank 9 (E9-xxxxx) 18: EM bank A (EA-xxxxx) 19: EM bank B (EB-xxxxx) 20: EM bank C (EC-xxxxx)
*_SlvOutHoldBusErr	BOOL	R	Data hold on PROFIBUS fail	FALSE: Clear data to Host CPU TRUE: Hold data to Host CPU Indicates how the slave will behave on the Host CPU I/O bus in the event the PROFIBUS data exchange communication fails (e.g. comm. watchdog timeout).
*_SlvOutIntelMd	BOOL	R	Outputs Intel mode	FALSE: Motorola (high byte first) TRUE: Intel (low byte first) Outputs Motorola/Intel mode Indicates how the data bytes of a PROFIBUS data exchange telegram are mapped to Host CPU data words. The values in *_*SlvOutSta* are provided by the PROFIBUS master's Set_Prm telegram, and indicated in *_*SlvOutSta* after both the Set_Prm and Chk_Cfg telegrams have been accepted.



Name of Device Variable for CJ-series Unit	Type	R/W	Description	Function
*_SlvOutStartAdr	UINT	R	Output start address	Output start address (data from Master to Slave CPU) Indicates the start address in the area indicated in *_SlavOutSta, to which the PROFIBUS output data, received from the master, will be written. The value is provided by the PROFIBUS master's Set_Prm telegram, and indicated in *_SlvOutStartAdr after both the Set_Prm and Chk_Cfg telegrams have been accepted. The indication is only valid in case the output area code is unequal to 00. The start address is indicated as a value in the range 0-32767.



Name of Device Variable for CJ-series Unit	Type	R/W	Description	Function
*_SlvOutDatLen	UINT	R	Output data length	Output data length (data from Master to Slave CPU). The value indicates the size of the area to which the PROFIBUS output data, received from the master, will be written. The value is provided by the PROFIBUS master's Chk_Cfg telegram, and indicated in *_*SlvOutSta* after both the Set_Prm and Chk_Cfg telegrams have been accepted. The indication is only valid in case the output area code is unequal to 00. The length (in words) is indicated as a value in the range 0 to 100.

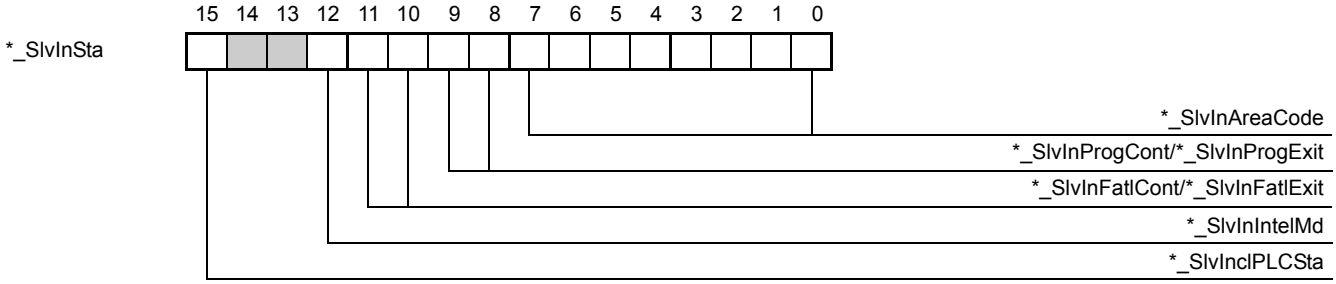
Precautions for Correct Use

Before using the Slave output data in the CPU program, the user is to make sure the Unit Status Flags in Variable *_*SlvSta* indicate that:

- PROFIBUS data exchange is active,
- there are no configuration errors,
- and that the correct data format is selected. Otherwise the Slave Output words may contain invalid data.

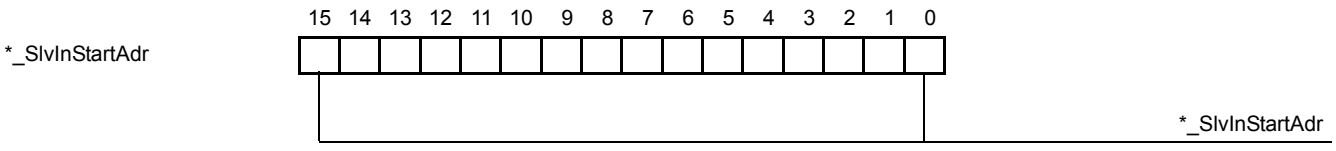
3-7-3 Slave Input Settings (*_SlvInSta)

The CJ1W-PRT21 unit indicates configuration information and operational behavior settings for slave input data from the Slave CPU to the master (Dm+5, Dm+6 and Dm+7).



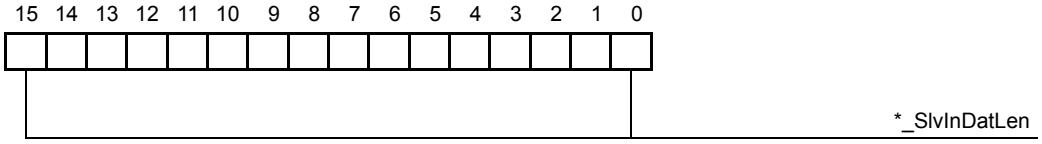
Name of Device Variable for CJ-series Unit	Type	R/W	Description	Function
*_SlvInAreaCode	USINT	R	Input area code	Input area code (data from Slave CPU to Master). Indicates the area to which the unit will write PROFIBUS input data to be sent to its master. 00: No assignment made 01: CIO area (CIOxxxx) 03: DM area (Dxxxxx) 04: Work area (Wxxx) 05: Holding area (Hxxx) 08: EM bank 0 (E0-xxxxx) 09: EM bank 1 (E1-xxxxx) 10: EM bank 2 (E2-xxxxx) 11: EM bank 3 (E3-xxxxx) 12: EM bank 4 (E4-xxxxx) 13: EM bank 5 (E5-xxxxx) 14: EM bank 6 (E6-xxxxx) 15: EM bank 7 (E7-xxxxx) 16: EM bank 8 (E8-xxxxx) 17: EM bank 9 (E9-xxxxx) 18: EM bank A (EA-xxxxx) 19: EM bank B (EB-xxxxx) 20: EM bank C (EC-xxxxx)
*_SlvInProgCont	BOOL	R	Continue in PROGRAM mode	Indicates how the slave will behave on PROFIBUS in case the host CPU is in PROGRAM mode (as opposed to RUN mode). *Examine condition of both *_*SlvInProgCont* and *_*SlvInProgExit* for slave behavior shown below. *_*SlvInProgCont*: FALSE *_*SlvInProgExit*: FALSE • Slave has not been configured by a master (n.a.). *_*SlvInProgCont*: TRUE *_*SlvInProgExit*: FALSE • Continue data exchange, and provide diagnostics to the master. *_*SlvInProgCont*: FALSE *_*SlvInProgExit*: TRUE • Exit data exchange, and provide diagnostics to the master. In this case the Slave will send static diagnostics messages to the master.
*_SlvInProgExit	BOOL	R	Exit in PROGRAM mode	

Name of Device Variable for CJ-series Unit	Type	R/W	Description	Function
*_SlvInFatlCont	BOOL	R	Continue on Fatal error	Indicates how the slave will behave on PROFIBUS in case (the communication with) the host CPU has a fatal error (CPU ERH indicator ON) e.g. I/O refresh timeout). *Examine condition of both *_*SlvInFatlCont* and *_*SlvInFatlExit* for slave behavior as shown below. *_*SlvInFatlCont*: FALSE *_*SlvInFatlExit*: FALSE • Slave has not been configured by a master (n.a.). *_*SlvInFatlCont*: TRUE *_*SlvInFatlExit*: FALSE • Continue data exchange, and provide diagnostics to the master. *_*SlvInFatlCont*: FALSE *_*SlvInFatlExit*: TRUE • Exit data exchange, and provide diagnostics to the master. In this case the Slave will send static diagnostics messages to the master.
*_SlvInFatlExit	BOOL	R	Exit on fatal error	
*_SlvInIntelMd	BOOL	R	Inputs Intel mode	Indicates how the host CPU data words are mapped to a PROFIBUS data exchange telegram. FALSE: Motorola (high byte first) TRUE: Intel (low byte first) The values in *_*SlavInSta* are provided by the PROFIBUS master's Set_Prm telegram, and indicated in *_*SlavOutSta* after both the Set_Prm and Chk_Cfg telegrams have been accepted.
*_SlvInclPLCSta	BOOL	R	Include CPU status in input data	Include CPU status in input data Indicates if the CPU status information should occupy the first two words of input data to the PROFIBUS master. FALSE: Do not include CPU status words TRUE: Include CPU status words. See section *3-8 CPU Status Information*.



Name of Device Variable for CJ-series Unit	Type	R/W	Description	Function
*_SlvInStartAdr	UINT	R	Input start address	Indicates the start address in the area indicated in *_*SlvInSta*, from which the PROFIBUS input data will be read (data from Slave CPU to Master). The value is provided by the PROFIBUS master's Set_Prm telegram, and indicated in *_*SlvInStartAd*r after both the Set_Prm and Chk_Cfg telegrams have been accepted. The indication is only valid in case the input area code is unequal to 00. The start address is indicated as a value in the range 0 to 32767.

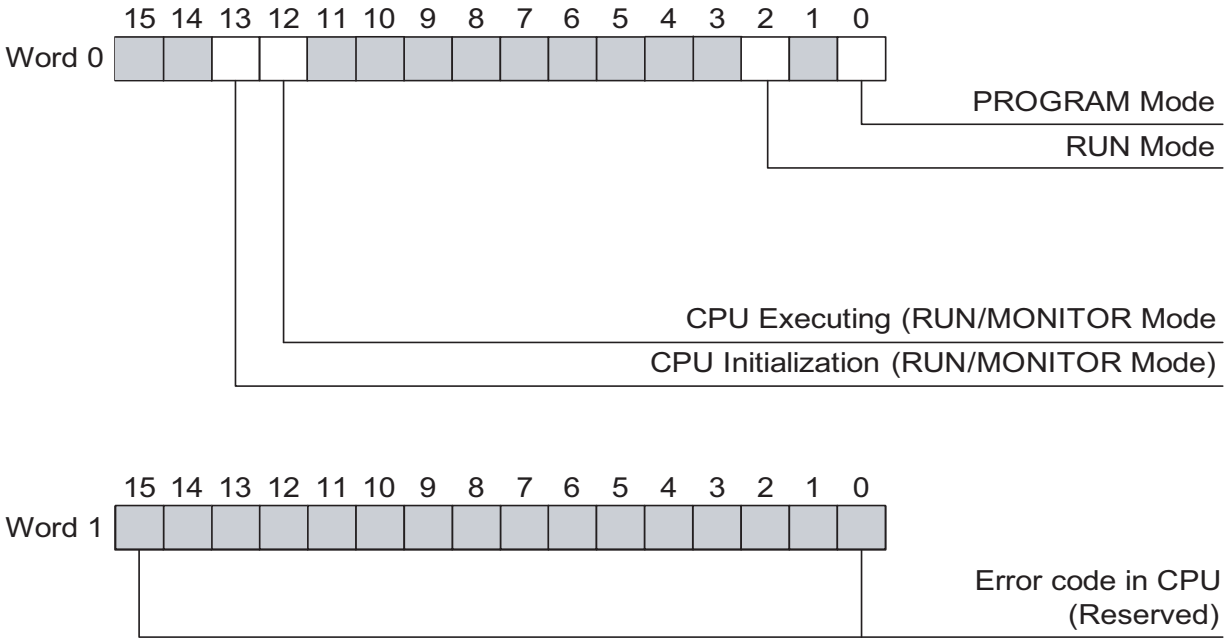
*_SlvInDatLen



Name of Device Variable for CJ-series Unit	Type	R/W	Description	Function
*_SlvInDatLen	UINT	R	Input data length	The value indicates the size of the area from which the PROFIBUS input data will be read (data from Slave CPU to Master). The value is provided by the PROFIBUS master's Chk_Cfg telegram, and indicated in *_*SlvInDatLen* after both the Set_Prm and Chk_Cfg telegrams have been accepted. The indication is only valid in case the input area code is unequal to 00. The length (in words) is indicated as a value in the range 0 to 100.

3-8 CPU Status Information

The user may specify that the first two input words to be sent over PROFIBUS that will contain status information about the slave CPU. This information is also contained in the PROFIBUS-DP diagnostics, but access to cyclic I/O data may be easier than access to diagnostics. In case the status of the slave CPU is unknown (at startup, or at fatal I/O bus error), both Words 0 is set to "0000" (status unknown).



Additional Information

- Shown format for both words is in Motorola mode. If Intel mode is specified for the PROFIBUS inputs, the high and low bytes will change places.
- Specific NJ-series CPU status is not mapped in the second word (Word 1 above). Use generic PROFIBUS Input to map detailed NJ-series status.
- Refer to the NJ-series GetAlarm and GetPLCError functions to access detailed CPU status data.

4

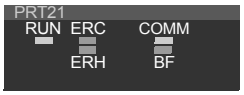
Troubleshooting and Maintenance

This section describes the troubleshooting procedure, event logs and maintenance procedure for the CJ1W-PRT21 PROFIBUS Slave Unit.

4-1 Error Indicators

4-1-1 Determining Operating Status from the Indicators

The CJ1W-PRT21 Unit uses 5 indicators (RUN, ERC, ERH, BF, and COM) to indicate the status of Unit and network communications. The indicators can provide a clue for quick resolution of system problems.



The general descriptions of these indicators are described in the tables below.

The RUN, ERC and ERC indicators depict the status of the CJ1W-PRT21 Unit communication with the Host CPU unit.

Indicator	Color	Status	
RUN	Green	OFF	The Unit is not in operation.
		ON	The Unit is in operation.
ERC	Red	OFF	The Unit is normal.
		ON	The Unit has an operational failure.
ERH	Red	OFF	The CPU is normal.
		BLINK	Communication with the Host CPU has stopped
		ON	The CPU has an operational failure.

The BF and COMM indicators depict the status of the PROFIBUS-DP interface.

Indicator	Color	Status	
COMM	Green	OFF	No PROFIBUS-DP Data exchange communication
		ON	I/O data exchange on PROFIBUS-DP is active (see **_DatXchgActSta* setting).
BF	Red	OFF	No PROFIBUS-DP communication errors, Set_Prm and Chk_Cfg telegrams have been accepted.
		BLINK	The unit communicates with a master, but is not in data exchange mode. Either the Set_Prm or the Chk_Cfg telegram contained incorrect data.
		ON	Response monitoring time has elapsed. The master did not address CJ1W-PRT21 within the configured watchdog time, or no master was present after power-on (COMM indicator will be OFF).

Additional Information

Blink frequency of indicators is 1 Hz under normal operating conditions (50% duty cycle).

4-1-2 Errors During Initial Processing

RUN	ERC	ERH	Error	Probable Cause	Remedy
OFF	OFF	OFF	---	• The CPU power is off • The Unit is defective	• Apply power to the CPU • Replace the Unit
OFF	OFF	ON	CPU Error	• An error was detected in the CPU	• Resolve the error in the CPU and restart the system.
OFF	OFF	Flashing	---	• The unit is configured correctly. The CPU is in program mode likely because it has been configured to operate upon error based on the settings of **_SlvInFatlCont* and **_SlvInFatlExit*. The Unit will transmit diagnostics to the PROFIBUS Master for more information. • The unit is configured correctly. The CPU has an error and the Unit has been programmed to stop (Action Fatal Error in Configuration is set to Stop). The Unit will transmit diagnostics to the PROFIBUS Master.	• Check the status of **_SlvInFatlCont* and **_SlvInFatlExit.* • Check the operating mode of the CPU. • Check the diagnostics sent to the Master Unit for more information.
OFF	ON	OFF	Unit Error	• The Unit is defective	• Replace the Unit

4-1-3 Errors During Normal Operation

COMM	BF	Error	Probable Cause	Remedy
OFF	OFF	Not Exchanging I/O data with CPU	• The Unit is not mounted to the CPU system properly. • The Master Unit or transmission line have failed. • The watchdog of the slave has switched the outputs of the slave to the fail-safe mode. • I/O refresh has been disabled. • The Slave is defective. • CPU is not in RUN mode.	• Check the mounting of the system is correct. • Check the transmission line for proper connection and correct wiring according to recommended procedures (see *2-3 Network Installation*). • Disable the watchdog for troubleshooting measures. • Check the CPU settings. • Replace the Unit.

COMM	BF	Error	Probable Cause	Remedy
OFF	ON	PROFIBUS communication error	• **_StartCommCmd* is FALSE • The PROFIBUS configuration is not correct. • The PROFIBUS wiring is not correct. • The PROFIBUS Master Unit is malfunctioning. • The Slave Unit is defective.	• Change the **_StartCommCmd* to TRUE. • Verify that the correct GSD-file is used in the master. Also check the Slave Unit's station address is matching the Master Unit's configuration. Look for station duplication address occurrences. • Check for errors in the start/end address and area settings in the Master. Examine the status of variables **_StartAdrInErr, *_EndAdrInErr, *_StartAdrOutErr*, and **_EndAdrOutErr* for more information. • Check the transmission lines for proper connection and correct wiring according to the recommended procedures (see *2-3 Network Installation*). • Replace the Master Unit. • Replace the Slave Unit.
OFF	Flashing	Parameter/Configuration Error	• Invalid configuration in PROFIBUS Master Unit. • The Slave Unit is defective.	• Check **_ParamErr* variable details in *3-6-2 Status Flags (*_SlvSta)*. • Verify the configuration and parameter data of the Slave Unit. • Verify the configuration of the Master Unit. • Check the baud rate. • Replace the Slave Unit.
ON	---	No I/O Data Exchanged	• Another mounted Unit has overlapping memory areas. • Slave in Sync or Freeze mode. • Watchdog is off. • Slave Unit is defective	• Check the status of the bits in **_SlvSta.* • Check other Unit for incorrect mapping of data. • Check the mode commanded from the Master Unit. • Check the transmission lines for proper connection and correct wiring according to the recommended procedures (see *2-3 Network Installation*). • Enable the watchdog. • Replace the Slave Unit.

4-2 Standard and Extended Diagnostics

PROFIBUS-DP specifies standard diagnostics and extended diagnostics. The standard diagnostics have a fixed format defined in the PROFIBUS standard.

The extended diagnostics are meant for user diagnostics. CJ1W-PRT21 provides extended diagnostics to inform the PROFIBUS master unit about the status of the slave unit and its host CPU.

- CPU PROGRAM mode
- Fatal bus error
- Error message (FAL/FALS code)*1
- Invalid start address input area
- Invalid end address input area
- Invalid start address output area
- Invalid end address output area

Note Note Extended diagnostics are sent to the master upon mode changes or when error codes are changed.

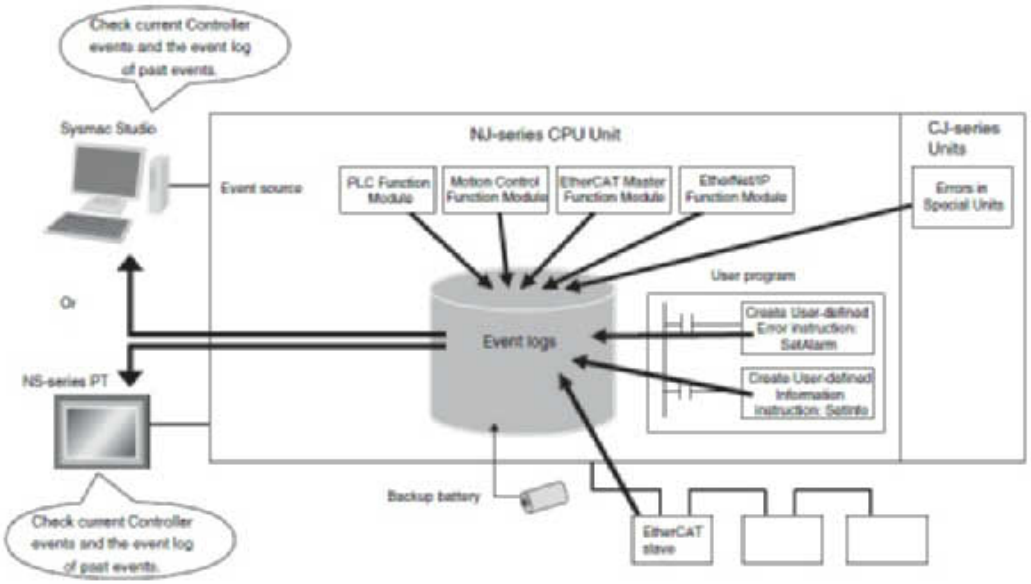
Byte	Bit Position								Designation
	7	6	5	4	3	2	1	0	
0	<According to PROFIBUS standard>								Station_status_1
1	<According to PROFIBUS standard>								Station_status_2
2	<According to PROFIBUS standard>								Station_status_3
3	<Address of master unit [hex]>								Diag.Master_Add
4	06								Ident_Number_High
5	02								Ident_Number_Low
6	0	0	0	0	0	1	0	1	5 bytes of Device related diagnostics
7									PLC Status High
8	Invalid End address output area	Invalid Start address output area	Invalid End address input area	Invalid Start address input area				PRO-GRAM mode	PLC status Low
9									Not Applicable
10									Not Applicable

4-3 Event Logs

4-3-1 Overview of the Event Logs

The Event Log allows the user to access all of the events that occur on the NJ-series Controller including errors and information. You can use the Sysmac Studio or an NS-series PT to confirm current Controller events and the logs of events that have occurred. These logs are called event logs. Controller errors that occur for this Unit are also reported as events in the NJ-series CPU Unit.

Refer to the *NJ-series CPU Unit Software User's Manual* (Cat. No. W501) for details on the event logs in an NJ-series CPU Unit. Refer to the *NJ-series Troubleshooting Manual* (Cat. No. W503) for details on Controller errors, confirmation methods and corrections.



4-3-2 Error Table

The errors that may occur for this Unit are listed below. Event levels are given in the table as follows:

Maj: Major fault level

Prt: Partial fault level

Min: Minor fault level

Obs: Observation

Info: Information

Refer to the *NJ-series Troubleshooting Manual* (Cat. No. W503) for all of the event codes that may occur in an NJ-series Controller.

Event code	Event name	Meaning	Assumed cause	Level				
				Maj	Prt	Min	Obs	Info
38180000 hex	Parameter/Configuration Error	The Slave has received incorrect parameter and/or configuration messages from a Master Unit.	Parameter Error can be caused by: • Invalid standard parameter settings (valid settings are described in the PROFIBUS standard). • Invalid user parameter settings (allowed settings are described in the GSD file of the Unit). • Incorrect start addresses for I/O data in the host CPU system. If one of them is invalid, parameter error is indicated, plus **_StartAdrInErr* and/or **_StartAdrOutErr* will be set. Configuration Error can be caused by: • Input - or output length > 100 words • Input + output length > 180 words • Input length < 2 words while CPU status should be included. • Input - or output length causing errors indicated by **_EndAdrInErr, *_EndAdrOutErr*			X		

4-3-3 Error Descriptions

This section describes the information that is given for individual errors.

Controller Error Descriptions

The items that are used to describe individual errors (events) are described in the following copy of an error table.

<table>
<tr><td>Event name</td><td colspan="3">Gives the name of the error.</td><td>Event code</td><td colspan="2">Gives the code of the error.</td></tr>
<tr><td>Meaning</td><td colspan="6">Gives a short description of the error.</td></tr>
<tr><td>Source</td><td colspan="2">Gives the source of the error.</td><td>Source details</td><td>Gives details on the source of the error.</td><td>Detection timing</td><td>Tells when the error is detected.</td></tr>
<tr><td>Error attributes</td><td>Level</td><td>Tells the level of influence on control.*1</td><td>Recovery</td><td>Gives the recovery method.*2</td><td>Log category</td><td>Tells which log the error is saved in.*3</td></tr>
<tr><td>Effects</td><td>User program</td><td>Tells what will happen to execution of the user program.*4</td><td>Operation</td><td colspan="3">Provides special information on the operation that results from the error.</td></tr>
<tr><td rowspan="2">System-defined variables</td><td colspan="2">Variable</td><td colspan="2">Data type</td><td colspan="2">Name</td></tr>
<tr><td colspan="6">Lists the variable names, data types, and meanings for system-defined variables that provide direct error notification, that are directly affected by the error, or that contain settings that cause the error.</td></tr>
<tr><td rowspan="2">Cause and correction</td><td colspan="2">Assumed cause</td><td colspan="2">Correction</td><td colspan="2">Prevention</td></tr>
<tr><td colspan="6">Lists the possible causes, corrections, and preventive measures for the error.</td></tr>
<tr><td>Attached information</td><td colspan="6">This is the attached information that is displayed by the Sysmac Studio or an NS-series PT.</td></tr>
<tr><td>Precautions/ Remarks</td><td colspan="6">Provides precautions, restrictions, and supplemental information.</td></tr>
</table>

*1 One of the following:
Major fault: Major fault level
Partial fault: Partial fault level
Minor fault: Minor fault level
Observation
Information

*2 One of the following:
Automatic recovery: Normal status is restored automatically when the cause of the error is removed.
Error reset: Normal status is restored when the error is reset after the cause of the error is removed.
Cycle the power supply: Normal status is restored when the power supply to the Controller is turned OFF and then back ON after the cause of the error is removed.
Controller reset: Normal status is restored when the Controller is reset after the cause of the error is removed.
Depends on cause: The recovery method depends on the cause of the error.

*3 One of the following:
System: System event log
Access: Access event log

*4 One of the following:
Continues: Execution of the user program will continue.
Stops: Execution of the user program stops.
Starts: Execution of the user program starts.

Error Descriptions

Event name	Parameter/Configuration Error			Event code	38180000 hex	
Meaning	The Slave Unit has not received and accepted Set_Prm and Chk_Cfg telegrams from a master.					
Source	Function Module		Source details	CJ-series Unit	Detection timing	At startup of network
Error attributes	Level	Minor	Recovery	Restart the Master Unit	Log category	System
Effects	User program	Continues	Operation	The PROFIBUS Slave Unit will not start the network operation and will remain offline		
System-defined variables	Variable		Data type		Name	
	*_ParamErr		BOOL		Parameter/configuration error	
Cause and correction	Assumed cause		Correction		Prevention	
	Invalid standard parameter settings (valid settings are described in the PROFIBUS standard).		Check PROFIBUS standard and correct the settings.		Load the correct parameters to the Master Unit.	
	Invalid user parameter settings (allowed settings are described in the GSD file of the Unit).		Check settings described in GSD file of the Unit and correct the settings.		Load the correct parameters to the Master Unit.	
	Incorrect start addresses for I/O data in the host CPU system. If one of them is invalid, parameter error is indicated, plus *_*StartAdrInErr* and/or *_*StartAdrOutErr* will be set.		Change the start address setting in the Master Unit.		Load the correct start address to the Master Unit.	
Attached information	None					
Precautions/ Remarks	None					

4-4 Maintenance and Replacement

This section describes the routine cleaning and inspection recommended as regular maintenance as well as the Unit replacement procedure.

4-4-1 Cleaning

Clean the PROFIBUS Slave Unit regularly as described below in order to keep the network in its optimal operating condition.

- Wipe the Unit daily with a dry, soft cloth.
- When a spot can't be removed with a dry cloth, dampen the cloth with a neutral cleanser (2% solution), wring out the cloth and wipe the Unit.

Precautions for Correct Use

Never use volatile solvents such as paint thinner, benzine or chemical wipes. These substances could damage the surface of the Unit.

4-4-2 Inspection

Be sure to inspect the system periodically to keep it in optimum operating condition. In general, inspect the system once or twice a year, but more frequently if the system is used in high temperature or high humidity environments or dirty/dusty conditions.

Inspection Equipment

Prepare the following equipment before inspecting the system.

● Required Equipment

Philips type screwdriver, multimeter, alcohol and a clean cloth.

● Optional Test Equipment

Depending on system conditions, a synchroscope, oscilloscope, thermometer or hygrometer (to measure humidity) might be needed.

Inspection Procedure

Check the items in the following table and correct any that are below standard.

Item		Standard	Equipment
Environmental conditions	Ambient temperature	0° C to 55° C	Thermometer
	Ambient humidity	10% to 90%	Hygrometer
	Dust/dirt accumulation	None	Check visually

Item		Standard	Equipment
Installation	Are the units installed securely?	No looseness	Phillips head screwdriver
	Are the communications connectors fully inserted?	No looseness	Phillips head screwdriver
	Are the external wiring screws tight?	No looseness	Phillips head screwdriver
	Are the connecting cables undamaged?	No damage	Check visually

4-4-3 Replacing Faulty Units

The PROFIBUS Slave Unit is a Network device. If the Unit is damaged, it will effect the entire Network, so always ensure repairs are undertaken immediately. It is recommended to have a spare PROFIBUS Slave Unit on hand so that repairs may be conducted quickly.

Precautions

Observe the following precautions when replacing the Unit.

- Always turn OFF the power before replacing the Unit.
- Ensure that the new Unit is not faulty.
- If a poor connection is suspected of causing the malfunction, clean the connectors using a clean, soft cloth and industrial-grade alcohol. Remove any lint or threads left from the cloth, and remount the Unit.
- If returning a faulty Unit for repair, always attach a detailed fault report to the Unit and return it to the nearest OMRON dealer.

Precautions for Safe Use

In order to prevent faulty operation be sure to turn off the power to all master and slave devices before replacing the Unit.

When replacing the Unit, do not reconnect it to the Network before carrying out the procedures listed below.

Settings After Replacing PROFIBUS Slave Units

After replacing a PROFIBUS Slave Unit (before applying power) set the Machine number to the same number as the previous Unit.

4-4-4 Addition/Replacement of Units on the PROFIBUS Network

The PROFIBUS network allows to connect and disconnect devices while in operation.

● Connecting and Disconnecting Devices

Connecting/disconnecting any device in a PROFIBUS network is liable to result in a temporary increase of the communication cycle time. An existing slave device can only be replaced by the same type of device with the same configuration. Any change to this configuration is likely to require a new configuration. Changing a device with a different device (type and/or configuration) will have a significant influence on the performance on the PROFIBUS network.

App

Appendices

A-1 Differences of NJ Series from CJ series

You can use the CJ1W-PRT21 PROFIBUS Slave Unit with the NJ-series Units.

If this Unit is used with the NJ Series, some functions become unavailable compared to when it is used with the CJ Series.

The following shows differences between the NJ Series and the CJ-series for each function of this PROFIBUS Slave Unit.

A-1-1 Functional Difference

Item	Function in CJ series	Function in NJ series
Responding to DPM1 and DPM2 Masters	Data_Exchange, Slave_Diag, Set_Prm, Chk_cfg, Global_Control (SYNC/FREEZE/CLEAR)	Same as on left
Configurable with In, Out, and In/Out modules	1,2,4,8 and 16 words. Total of 0 to 100 words in + 0 to 100 words. Sum of Input and OUtput size can be up to 180 words.	Same as on left
CPU status information	Program, Monitor, Run modes. Output OFF, CPU Waiting, CPU Executing, CPU Initializing, Non-Fatal PLC Error, Fatal PLC Error.	Program and Run modes. CPU Executing, CPU Initializing.
Extended diagnostics/Device related diagnostics	Output OFF, CPU waiting, Non-fatal error, Fatal error, Program mode, Invalid Start/End address input area, Invalid Start/End address output area, Error code as in PLC.	Program mode, Invalid Start/End address input area, Invalid Start/End address output area.

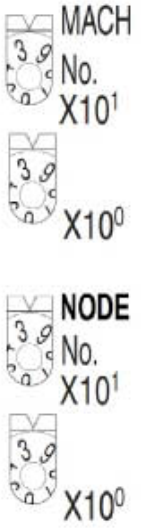
A-1-2 Differences in Access Methods from a User Program

With the NJ Series, device variables for CJ-series Unit are used for the PROFIBUS Slave Unit functions.

The following tables show how the words and bits of CJ-series I/O memory or the NJ-series memory used for CJ-series Unit correspond to the NJ-series device variables for CJ-series Unit.

Start address of special I/O Unit area: n = 2000 words + Unit number x 10 (Unit number: 0 to 95)

Start address of the special I/O Unit DM area: m = D20000 + Unit number x 100 (Unit number: 0 to 95)



The CIO and DM number occupied by the PROFIBUS Slave Unit are set by the machine number rotary switch on the front of the Unit.

Allocated CIO words (Start address CIO Area = 2000 + MACH No. x 10)

MACH No.	CIO Area	MACH No.	CIO Area
00	CIO 2000 to CIO 2009	06	CIO 2060 to CIO 2069
01	CIO 2010 to CIO 2019	07	CIO 2070 to CIO 2079
02	CIO 2020 to CIO 2029	08	CIO 2080 to CIO 2089
03	CIO 2030 to CIO 2039	09	CIO 2090 to CIO 2099
04	CIO 2040 to CIO 2049	10..	CIO 2100 to CIO 2109
05	CIO 2050 to CIO 2059	..95	CIO 2940 to CIO 2949

Allocated DM words (Start address DM Area = 20000 + MACH No. x 100):

MACH No.	CIO Area	MACH No.	CIO Area
00	DM 20000 to DM 20007	06	DM 20600 to DM 20607
01	DM 20100 to DM 20107	07	DM 20700 to DM 20707
02	DM 20200 to DM 20207	08	DM 20800 to DM 20807
03	DM 20300 to DM 20307	09	DM 20900 to DM 20907
04	DM 20400 to DM 20407	10	DM 21000 to DM 21007
05	DM 20500 to DM 20507	95	DM 29500 to DM 29507

Additional Information

- If two or more Units are set to an identical Machine number or if one Unit is set to areas of plural Machine numbers, the CPU Unit has a major fault level error, a duplicated Unit number error, and stops operation. After correcting the Machine number setting, cycle the power to the Controller.
- Be sure that no Machine numbers are duplicated.

To avoid duplication, when you set a PROFIBUS Slave Unit to the Machine number "n", set the next Unit to the Machine number "n + 1".

Special I/O Units Area (Allocated CIO Area Words)

● CIO n (Software Switches)

The device variable for CJ-series Unit that corresponds to all bits of a word in CIO n is as follows:

CJ-series I/O memory address		NJ-series device variables for CJ-series Unit	
Word address	Bit	Variable name	Description
CIO n	0 to 15	*_SwCmd	Software Switches

The device variables for CJ-series Units that correspond to bits 0 to 15 of a word in CIO n are as fo llows:

CJ-series I/O memory address		NJ-series device variables for CJ-series Unit	
Word address	Bit	Variable name	Description
CIO n	0	*_StartCommCmd	Start Communication
	1	*_StopCommCmd	Stop Communication
	2 to 15	Undefined	Reserved by system

● CIO n+1 (Status Flags)

The device variable for CJ-series Unit that corresponds to all bits of a word in CIO n + 1is as follows:

CJ-series I/O memory address		NJ-series device variables for CJ-series Unit	
Word address	Bit	Variable name	Description
CIO n + 1	0 to 15	*_SlvSta	Status flags

The device variables for CJ-series Units that correspond to bits 0 to 15 of a word in CIO n + 1 are as follows:

CJ-series I/O memory address		NJ-series device variables for CJ-series Unit	
Word address	Bit	Variable name	Description
CIO n + 1	0	*_DatXchgActSta	Data exchange active
	1	*_ClearSta	CLEAR
	2	*_FreezeSta	FREEZE
	3	*_SyncSta	SYNC
	4	*_WdtDsblSta	Watchdog disabled
	5	*_WdtTmBaseSta	Watchdog timebase 1 ms
	6	*_FailSafeEnblSta	Fail-safe enabled
	7	Undefined	Reserved by system
	8	*_ParamErr	Parameter/configuration error
	9 to 11	Undefined	Reserved by system
	12	*_StartAdrInErr	Incorrect start address for slave input area
	13	*_EndAdrInErr	Incorrect end address for slave input area
	14	*_StartAdrOutErr	Incorrect start address for slave output area
	15	*_EndAdrOutErr	Incorrect end address for slave output area

Special I/O DM Area (Allocated DM Area Words)

● DM and DM + 1 (Slave Parameter Data)

The device variable for CJ-series Unit that corresponds to all bits of the words in DM and DM + 1 are as follows:

CJ-series I/O memory address		NJ-series device variables for CJ-series Unit	
Word address	Bit	Variable name	Description
DM to DM + 1	0 to 15 for each word	*_SlvParamSta	Slave parameter data

The device variables for CJ-series Units that correspond to bits 0 to 15 of a each word in DM and DM + 1 are as follows:

CJ-series I/O memory address		NJ-series device variables for CJ-series Unit	
Word address	Bit	Variable name	Description
DM	0 to 7	*_SlvMstrAdr	Master address
	8	*_SlvGrp1	Slave assigned to Group 1
	9	*_SlvGrp2	Slave assigned to Group 2
	10	*_SlvGrp3	Slave assigned to Group 3
	11	*_SlvGrp4	Slave assigned to Group 4
	12	*_SlvGrp5	Slave assigned to Group 5
	13	*_SlvGrp6	Slave assigned to Group 6
	14	*_SlvGrp7	Slave assigned to Group 7
	15	*_SlvGrp8	Slave assigned to Group 8
DM + 1	0 to 7	*_SlvWdtFact1	Watchdog factor 1
	8 to 15	*_SlvWdtFact2	Watchdog factor 2

● DM + 2 to DM + 4 (Slave Output Data)

The device variable for CJ-series Unit that corresponds to all bits of the words in DM+ 2 to DM + 4 are as follows:

CJ-series I/O memory address		NJ-series device variables for CJ-series Unit	
Word address	Bit	Variable name	Description
DM + 2 to DM + 4	0 to 15 for each word	*_SlvOutSta	Slave Output Data

The device variables for CJ-series Units that correspond to bits 0 to 15 of a each word in DM + 2 to DM + 4 are as follows:

CJ-series I/O memory address		NJ-series device variables for CJ-series Unit	
Word address	Bit	Variable name	Description
DM + 2	0 to 7	*_SlvOutAreaCode	Output area code
	8	*_SlvOutHoldBusErr	Data hold on PROFIBUS fail
	9 to 11	Undefined	Reserved by system
	12	*_SlvOutIntelMd	Outputs Intel mode
	13 to 15	Undefined	Reserved by system
DM + 3	0 to 15	*_SlvOutStartAdr	Output start address

CJ-series I/O memory address		NJ-series device variables for CJ-series Unit	
Word address	Bit	Variable name	Description
DM + 4	0 to 15	*_SlvOutDatLen	Output data length

● DM + 5 to DM + 7 (Slave Input Settings)

The device variable for CJ-series Unit that corresponds to all bits of the words in DM+5 to DM + 7 are as follows:

CJ-series I/O memory address		NJ-series device variables for CJ-series Unit	
Word address	Bit	Variable name	Description
DM + 5 to DM + 7	0 to 15 for each word	*_SlvInSta	Slave Input Settings

The device variables for CJ-series Units that correspond to bits 0 to 15 of a each word in DM + 5 to DM + 7 are as follows:

CJ-series I/O memory address		NJ-series device variables for CJ-series Unit	
Word address	Bit	Variable name	Description
DM + 5	0 to 7	*_SlvInAreaCode	Input area code
	8	*_SlvInProgCont	Continue in PROGRAM mode
	9	*_SlvInProgExit	Exit in PROGRAM mode
	10	*_SlvInFatlCont	Continue on fatal error
	11	*_SlvInFatlExit	Exit on fatal error
	12	*_SlvInIntelMd	Inputs Intel mode
	13 and 14	Undefined	Reserved by system
	15	*_SlvInclPLCSta	Include PLC status in input data
DM + 6	0 to 15	*_SlvInStartAdr	Input start address
DM + 7	0 to 15	*_SlvInDatLen	Input data length

A-2 GSD File for CJ1W-PRT21

```
;***************************************************************************
;**                                                                       **
;**      Omron Europe B.V.                                                **
;**                                                                       **
;**      European Headquarters                                            **
;**      Wegalaan 67-69                                                   **
;**      NL-2132 JD  Hoofddorp                                            **
;**      The Netherlands                                                  **
;**                                                                       **
;**      Automation & Drives Development Centre                           **
;**      Zilverenberg 2                                                   **
;**      NL-5234 GM 's-Hertogenbosch                                      **
;**      The Netherlands                                                  **
;**                                                                       **
;***************************************************************************
;**                                                                       **
;**      Device DataBase File for CJ1W-PRT21 PLC I/O Slave                **
;**                                                                       **
;**      Filename:  OC_0602.GSD                                           **
;**      Version :  2.2000                                                **
;**      Date    :  November 16, 2004                                     **
;**                                                                       **
;**      (C) Copyright OMRON Corporation 2004                             **
;**          All Rights Reserved                                          **
;**                                                                       **
;***************************************************************************
;**                                                                       **
;**   Important notice:                                                   **
;**   ==================                                                  **
;**   - Any modification of parameters in this file may lead to undefined  **
;**     behavior of the Profibus-DP system.                               **
;**                                                                       **
; General information ********************************************************/

                                        ;
#Profibus_DP                            ;
GSD_Revision        = 2                 ; GSD file revision 2.0.
                                        ;
Vendor_Name         = "OMRON Corporation"   ; Vendor name string.
Model_Name          = "OMRON CJ1W-PRT21"    ; Model type string.
Ident_Number        = 0x0602            ; PNO Identification number.
                                        ;
                                        ;
FMS_supp            = 0                 ; Profibus-FMS not supported.
Protocol_Ident      = 0                 ; Profibus-DP supported.
Station_Type        = 0                 ; Station = DP-Slave.
Slave_Family        = 10                ; Slave family = 10 (PLC).
                                        ;
Revision            = "V2.2"            ; Device revision 2.2.
Hardware_Release    = "V1.1"            ; Hardware revision 1.1.
```

```
                                                ; (0991860-9A).
Software_Release    = "V2.0"                    ; Software revision 2.0.
                                                ;
Bitmap_Device       = "OC0602_R"                ; Bitmap RUNNING
Bitmap_Diag         = "OC0602_D"                ; Bitmap DIAGNOSTIC
Bitmap_SF           = "OC0602_S"                ; Bitmap SPECIAL
                                                ;
; Specific implementation information ************************************/
                                                ;
Implementation_type = "SPC3"                    ; DP protocol.
                                                ; handled by SPC3.
Redundancy          = 0                         ; Redundancy NOT supported.
Repeater_Ctrl_Sig   = 2                         ; Supported, TTL level
24V_Pins            = 0                         ; No external 24 Volt input.
                                                ;
Set_Slave_Add_supp  = 0                         ; Station address is set
                                                ; through hardware address
                                                ; selectors.
; Media access information ***************************************************/
                                                ; Automatic baud rate select
Auto_Baud_supp      = 1                         ; (SPC3 specific feature).
                                                ; Supported baud rates:
9.6_supp            = 1                         ; 9600 Baud
19.2_supp           = 1                         ; 19.2 kBaud
45.45_supp          = 1                         ; 45.45 kBaud
93.75_supp          = 1                         ; 93.75 kBaud
187.5_supp          = 1                         ; 187.5 kBaud
500_supp            = 1                         ; 500 kBaud
1.5M_supp           = 1                         ; 1.5 MBaud
3M_supp             = 1                         ; 3 MBaud
6M_supp             = 1                         ; 6 MBaud
12M_supp            = 1                         ; 12 MBaud
                                                ; Max. response times:
MaxTsdr_9.6         = 60                        ; 60 Tbit = 6.25 msec.
MaxTsdr_19.2        = 60                        ; 60 Tbit = 3.125 msec.
MaxTsdr_45.45       = 60                        ; 60 Tbit = 1.32 msec.
MaxTsdr_93.75       = 60                        ; 60 Tbit = 640 usec.
MaxTsdr_187.5       = 60                        ; 60 Tbit = 320 usec.
MaxTsdr_500         = 100                       ; 100 Tbit = 200 usec.
MaxTsdr_1.5M        = 150                       ; 150 Tbit = 100 usec.
MaxTsdr_3M          = 250                       ; 250 Tbit = 83 usec.
MaxTsdr_6M          = 450                       ; 450 Tbit = 75 usec.
MaxTsdr_12M         = 800                       ; 800 Tbit = 67 usec.
                                                ;
Min_Slave_Intervall = 5                         ; Minimum slave interval =
                                                ; 0.5 msec.
                                                ;
; DP-slave information ***************************************************/
                                                ;
Freeze_Mode_supp    = 1                         ; Freeze mode supported.
Sync_Mode_supp      = 1                         ; Sync mode supported.
Fail_Safe           = 1                         ; Fail safe supported.
                                                ;
```

```
Modular_Station     = 1                         ; Modular station.
Max_Module          = 32                        ; Maximum # of modules: 32.
                                                ;
Max_Input_Len       = 200                       ; Maximum # of input bytes.
Max_Output_Len      = 200                       ; Maximum # of output bytes.
Max_Data_Len        = 360                       ; Maximum # of data bytes.
                                                ;
PrmText=1
Text(1)="Continue I/O data exchange"
Text(2)="Stop I/O data exchange"
EndPrmText
                                                ;
PrmText=2                                       ; Compatible with DRM21
Text(1)="CIO area (CIOxxxx)"                    ;
Text(3)="Data Memory (Dxxxxx)"
Text(4)="Work area (Wxxx)"
Text(5)="Holding area (Hxxx)"
Text(8)="EM bank 0 (E0-xxxxx)"
Text(9)="EM bank 1 (E1-xxxxx)"
Text(10)="EM bank 2 (E2-xxxxx)"
Text(11)="EM bank 3 (E3-xxxxx)"
Text(12)="EM bank 4 (E4-xxxxx)"
Text(13)="EM bank 5 (E5-xxxxx)"
Text(14)="EM bank 6 (E6-xxxxx)"
Text(15)="EM bank 7 (E7-xxxxx)"
Text(16)="EM bank 8 (E8-xxxxx)"
Text(17)="EM bank 9 (E9-xxxxx)"
Text(18)="EM bank A (EA-xxxxx)"
Text(19)="EM bank B (EB-xxxxx)"
Text(20)="EM bank C (EC-xxxxx)"
EndPrmText

PrmText=3
Text(0)="Motorola (default)"
Text(1)="Intel"
EndPrmText

PrmText=4
Text(0)="Reset to 0 (default)"
Text(1)="Hold last value"
EndPrmText

PrmText=5
Text(0)="OFF"
Text(4)="ON (default)"
EndPrmText

PrmText=6
Text(0)="10 ms (default)"
Text(4)="1 ms"
EndPrmText

PrmText=7
```

```
Text(0)="PROFIBUS diagnostics only"
Text(1)="Cyclic by first 2 input words"
EndPrmText

ExtUserPrmData=1 "Action on slave PLC PROGRAM mode"
BitArea(0-1) 1 1-2
Prm_Text_Ref=1
EndExtUserPrmData

ExtUserPrmData=2 "Action on slave PLC I/O bus fail"
BitArea(2-3) 2 1-2
Prm_Text_Ref=1
EndExtUserPrmData

ExtUserPrmData=3 "Input from slave PLC area"
Unsigned8 1 1-20
Prm_Text_Ref=2
EndExtUserPrmData

ExtUserPrmData=4 "Input area start address "
Unsigned16 50 0-32767
EndExtUserPrmData

ExtUserPrmData=5 "Input data format"
Bit(4) 0 0-1
Prm_Text_Ref=3
EndExtUserPrmData

ExtUserPrmData=6 "Output to slave PLC area"
Unsigned8 1 1-20
Prm_Text_Ref=2
EndExtUserPrmData

ExtUserPrmData=7 "Output area start address "
Unsigned16 350 0-32767
EndExtUserPrmData

ExtUserPrmData=8 "Output data format"
Bit(4) 0 0-1
Prm_Text_Ref=3
EndExtUserPrmData

ExtUserPrmData=9 "Output data on PROFIBUS fail"
Bit(0) 0 0-1
Prm_Text_Ref=4
EndExtUserPrmData

ExtUserPrmData=10 "Fail-Safe support"
BitArea(4-7) 4 0,4
Prm_Text_Ref=5
EndExtUserPrmData

ExtUserPrmData=11 "Watchdog Base"
```

```
BitArea(0-3) 0 0,4
Prm_Text_Ref=6
EndExtUserPrmData

ExtUserPrmData=12 "Slave PLC status indication"
Bit(7) 0 0,1
Prm_Text_Ref=7
EndExtUserPrmData

; User parameter message definition ****************************************/

Max_User_Prm_Data_Len = 11

Ext_User_Prm_Data_Ref(0) = 10
Ext_User_Prm_Data_Ref(0) = 11

Ext_User_Prm_Data_Ref(3) = 9
Ext_User_Prm_Data_Ref(3) = 8
Ext_User_Prm_Data_Ref(4) = 6
Ext_User_Prm_Data_Ref(5) = 7

Ext_User_Prm_Data_Ref(7) = 1
Ext_User_Prm_Data_Ref(7) = 2
Ext_User_Prm_Data_Ref(7) = 5
Ext_User_Prm_Data_Ref(8) = 3
Ext_User_Prm_Data_Ref(9) = 4
Ext_User_Prm_Data_Ref(7) = 12

; Diagnostics ************************************************************/
;
Max_Diag_Data_Len   = 11                          ; Maximum diagnostic length.
;
;Host-Diagnostics (CPU-Mode & Diagnostic)
Unit_Diag_Bit(0002) = "PLC Output OFF"
Unit_Diag_Bit(0003) = "PLC CPU waiting"
Unit_Diag_Bit(0006) = "PLC non-fatal error (FAL)"
Unit_Diag_Bit(0007) = "PLC fatal error (FALS)"
Unit_Diag_Bit(0008) = "PLC in Program mode"
Unit_Diag_Bit(0012) = "Invalid start address input area"
Unit_Diag_Bit(0013) = "Invalid end address input area"
Unit_Diag_Bit(0014) = "Invalid start address outp. area"
Unit_Diag_Bit(0015) = "Invalid end address output area"
;
;Error messages in CPU word A400
Unit_Diag_Area = 16-23
Value (2) ="CPU Bus Unit error"
Value (3) ="Special I/O Unit error"
Value (4) ="CPU Bus Unit setup error"
Value (5) ="Special I/O unit setup error"
Value (128) ="Fatal PLC error"
Unit_Diag_Area_End
;
; Module definition list ***************************************************/
```

```
; Default configuration
;1 word  Out (No Cons.)
;1 word  In (No Cons.)
                                                    ; I/O definitions:
Module = " 1 word  In/Out" 0xF0                     ; 1 word I/O.
EndModule                                           ;
Module = " 2 words In/Out" 0xF1                     ; 2 words I/O.
EndModule                                           ;
Module = " 4 words In/Out" 0xF3                     ; 4 words I/O.
EndModule                                           ;
Module = " 8 words In/Out" 0xF7                     ; 8 words I/O.
EndModule                                           ;
Module = "16 words In/Out" 0xFF                     ; 16 words I/O.
EndModule                                           ;
                                                    ; Output definitions:
Module = " 1 word  Out (from master)" 0xE0          ; 1 word Out.
EndModule                                           ;
Module = " 2 words Out (from master)" 0xE1          ; 2 words Out.
EndModule                                           ;
Module = " 4 words Out (from master)" 0xE3          ; 4 words Out.
EndModule                                           ;
Module = " 8 words Out (from master)" 0xE7          ; 8 words Out.
EndModule                                           ;
Module = "16 words Out (from master)" 0xEF          ; 16 words Out.
EndModule                                           ;
                                                    ; Input definitions:
Module = " 1 word  In (to master)" 0xD0             ; 1 word In.
EndModule                                           ;
Module = " 2 words In (to master)" 0xD1             ; 2 words In.
EndModule                                           ;
Module = " 4 words In (to master)" 0xD3             ; 4 words In.
EndModule                                           ;
Module = " 8 words In (to master)" 0xD7             ; 8 words In.
EndModule                                           ;
Module = "16 words In (to master)" 0xDF             ; 16 words In.
EndModule                                           ;
                                                    ;
Module = "=== Non-consistent I/O (S7) ===" 0x00     ; No consistency
Endmodule                                           ; (for S7 Master)
                                                    ;
                                                    ; I/O definitions:
Module = " 1 word  In/Out (No Cons.)" 0x70          ; 1 word I/O.
EndModule                                           ;
Module = " 2 words In/Out (No Cons.)" 0x71          ; 2 words I/O.
EndModule                                           ;
Module = " 4 words In/Out (No Cons.)" 0x73          ; 4 words I/O.
EndModule                                           ;
Module = " 8 words In/Out (No Cons.)" 0x77          ; 8 words I/O.
EndModule                                           ;
Module = "16 words In/Out (No Cons.)" 0x7F          ; 16 words I/O.
EndModule                                           ;
                                                    ; Output definitions:
```

```
Module = " 1 word  Out (No Cons.)" 0x60          ; 1 word Out.
EndModule                                        ;
Module = " 2 words Out (No Cons.)" 0x61          ; 2 words Out.
EndModule                                        ;
Module = " 4 words Out (No Cons.)" 0x63          ; 4 words Out.
EndModule                                        ;
Module = " 8 words Out (No Cons.)" 0x67          ; 8 words Out.
EndModule                                        ;
Module = "16 words Out (No Cons.)" 0x6F          ; 16 words Out.
EndModule                                        ;
                                                 ; Input definitions:
Module = " 1 word  In (No Cons.)" 0x50           ; 1 word In.
EndModule                                        ;
Module = " 2 words In (No Cons.)" 0x51           ; 2 words In.
EndModule                                        ;
Module = " 4 words In (No Cons.)" 0x53           ; 4 words In.
EndModule                                        ;
Module = " 8 words In (No Cons.)" 0x57           ; 8 words In.
EndModule                                        ;
Module = "16 words In (No Cons.)" 0x5F           ; 16 words In.
EndModule                                        ;

; End of GSD file *************************************************************/
```

A-3 Parameterization by the PROFIBUS Master Unit

The parameterisation of the passive stations by the master is first done in the start-up phase of the PROFIBUS-DP system and is also possible in the data exchange mode. The first 10 bytes of parameter data are defined by the PROFIBUS standard the additional 9 bytes are device specific. The format of the parameters is depicted in the following table.

Byte	Bit Position								Designation
	7	6	5	4	3	2	1	0	
0	Lock Req	Unlock Req	Sync Req	Freeze Req	WD on	Res	Res	Res	Station status
1	00 to FF								WD_Fact_1
2	00 to FF								WD_Fact_2
3									MinTSDR
4	00 to FF								Ident_Number_High
5	00 to FF								Ident_Number_Low
6	00 to FF								Group_Ident
7	0	Fail Safe	0	0	0	WD 1 ms	0	0	DPV1_Status_1
8	0	0	0	0	0	0	0	0	DPV1_Status_2
9	0	0	0	0	0	0	0	0	DPV1_Status_3
10	0	0	0	Motor-ola/ Intel	0	0	0	Reset/ Hold	Output options*
11	codes to indicate CIO, H, W, D, E0 to EC								Output Area*
12	00 to 7F								Out start address High*
13	00 to FF								Out start address Low*
14	Incl. Sta-tus	0	0	Motor-ola/ Intel	Action Fatal Error (Continue/Stop)		Action PRGmode (Continue/Stop)		Input options*
15	codes to indicate CIO, H, W, D, E0-EC								Input Area*
16	00 to 7F								In start address High*
17	00 to FF								In start address Low*

Although the Unit does not support PROFIBUS-DP/V1 functionality, the three DPV1 status bytes are reserved in the Set_Prm message. Only the 2 indicated bits can be set by the user.

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