OMRON

PROFINET Fieldbus

Industrial Robot Configuration

User's Guide



- NOTE -

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form, or by any means, mechanical, electronic, photocopying, recording, or otherwise, without the prior written permission of OMRON.

No patent liability is assumed with respect to the use of the information contained herein. Moreover, because OMRON is constantly striving to improve its high-quality products, the information contained in this manual is subject to change without notice. Every precaution has been taken in the preparation of this manual. Nevertheless, OMRON assumes no responsibility for errors or omissions. Neither is any liability assumed for damages resulting from the use of the information contained in this publication.

Trademarks -

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

Copyrights

Microsoft product screen shots reprinted with permission from Microsoft Corporation.

Introduction

This manual is OMRON's original instructions describing the setup and operations of the PROFINET fieldbus.

Please read this manual and make sure you understand the functionality and performance of PROFI-NET fieldbus before attempting to use it.

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 factory automation (FA) systems, robotic control methods, and Siemens controller configuration methods.

- 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.

Applicable Models

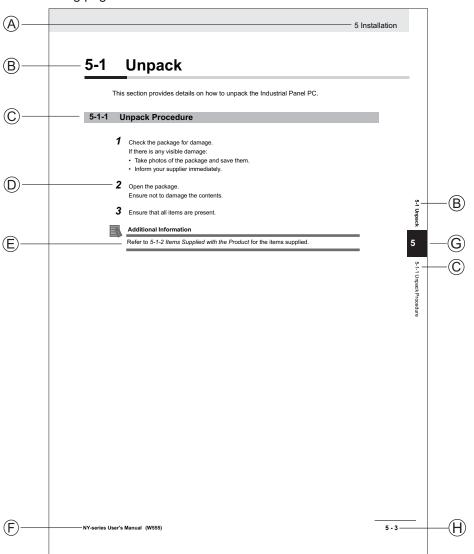
This manual provides information for industrial robots that support PROFINET fieldbus. When information varies between different robot models, details are provided.

Units

All units are metric unless otherwise noted.

Manual Information

Page Structure



The following page structure is used in this manual.

Note: This illustration is provided as a sample. It will not literally appear in this manual.

Item	Explanation	ltem	Explanation
А	Level 1 heading	Е	Special Information
В	Level 2 heading	F	Manual name
С	Level 3 heading	G	Page tab with the number of the main section
D	Step in a procedure	Н	Page number

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.



R

51:

Precautions for Correct Use

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

Additional Information

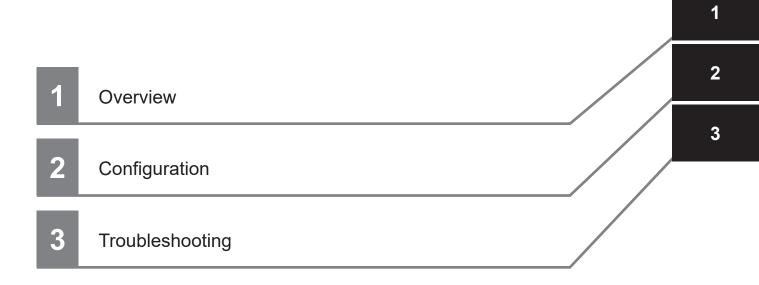
Additional information to read as required. This information is provided to increase understanding or make operation easier.



Version Information

Information on differences in specifications and functionality between different versions.

Sections in this Manual



CONTENTS

Introduction	1
Intended Audience	1
Applicable Models	1
Units	1
Manual Information	2
Page Structure	
Special Information	2
Sections in this Manual	5
Terms and Conditions Agreement	7
Terms and Conditions Agreement.	
Warranty and Limitations of Liability	7
	7 7
Warranty and Limitations of Liability Application Considerations Disclaimers	7 7 8
Warranty and Limitations of Liability Application Considerations Disclaimers	7 7 8
Warranty and Limitations of Liability Application Considerations Disclaimers Definition of Precautionary Information	
Warranty and Limitations of Liability Application Considerations Disclaimers	

Section 1 Overview

1-1	Introd	uction	1-2
	1-1-1	PROFINET Specifications	.1-2
		Robot Firmware and Software Requirements	
	1-1-3	Data Types	.1-3

Section 2 Configuration

2-1	Basic Configuration Steps	.2-2
2-2	Configuration Example	.2-3
2-3	V+ Program Example	.2-9

Section 3 Troubleshooting

3-1	PROFINET Status	3-2
3-2	PROFINET Errors	3-3

Terms and Conditions Agreement

Warranty and Limitations of Liability

Warranty

Exclusive Warranty

Omron's exclusive warranty is that the Products will be free from defects in materials and workmanship for a period of twelve months from the date of sale by Omron (or such other period expressed in writing by Omron). Omron disclaims all other warranties, expressed or implied.

Limitations

OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, ABOUT NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OF THE PRODUCTS. BUYER ACKNOWLEDGES THAT IT ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. Omron further disclaims all warranties and responsibility of any type for claims or expenses based on infringement by the Products or otherwise of any intellectual property right.

Buyer Remedy

Omron's sole obligation hereunder shall be, at Omron's election, to (i) replace (in the form originally shipped with Buyer responsible for labor charges for removal or replacement thereof) the non-complying Product, (ii) repair the non-complying Product, or (iii) repay or credit Buyer an amount equal to the purchase price of the non-complying Product; provided that in no event shall Omron be responsible for warranty, repair, indemnity or any other claims or expenses 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. Return of any Products by Buyer must be approved in writing by Omron before shipment. Omron Companies shall not be liable for the suitability or unsuitability or the results from the use of Products in combination with any electrical or electronic components, circuits, system assemblies or any other materials or substances or environments. Any advice, recommendations or information given orally or in writing, are not to be construed as an amendment or addition to the above warranty.

See http://www.omron.com/global/ or contact your Omron representative for published information.

Limitations of Liability

OMRON COMPANIES SHALL NOT BE LIABLE FOR SPECIAL, INDIRECT, INCIDENTAL, OR CON-SEQUENTIAL DAMAGES, LOSS OF PROFITS OR PRODUCTION OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED IN CONTRACT, WARRANTY, NEGLIGENCE OR STRICT LIABILITY. Further, in no event shall liability of Omron Companies exceed the individual price of the Product on which liability is asserted.

Application Considerations

Suitability for Use

Omron Companies shall not be responsible for conformity with any standards, codes or regulations which apply to the combination of the Product in the Buyer's application or use of the Product. At Buyer's request, Omron will provide applicable third party certification documents identifying ratings and limitations of use which apply to the Product. This information by itself is not sufficient for a complete determination of the suitability of the Product in combination with the end product, machine, system, or other application or use. Buyer shall be solely responsible for determining appropriateness of the particular Product with respect to Buyer's application, product or system. Buyer shall take application responsibility in all cases.

NEVER USE THE PRODUCT 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 PRODUCT(S) IS PROPERLY RATED AND IN-STALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

Programmable Products

- Omron Companies shall not be responsible for the user's programming of a programmable Product, or any consequence thereof.
- Omron Companies shall not be responsible for the operation of the user accessible operating system (e.g. Windows, Linux), or any consequence thereof.

Disclaimers

Performance Data

Data presented in Omron Company websites, catalogs and other materials 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 user must correlate it to actual application requirements. Actual performance is subject to the Omron's Warranty and Limitations of Liability.

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 part numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the Product may be changed without any notice. When in doubt, special part numbers may be assigned to fix or establish key specifications for your application. Please consult with your Omron's representative at any time to confirm actual specifications of purchased Product.

Errors and Omissions

Information presented by Omron Companies has been checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical or proofreading errors or omissions.

Safety Precautions

Definition of Precautionary Information

The following notation is used in this manual to provide precautions required to ensure safe usage of the LD-series AMR. 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.

Anger	Identifies an imminently hazardous situation which, if not avoid- ed, is likely to result in serious injury, and might result in fatality or severe property damage.
	Indicates a potentially hazardous situation which, if not avoid- ed, could result in death or serious injury. Additionally, there may be severe property damage.
	Indicates a potentially hazardous situation which, if not avoid- ed, may result in minor or moderate injury, or property damage.

Symbols

	The circle and slash symbol indicates operations that you must not do. The specific opera- tion 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.
$\underline{\mathbb{N}}$	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.
0	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.
	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 high temperatures.

Warnings

Cybersecurity

To maintain the security and reliability of the system, a robust cybersecurity defense program should be implemented, which may include some or all of the following:

Anti-virus protection

- Install the latest commercial-quality anti-virus software on the computer connected to the control system and keep the software and virus definitions up-to-date.
- Scan USB drives or other external storage devices before connecting them to control systems and equipment.

Security measures to prevent unauthorized network access

- Install physical controls so that only authorized personnel can access control systems and equipment.
- Reduce connections to control systems and equipment via networks to prevent access from untrusted devices.
- Install firewalls to block unused communications ports and limit communication between systems. Limit access between control systems and systems from the IT network.
- Control remote access and adopt multifactor authentication to devices with remote access to control systems and equipment.
- Set strong password policies and monitor for compliance frequently.

Data input and output protection

- Backup data and keep the data up-to-date periodically to prepare for data loss.
- Validate backups and retention policies to cope with unintentional modification of input/ output data to control systems and equipment.
- Validate the scope of data protection regularly to accommodate changes.
- Check validity of backups by scheduling test restores to ensure successful recovery from incidents.
- Safety design, such as emergency shutdown and fail-soft operations in case of data tampering and incidents.

Additional recommendations

- When using an external network environment to connect to an unauthorized terminal such as a SCADA, HMI or to an unauthorized server may result in network security issues such as spoofing and tampering.
- You must take sufficient measures such as restricting access to the terminal, using a terminal equipped with a secure function, and locking the installation area by yourself.
- When constructing network infrastructure, communication failure may occur due to cable disconnection or the influence of unauthorized network equipment.
- Take adequate measures, such as restricting physical access to network devices, by means such as locking the installation area.
- When using devices equipped with an SD Memory Card, there is a security risk that a third party may acquire, alter, or replace the files and data in the removable media by removing or unmounting the media.
- Please take sufficient measures, such as restricting physical access to the Controller or taking appropriate management measures for removable media, by means of locking and controlling access to the installation area.
- Educate employees to help them identify phishing scams received via email on systems that will connect to the control network.



Related Manuals

Use the following related manuals for reference.

Manual Title	Description
Automation Control Environment (ACE) Version 4 User's Manual (Cat. No. 1633)	Instruction for the use of the ACE Version 4 software.
V+ User's Manual (Cat. No. I671)	Provides a description of the V+ programming lan- guage and functionality.
V+ Keyword Reference Manual (Cat. No. I672)	Provides reference to V+ Keyword use and functionali- ty.
Robot User's Manual	User Manual for specific robot types.

1

Overview

This section provides a general overview.

1-1	Introdu	iction	. 1-2
		PROFINET Specifications	
		Robot Firmware and Software Requirements	
	1-1-3	Data Types	. 1-3
		• •	

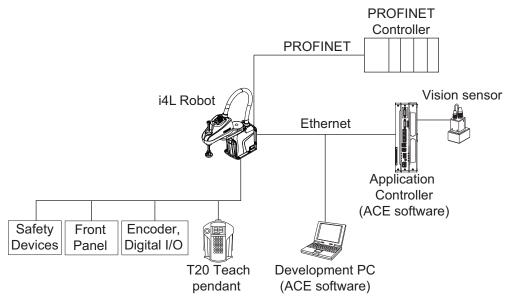
1-1 Introduction

This document provides information about PROFINET configuration and programming methods for OMRON Industrial Robots.

PROFINET fieldbus provides the ability for OMRON Industrial Robots to exchange data with other industrial devices. The robot can be configured as a PROFINET device for communications with a PRO-FINET controller.

V+ variables and robot status information can be shared over the PROFINET fieldbus allowing movement and control with simple programming methods.

The PROFINET implementation uses a vendor-specific device profile that is detailed in this document. The typical PROFINET system configuration is shown below.



1-1-1 **PROFINET Specifications**

PROFINET communication specifications are provided below.

Item	Specification
Protocol	PROFINET v2.4
Class	В
Device profile	Vendor specific I/O
IO connection cycle time	4, 8, 16, 32, 64, 128, 512 ms
Maximum data payload	512 bytes
Sub-slot limit	Slot 1 with V+ variable exchange can contain up to 32
	sub-slots.

1-1-2 Robot Firmware and Software Requirements

The following firmware and software versions are required for PROFINET support.

- Firmware: version 6.0Cx or higher.
- Software: ACE version 4.7 or higher.
- i4L Robot Controller: Revision B and above.

• i4H Robot Controller: Revision C and above.



Additional Information

Contact your local OMRON representative for more information about robot controller types not listed above.

1-1-3 Data Types

Use the following information to understand all data types and sizes.

Data Type	Minimum Byte Length	Array Option (Byte Length)
BOOL	1	8/16/32 (1/2/4)
INT	2	1/16/32 (2/4/8)
DINT	4	1/16/32 (4/64/128)
REAL	4	1/16/32 (4/64/128)
LREAL	8	1/16/32 (8/128/256)
BYTE	32 (1 byte for each character)	32/64/128 (32/64/128)

1

1 Overview

2

Configuration

2-1	Basic Configuration Steps	. 2-2
2-2	Configuration Example	. 2-3
2-3	V+ Program Example	. 2-9

2-1 Basic Configuration Steps

Basic PROFINET configuration steps are provided below. Refer to 2-2 *Configuration Example* on page 2-3 for a specific configuration example.

The following items are required for PROFINET configuration:

- Siemens TIA Portal configuration software.
- A Siemens PLC that supports PROFINET controller functionality.
- An OMRON Industrial Robot that supports PROFINET device functionality.
- ACE software version 4.7 or higher.
- An installed robot device and a PLC controller with proper network connections.

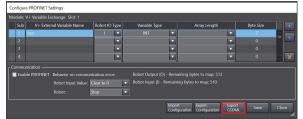
Refer to the Automation Control Environment (ACE) Version 4 User's Manual (Cat. No. 1633) for more information about the Configure PROFINET Settings area.

- **1** Obtain the GSDML file using ACE.
- **2** Install the GSDML file using TIA Portal.
- **3** Add the robot device and make configuration settings in TIA Portal.
- **4** Add, compile, and download the TIA Portal configuration to the PLC.
- **5** Make robot configuration settings with ACE software.
- **6** Confirm data exchange between the robot and PLC.
- Scan for the new robot device.

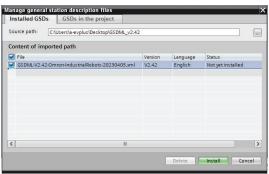
2-2 Configuration Example

This configuration example provides step-by-step instructions to configure the robot in a PROFINET network under the following conditions.

- A Siemens S7-1200 or 1500 PLC is used as the PROFINET controller.
- An i4L robot is used as the PROFINET device.
- TIA Portal version 15 is used with the PLC added.
- ACE software version 4.7 is used with the robot added and online.
- The robot will exchange data using i_bool_8[] and q_bool_8[] BOOL array variables (array length is 8, 1 byte).
 - 1 Obtain the GSDML xml file for the robot using ACE. The GSDML file is stored in the robot controller. Connect to the robot controller using ACE. Open the *Configure PROFINET Settings* area and then click the **Export GSDML** Button.



2 Install the GSDML file using TIA Portal.



3 Confirm that OMRON Corporation robots are listed in the Catalog area.

	e catalog		# 11)
Options			
			-
✓ Catalo	g		
<search></search>			ten ten
Filter	Profile:	<all></all>	
• Cont	rollers		(17 A)
HMI			
PC s	stems		
) 🚺 Drive	es & starter	s)	
	vork compo		
) 🚺 Dete	cting & Mo	nitoring	
) 📑 Distr	ibuted I/O		
Pow	er supply ar	id distribution	
🕨 🛅 Field	devices		
- Othe	er field devi	tes	
• 🛅 A	dditional Et	hemet devices	
🕶 🛄 Pi	ROFINETIO		
E 🚺	Drives		
E 🚺	Encoders		
	Gateway		
	NC/RC		
		I Corporation	
	- Indu	istrial Robots	
		4H-Series	
		4L-Series	
		i4-350L, 180mm quill	
		i4-350L, 180mm quill, wall mount	
		i4-450L, 180mm quill	
		i4-450L, 180mm quill, wall mount	
		i4-550L, 180mm quill	
		i4-550L, 180mm quill, wall mount	
		i4-550L, 350mm quill	
		i4-550L, 350mm quill, wall mount	
	Sensors		
🕨 🧾 Pl	ROFIBUS DP		

4 Add the robot device to the Network view with TIA Portal.

Demo + Devices & networks		_∎≡×
	🖉 Topology view 🛛 🛗 Network view	w Device view
💦 Network 🔛 Connections 🛛 HM connection 💌 🕎 🖽 🛄 🍳 🛨	Network overview Connect	ctions
	A W Device	Туре
	S7-1200 station_1	S7-1200 station
378 omron-industri	PLC_378	CPU 1212C AC/DC/Rly
1212C 14-450L, 180m DP.NORM	✓ GSD device_1	GSD device
PLC_378	omron-industrial-robot	i4-450L, 180mm quill
	•	
PN/IE_1		
	~	
< III > 100%	()))	>



5 Assign the IP address of the robot with TIA Portal.

Project tree 🛛 🕄 🕻	Demo → Ungrouped devices →	omron-industrial-robot [i4-450L, 180mm quill]
Devices		
Devices	Original Conference on Automatical Sectors of Conference on Confere	Protected append unatification access a by size of Measure and Presson's agreentation. Pre more enformation advocumduated accump, please visit They Announcement cominification accump, please visit
Cocumentation settings Languages & resources	c = 10	Assign
 Sign Online access Sign Carle Readent/St memory Control Readent/St memory Control Readent/St memory V Datality view 	General ID Lag Syste General ID Lag Syste Grant Bonario PROFECTentheck(1) General Herrolicate Subtractor Herrolicate Subtractor Management Management Participation Management Option Participation Pa	Inhumentaliti Itenso Name Interface networked with Soldner: Itenso Interface networked with Itenso Itenso IP protocol If address soldner: If IP protocol If If <
Name		PROFINET PROFINET Converse PROFINET device nume automatically PROFINET converter name: [ms]78 Device number: [1 •

6

Assign a unique device name to the robot in TIA Portal.

Devices							
19 🛄 🖬	▼ Diagnostics General		Configured PRO	FINET dev	ice		
Dens Dens Dens Dens Dense Denses Dens	Diagnostis tathut Channel dispositis Protrottat interface [ct] Protrottan Assign Proddess Assign Proddess Assi		PROFINET devic Device Type of the PGIPC i POPC I Device filter Only show Only show	ce name: vice type: interface: interface: devices of the devices with	oms378 ie-450L, 180mm quill Phile IM Intel(X) 82574L Gige Ie same type I bad parameter setting:	en nervon Correction	
Online access		Accessible device					
Card Reader/USB memory		IP address	MAC address	Device	PROFINET device name		
			00-10-EA-EE-C3-CF			Device name is different	^
		10.151.17.51	00-10-EA-C7-7D-A2			1 Device name is different	_
		10.151.22.81	00-10-EA-8F-A9-0F		5485-0004	Device name is different	
		10.151.22.86	00-10-EA-83-18-7F		5440-00397	Device name is different	
		10.151.22.189	00-10-EA-CA-42-84	FDED_RO_	proto9	1 Device name is different	
		10.151.22.191	00-10-EA-AC-A6-97	FDED_RO_	5485-00080	1 Device name is different	
		10.151.22.192	00-10-EA-8C-44-E7	FINED_RO_	5450-00031	Device name is different	~
	<	10.151.22.192	00-10-EA-8C-44-E7	POZD_RO_		Device name is different Update list	~

7 Set the IO cycle update time with TIA Portal.

General Catalog information	>> IO cycle		
PROFINET interface (X1) General Ethernet addresses identification 8 Meintenance) Colouilate update time automatically 6 Set update time manually	
Advanced options Interface options Real time settings Copyrig Port 1[X1 P1]	no Update time: 4000		ms 🖛
	Watchdog time		
	Accepted update cycles without IO date:		-
	Watchdog time:	12,000	

8 Add the V+ Variable Exchange Module to the Device Overview.

mo Vingrouped devices morindustrial-robot [id]	-350L, 180mm	ı quill]					_ 🖬 🖬 🗙	Hardware catalog
		a Topolo	ogy view	db Ne	etwork viev	v 🕅 D	evice view	Options
omron-industrial-robot (i4-35 💌 🔡 🖉 🚮 🔛 🔭 📑	Device o	verview						
SHOW MARKEN !!	* ¥ M	odule	Rack	Slot	Laddress	Q address	Туре	✓ Catalog
useria	-	omron-industrial-robot	0	0			i4-350L, 180m	Searchs
andt		PNHO	0	0 X1			omron-industri	Filter Profile: Alb
mat			0	1				▼ T Head module
8.								▼ i i4L/Series
								i4-350L, 180mm quill
								• Module
_								V Tel Maria bla Charden
DP-NORM								V+ Variable Exchange
	-							
	-							
100%								
> 100% · · · · · · · · · · · ·		12.		(1)	L Killer			
		g Pro	operties	1 Int	0 1 0 Di	agnostics		
No 'properties' available.								

9 Configure the data to exchange with TIA Portal.

Set the input and output data to exchange between the robot and PLC in the following manner.

1	Module	Rack	Slot	I address	Q address	Туре	Article no.	Firmware	
		0	0			i4-550L, 180mm q	R\$4-2055002		^
	PN-IO	0	0 X1			omron-industrial-r			
	 V+ Variable Exchange_1 	0	1			V+ Variable Exchan			
	BOOL[8] - I	0	11	70		BOOL[8] - I			
	BOOL[8] - O	0	12		70	BOOL[8] - O			=
		0	13						
		0	14						

10 Assign symbolic names for each address.

General	IO tags	System con	stants Texts	General	IO tags	System con	stants Texts	(
Name	Туре	Address	Tag table	Name	Туре	Address	Tag table	
	Bool	%170.0	Bool	Q_Bool	_O Bool	%Q70.0	Bool	
	Bool	%/70.1	Bool	Q_Bool	_1 Bool	%Q70.1	Bool	
	2 Bool	%170.2	Bool	Q_Bool	_2 Bool	%Q70.2	Bool	
	B Bool	%170.3	Bool	Q_Bool	_3 Bool	%Q70.3	Bool	
	Bool	%170.4	Bool	Q_Bool	_4 Bool	%Q70.4	Bool	
	5 Bool	%170.5	Bool	Q_Bool	_5 Bool	%Q70.5	Bool	
	5 Bool	%170.6	Bool	Q_Bool	_6 Bool	%Q70.6	Bool	
I_Bool_7	7 Bool	%170.7	Bool	Q_Bool	_7 Bool	%Q70.7	Bool	

- **11** Add, compile, and download the TIA Portal configuration to the PLC.
- **12** Access the robot controller *Configure Options* area with the ACE software and then proceed with the *Configure PROFINET Settings* option.

The data was been been by the data was an analysis of the data was an	New Project - H-350L_0 - ACE 4.7	(860)	- D X
Name of the second seco	File Edit View Insert Control	fler Tools Window Help	
Image: State	◎ ◎ ♂ ∧ ☆ ↓	<u> </u>	
Very Very Very Very Very Very Very V		🕞 profestoorem 🛛 🔯 Controller Settings 🗙	
Province	14-350L0 🔻 🛄		(Search) 💌 🗵 🗮
Conjuga Mani and Conjuga Mani Andre			·
Image: Second			
Normality Market output to storehyput Product frage Contrapt to the storehyput Pattern Contrapt to the storehyput Pattern Contrapt to the storehyput Contrapt to the storehyput Contrapt to the storehyput The contrapt to the storehyput Contrapt to the storehyput Name Pattern Name Pattern	Monitor Window		
Forder Trans Configues that forcidar Labora Configues that forcidar Labora Configues that forcidar Labora Statement for Configues that forcidar Labora Matter Configues that forcidar Labora Statement for Configues that forcidar Labora Intermediate Configues that forcidar Labora That Configues that forcidar Labora			_
Configure March Charles Labors Configure March Charles Labors Configure March Charles Labors Configure March Charles Configur		Fruitied Encod	
Configure Marinis Advirt Tamord Configure Marinis Advirt Tamor		P Address Configure Belt Encoder Latches	12
Control Contro		Configure Robot Position Latches	
Configure Microit Series		Configure Robots Safety Timeout	
Contract RCHUID Serrap		Configure System Settings	
		Configure Network Settings	
		Configure PROFINET Settings	
		Software Ravisic The V+ version of	
	Configure Match Safety (Party Match Safety (Party Match Safety)) Configure Match Conf		
		N. 1	1.4
		States A	
		🕴 🖬 👘 👔 👔 👔	Cancel
	fl fbrr	Output Ridd	

13 Enter the V+ External Variable Name and then set the IO Type, Variable Type and Array Length in the *Configure PROFINET Settings* area.

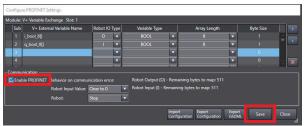
Make the following considerations when creating V+ External Variables in this area.

- Ensure the order (top to bottom) of the variables corresponds with the order established in TIA Portal.
- V+ External Variables standard types are 64 bit floating point.
- Brackets [] must follow the variable name when declaring an array variable type. Array variables must also have an array length set.
- A \$ character must proceed the variable name when declaring a string variable type. String variables must also have an array length set.
- V+ variable naming convention must be followed. Refer to the V+ User's Manual (Cat. No. *1671)* for more information.

00	ule:	V+ Variable B	exchange Slot: 1							
	Sub	V+ Exte	mal Variable Name	Robot IO	Туре	Variable Type	Array Length		Byte Size	
				0						
				1						
	3							-		
		nication — ole PROFINET	Behavior on commu Robot Input Value:		or:		g bytes to map: 5 sytes to map: 511			
			Robot:	Stop	-					

14 Select the *Enable PROFINET* check-box and adjust the communication error behavior settings. Click the **Save** Button to implement the changes.

Saving triggers a robot controller reboot request.



15 Synchronize the new variables created in the robot controller after the reboot.

Select the new variables and then click **Transfer from Target** to bring the new variables into the ACE project.

Synchron	nisation		
	Computer: Data Name	Target : Data Name	Compare
1	▼ Variables	▼ Variables	
1			
2 2 2			
Legend:	Synchronized Officient		Not checked
	Transfer To Targ	et Transfer From Target	Recompare Close

16 Scan for the new robot device.

6 1 . . .

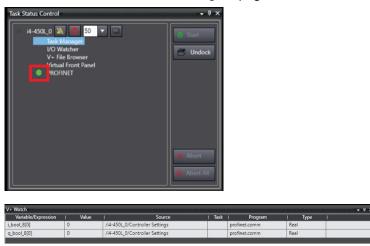
If the new robot is not detected, check network connections and repeat previous steps. Refer to *Section 3 Troubleshooting* on page 3-1 for more information.

		Type of the PG/PC interfac	e: 🖳 PN/IE		•	
\square		PG/PC interfat	:e: 🚺 Intel(R) I		Connection 💌 🖲	
	Accessible nodes of th					
	Device	Device type	Interface type	Address	MAC address	
	omron-fixed-robot	FIXED_ROBOT	ISO	00-10-EA-EE-C3-CF		
	i4-550l	i4-550L, 180mm	PN/IE	10.151.17.35	00-10-EA-A6-A8-B3	
	hmi_1	SIMATIC-HM	PN/IE	10.151,17.41	E0-DC-A0-00-52-61	10
	i4-350l	i4-350L, 180mm	PN/IE	10.151.17.51	00-10-EA-C7-7D-A2	
	labrat-cobra2	SIMATIC-PC	PN/IE	10.151.17.82	00-50-56-89-FD-8E	
	desktop-4nfb7pe	SIMATIC-PC	PN/IE	10.151.17.84	00-50-56-89-89-30	
	plc_1	CPU 1212C AC/D	PN/IE	10.151.17.140	8C-F3-19-78-DA-41	
Flash LED	plc_dev	CPU 1212C AC/D	PN/IE	10.151.17.141	8C-F3-19-78-D9-FA	
	usomca2192	SIMATIC-PC	PN/IE	10.151.22.19	98-FA-98-3E-64-6F	
	desktop-2f9g86a	SIMATIC-PC	PN/IE	10.151.22.74	00-00-0A-A7-0A-90	1
line status inform	ation			Display only er	<u>Start sea</u>	rch
	e device usomca0911			- Disbiay only er	ion messages	1
	a device usomcaus() i 1, 30 devices found,					1
Retrieving devic						
						1
Scan and inform	ation retrieval completed.					

17 Check the *Device Overview* area in TIA Portal to ensure the connection status is valid. If the connection status is not valid, check network connections and repeat previous steps. Refer to *Section 3 Troubleshooting* on page 3-1 for more information.

		🚽 Topology view 🛛 📩 Networ	k view	De De	vice view	
🏰 🛛 OMS378 (i4-450L, 180mm qu 🖃 🔛 🌃 🖽 🛄 🔍 🛓	a (Device overview				
	^	1 Module	Rack	Slot	I address	T
		OMS378	0	0		1
e 1	=	PN-IO	0	0 X1		i T
045319		V+ Variable Exchange_1	0	1		
		BOOL[8] - I	0	11	1	
		BOOL[8] - O	0	12		
			0	13		
			0	14		ilł
			0	15		
DP-NORM			0	16		
DP-NORM			0	17		
			0	18		
			0	19		14
	-		0	1 10		
	<u>*</u>		0	1 11		

18 Confirm data exchange by checking the following areas in the ACE software. If the data exchange is not occurring, check network connections and repeat previous steps. Refer to *Section 3 Troubleshooting* on page 3-1 for more information.



2-3 V+ Program Example

This section shows an example V+ program.

While the robot is active and connected, the program checks for the status of the first bit in the q_bool_8 array, and then based on that bool value, sets the value of the first bit of the i_bool_8 array to match and prints the values of both bits.

If there is an error, the program will instead print information about the error.

```
.PROGRAM profinet.comm()
```

```
;Main loop
WHILE TRUE DO
;While PROFINET State is ACTIVE (enabled, connected, and communicating)
    WHILE FB.STATE == 3 DO
        ;Reflect input to output from PLC point of view
        IF q bool 8[0] THEN
            i bool 8[0] = TRUE
        END
        IF NOT q bool 8[0] THEN
            i bool 8[0] = FALSE
        END
        ;Delay of 2ms
        WAIT.EVENT , 2E-03
        ; Print values of PROFINET Input and Output Data
        TYPE "q_bool_8[0]: ", q_bool_8[0], ", i_bool_8[0]: ", i_bool_8[0]
   END
    $additional info = ""
    ;Get PROFINET Error Code and Additional Information (FB.ERROR)
    fieldbus error = FB.ERROR($additional info)
    ; If there is a PROFINET Error
    IF (fieldbus error <> 1) THEN
        ; Print Error Information
        TYPE "General Profinet error: ", fieldbus_error
        TYPE "Additional Information: ", $additional info
    END
    ;Delay of 2ms
   WAIT.EVENT , 2E-03
END
```

.END

3

Troubleshooting

Use the information in this section to troubleshoot PROFINET communication issues.

3-1	PROFINET Status	. 3-2
3-2	PROFINET Errors	. 3-3

3-1 **PROFINET Status**

Use the FB.STATE keyword to return the current state of the fieldbus. This keyword returns the following information.



Additional Information

Refer to the V+ Keyword Reference Manual (Cat. No. 1672) for more information about the FB.STATE keyword and usage.

Value Returned	Fieldbus State	Description	
0	Disabled	Initialization fails or PROFINET is	
		disabled.	
1	Inactive	PROFINET is enabled but there is	
		no connection	
2	Idle	PROFINET is enabled and con-	
		nected, but there is not data ex-	
		change between the Controller and	
		the robot.	
3	Active	PROFINET is enabled, connected,	
		and communicating. Data is being	
		actively exchanged between the	
		Controller and the robot.	

3-2 **PROFINET Errors**

Use the FB.ERROR keyword to obtain detailed PROFINET error information. Fieldbus error code and error description details returned from the FB.ERROR keyword are provided below.



Additional Information

- Refer to the V+ Keyword Reference Manual (Cat. No. 1672) for more information about the FB.ERROR keyword and usage.
- The robot behavior when communication errors occur can be configured in the ACE software. Refer to the *Automation Control Environment (ACE) Version 4 User's Manual (Cat. No. 1633)* for more information about configuring PROFINET settings.

Error Code	Error Description	Fieldbus State	Cause	Details	
-1202 (field- bus system initialization fault)	Error Code 1	Disabled	Device configuration failed.	 I&M configuration corrupted. Memory not initialized. Network interface not available. tion failed. 	
	Error Code 2		PROFINET stack initializati		
	Error Code 3		LLDP system description corrupted.	 LLDP system description in illegal status. Port description TLV (port 0). System name TLV. System description TLV. 	
	Error Code 4	-		LLDP port description in illegal status. Port description TLV (port 1).	
	Error Code 5		LLDP PHY not initialized.		
	Error Code 6		Profile version mismatch	PROFINET cannot be ini- tialized because of a ver- sion mismatch.	
-1201 (con- nection lost)	Connection rejected x y z a where: • x = Error code • y = Error decode • z = Error code 1 • a = Error code 2	Inactive	Connection request re- jected.	The connection request was rejected by the PRO- FINET controller.	
	Communication closed because of a comm loss		Connection timeout.	The connection has been aborted by the PROFI- NET controller.	

3

Error Code	Error Description	Fieldbus State	Cause	Details
-1203 (inva- lid data)	Not able to read data be- cause the PLC has stop- ped	IdleIdle	The controller stopped.	Communication data is in- valid because the Control- ler has stopped.
	Not able to read data be- cause supervisor is block- ing submodule		The supervisor blocked the submodule.	Communication data is in- valid because the supervi- sor is blocking the com- munication.
	Not able to read data be- cause the submodule is invalid		The submodule is invalid.	Communication data is in- valid because the sub- module is invalid.
-1200 (inva- lid configu- ration)	 Module Diff (Expected x, y, Actual z a) at b, c where: x, z = Module ident number y, a = Submodule ident number b = slot number c = subslot number 		A profile/robot mismatch occurred.	A mismatch between the PROFINET I/O and ACE submodule configuration exists.
	Peer Mismatch x where x = extended channel error type		A peer mismatch occur- red.	The peer port is mis- matched in the port name.
	MAU Type Mismatch: Ex- pected x, Actual y where x, y = MAU Type		A MAU type mismatch oc- curred.	The peer port mismatch- ed in the MAU type.
	Link State Mismatched (Expected x y, Actual z a) where: • x, z = Link State • y, a = Port State		A link mismatch occurred.	The peer port is mis- matched in the link.
	 Variable Type Mismatch (Expected: 0xY, Real: 0xA) at slot b, subslot c where: Y, A = submodule Ident Number in hex b = slot number c = subslot number 		A variable mismatch oc- curred.	A mismatch between PROFINET I/O and the ACE submodule configu- ration occurred.
	 Robot Type Mismatch (Expected: 0xY, Real: 0xA) at slot b, subslot c where: Y, A = Module Ident Number in hex b = slot number c = subslot number 		A robot type mismatch oc- curred.	The actual robot is differ- ent than the one config- ured in the PROFINET controller.

OMRON Corporation Industrial Automation Company

Kyoto, JAPAN

Regional Headquarters

OMRON EUROPE B.V. Wegalaan 67-69, 2132 JD Hoofddorp The Netherlands Tel: (31) 2356-81-300 Fax: (31) 2356-81-388

 Tel: (31) 2356-81-300
 Fax: (31) 2356-81-38

 OMRON ASIA PACIFIC PTE. LTD.

 4328 Alexandra Pacific PTE. LTD.

438B Alexandra Road, #08-01/02 Alexandra Technopark, Singapore 119968 Tel: (65) 6835-3011 Fax: (65) 6835-2711 **OMRON ELECTRONICS LLC** 2895 Greenspoint Parkway, Suite 200 Hoffman Estates, IL 60169 U.S.A. Tel: (1) 847-843-7900 Fax: (1) 847-843-7787

Contact : www.ia.omron.com

OMRON (CHINA) CO., LTD. Room 2211, Bank of China Tower, 200 Yin Cheng Zhong Road, PuDong New Area, Shanghai, 200120, China Tel: (86) 21-5037-2220 Fax: (86) 21-5037-2200 Authorized Distributor:

©OMRON Corporation 2023 All Rights Reserved. In the interest of product improvement, specifications are subject to change without notice.

Cat. No. 1685-E-01 0623