

Vision System FH-series

Practices Guide

ProfiNet communication

FH-1□□□/FH-1□□□-□□

FH-2□□□/FH-2□□□-□□

FH-3□□□/FH-3□□□-□□

FH-5□□□/FH-5□□□-□□

FH-L□□□/FH-L□□□-□□

FHV7□-□□□□□-C

FHV7□-□□□□□-S□□/FHV7□-□□□□□-S□□-□□

FHV7□-□□□□□-H□□/FHV7□-□□□□□-H□□-□□



Network
Connection
Guide

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1. Related Manuals

No.	Model	Title
Z365	FH FHV	User's Manual
Z342		User's Manual for Communications Settings
Z341		Processing Item Function Reference Manual

1.1. Intended audience

The details and information provided are intended to supplement the Vision System FH/FHV Series - User's Manual for Communications Settings (Z342). It is not intended to provide a ProfiNet manual but a Practical Guide to configure the communication between the devices.

1.2. Important information

For practical purposes of this guide only FH will be referred from now on. Because FH and FHV platforms are the same any example can be applied to both devices.

2. Precautions

- (1) When building an actual system, check the specifications of the component devices of the system, use within the ratings and specified performance, and implement safety measures such as safety circuits to minimize the possibility of an accident.
- (2) For safe use of the system, obtain the manuals of the component devices of the system and check the information in each manual, including Safety Precautions, Precautions for Safe Use.
- (3) It is the customer's responsibility to check all laws, regulations, and standards that the system must comply with.
- (4) 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.
- (5) The information in this guide is current as of February 2020.
It is subject to change without notice because of product's update.

Special information in this document is classified as follows:



Precautions for Safe Use

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



Precautions for Correct Use

Describes precautions on what to do and what not to do to ensure proper operation and performance.



Additional Information

Additional information to read as required.

It contains helpful and reference information for the users.

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3. ProfiNet communication configuration

- ◆ It should be considered the data transmission configured in the FH to configure the IO-Controller accordingly.
- ◆ It will be shown two communication examples:
 - FH-series (IO-Device) with CJ1W-PNT21 (IO-Controller).
 - FH-series (IO-Device) with Siemens PLC S7-1500 series (IO-Controller).

3.1. FH-series configuration:

For the different Output data sizes (with/without User Area) configurations refer to Vision System FH Series - User's Manual for Communications Settings (Z342-E1-10).

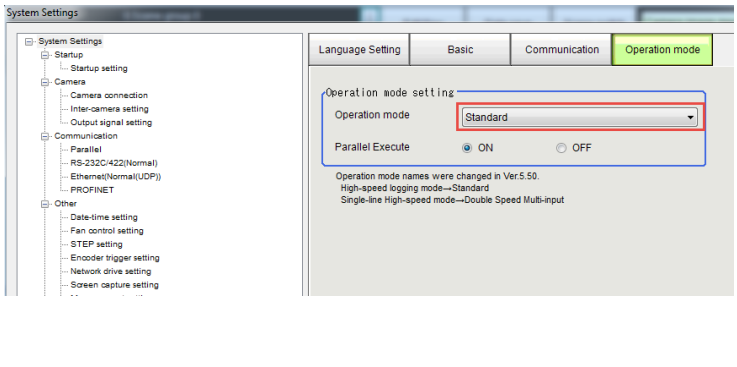
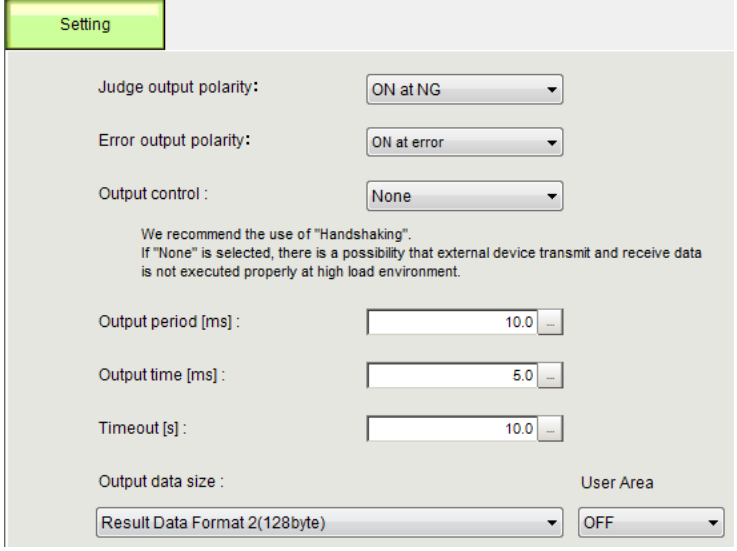
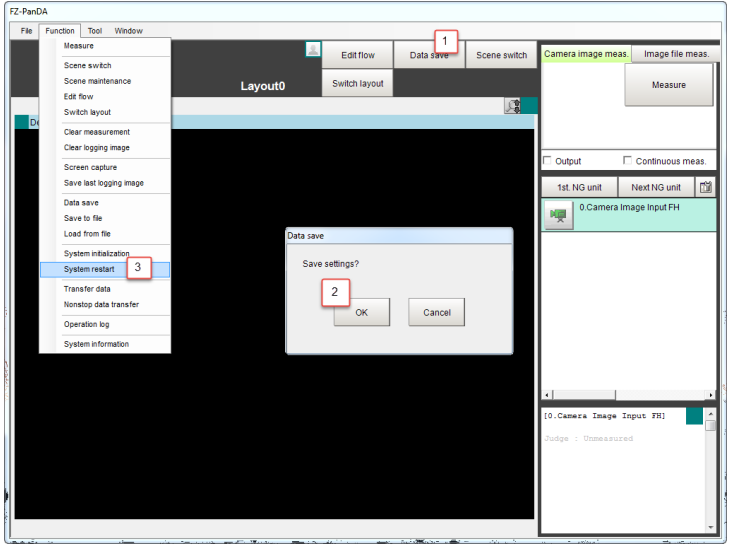
In this example, it will be defined **128 Bytes as Output data size without User Area**. Operation mode will be **'Standard'** but could be configured with Multi-line mode following the same steps described below.

1 Startup FZ-PanDA Tool.

Click [Tool] – [System Settings] – [Ethernet((Normal(UDP))):

- Set IP address under Address setting 2 ('192.168.0.100' for our example).
- Click [Apply].

2 Click [Tool] – [System Settings] – [Communication] tab and select PROFINET as Fieldbus.

<p>3 Click [Startup setting] under Startup tab in System Settings configuration tree.</p> <ul style="list-style-type: none"> ➤ Operation mode: Standard. ➤ Click [Apply]. <p>Restart the FH to apply the changes.</p>	
<p>4 Click [PROFINET] under Communication tab in System Settings configuration tree.</p> <ul style="list-style-type: none"> ➤ Judge output polarity: ON at NG. ➤ Error output polarity: ON at error. ➤ Output control: None. ➤ Output period [ms]: 10.0 ➤ Output time [ms]: 10.0 ➤ Timeout [s]: 10.0 ➤ Output data size: Result Data Format 2 (128Byte). ➤ User Area: OFF. ➤ Click [Apply]. 	
<p>5 Close configuration window: Click [Close].</p> <p>Save the modifications: Click [Function] – [Data save] – [OK].</p> <p>Restart the system: Click [Function] – [System restart] – [OK].</p>	

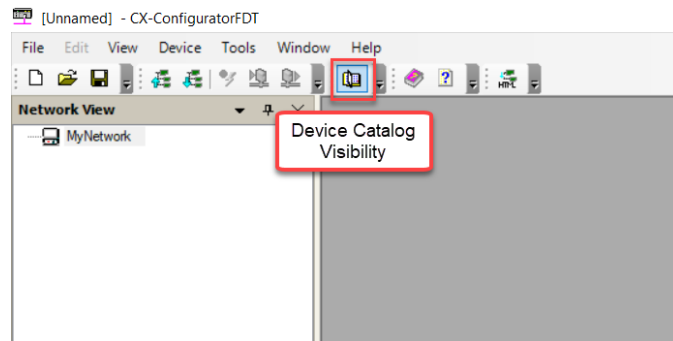
3.2. CJ1W-PNT21 configuration:

To configure the IO-Controller it will be used CX-ConfiguratorFDT tool.

1 Startup CX-ConfiguratorFDT tool.

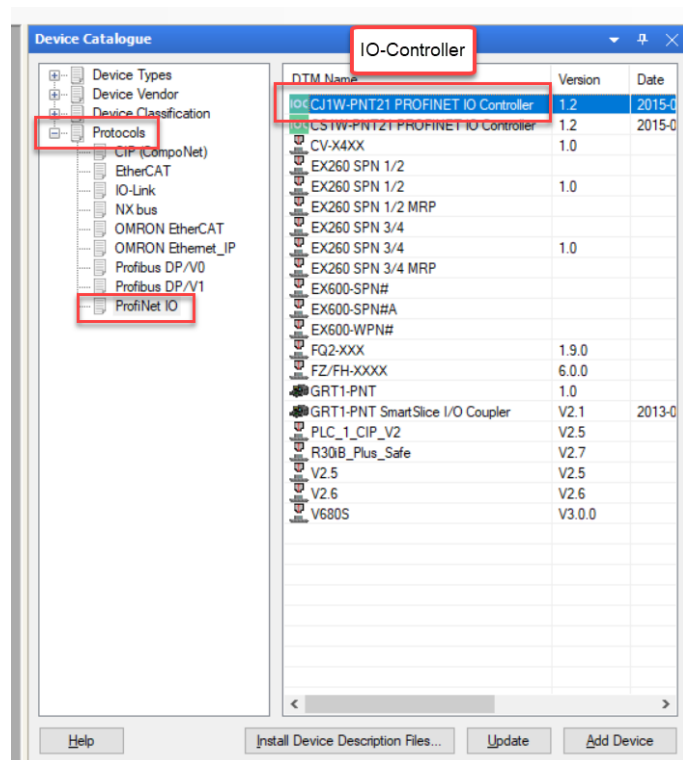
Open Device Catalog:

- Click on [Device Catalog Visibility].



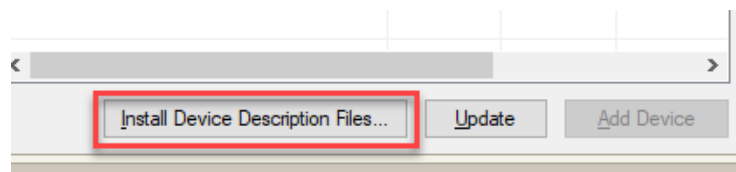
2 Attach the IO-Controller to your network:

- Select [ProfiNet IO] under [Protocols].
- Select the IO-Controller (CJ1W-PNT21 in our example).
- Use double-click to add it to your network.



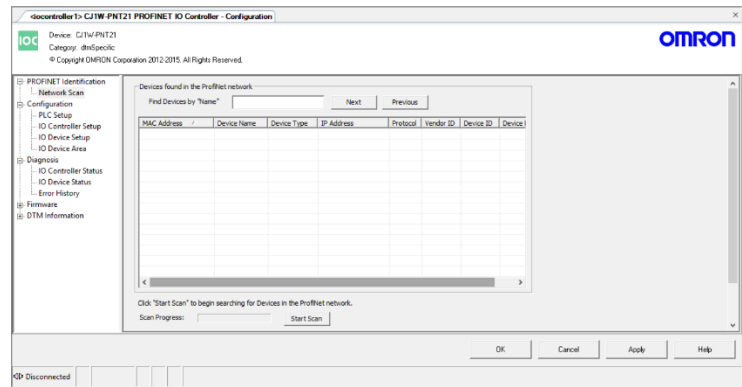
3 Install GSD files from FH/FHV

- If FH or FHV7 does not appear on the Device Catalog, install it by clicking on [Install Device Description Files] and selecting the right GSD file from your computer



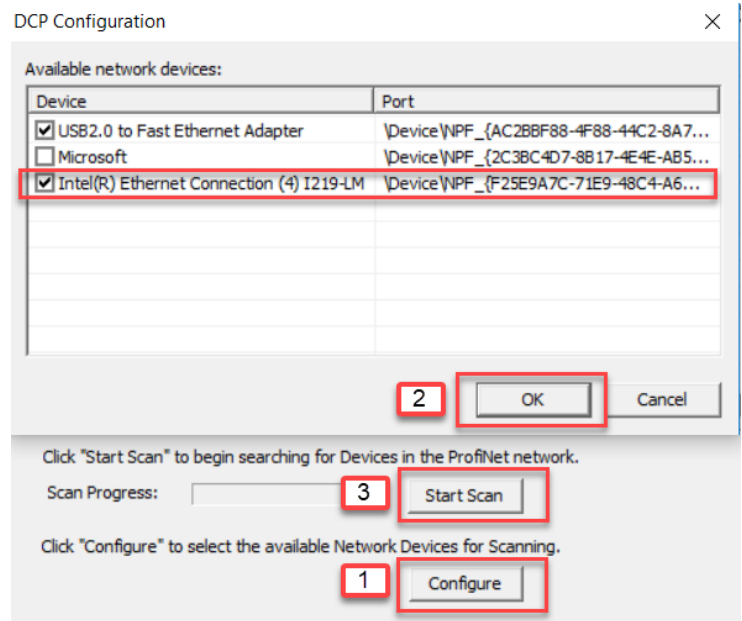
4 Open IO-Controller configuration window:

- Double-click on the IO-Controller included in your network on Step 2.



5 Scan the network to attach the IO-Device (FH-series) to your IO-Controller:

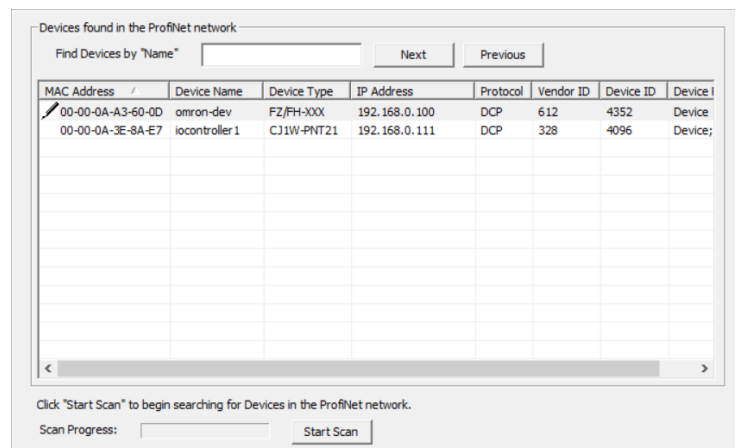
- Open configuration window: PROFINET Identification – Network Scan.
- Select your communication device (Ethernet board from your PC).
- Scan the network: Start Scan.



6 Attach the IO-Device (FH-series) to your IO-Controller:

- Right-click on the FH - Add Device to IO Controller.

On this screen you can verify the IP Address of your IO-Controller and IO-Device, the Device Names...




7 Test communication:

- Open PLC setup view: Configuration – PLC setup.
- Select the PLC where CJ1W-PNT21 is mounted on:
- Select the Unit number where the ProfiNet IO Controller is mounted.
- Start test and receive IO-Controller information: Click on Test.
- Apply changes.


Description and Firmware Version of your IO-Controller will be shown.

PLC Setup View

Communication

Configure Test 

PROFINET IO Controller Unit

Unit Number: 1 

PLC Mode

Program Run

Monitor Unknown

PROFINET IO Controller Unit Information

Description: CJ1W-PNT21

Firmware Version: V1.09

8 IO-Controller setup:


- Open IO-Controller setup view: Configuration – IO Controller Setup.
- Set the name and IP-Address.

Fields modified will show a pencil until changes are applied.

IO Controller Setup View

Network Settings

Name: iocontroller1

IP Address: 192 . 168 . 0 . 111 

Subnet Mask: 255 . 255 . 255 . 0

Use Gateway

Gateway: 0 . 0 . 0 . 0

Auto-Addressing

Auto-addressing enabled

Valid Output Data Handling

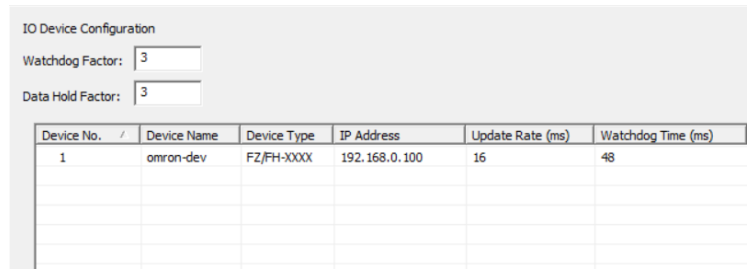
PLC Mode Dependent

User Bit Controlled

9 IO-Device setup:

- Open IO-Device setup view: Configuration – IO Device Setup.
- Change (if necessary) the name and IP-Address of the device.

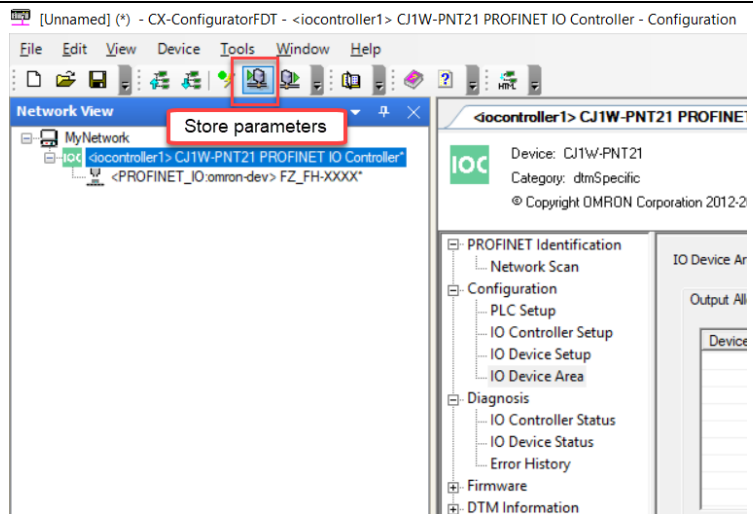
Update Rate can be updated and Watchdog Time and Data Hold Time will be modified according to a Factor established previously.



10 Store parameter set to device:

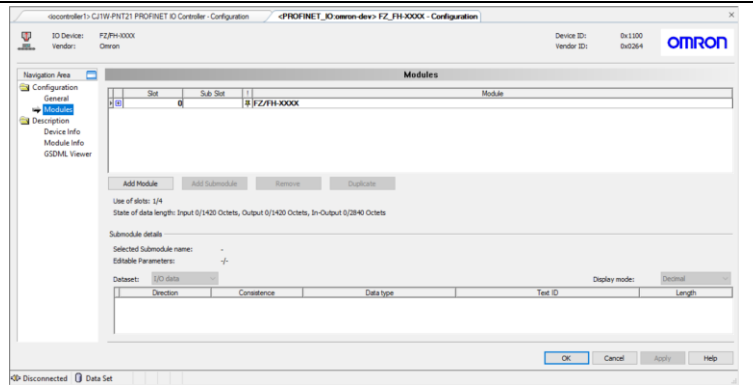
- Select Store Parameter Set to Device option.

PLC will be switched to Program/Run mode respectively.



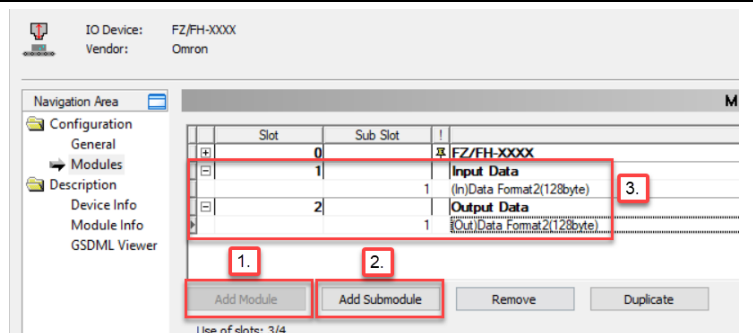
11 Open IO-Device configuration window:

- Double-click on the IO-Device included in your network on Step 5.



12 Add modules/submodules:

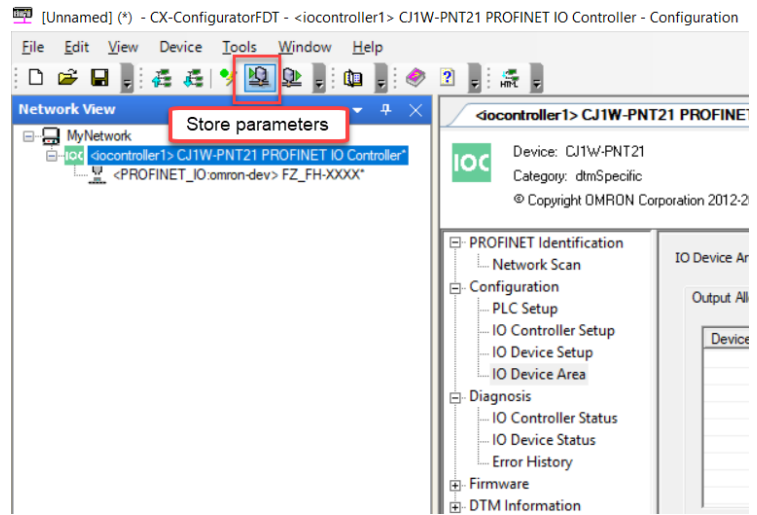
- Add Module – Select module type (Input/Output Data).
- Add Submodule – Select Data Format previously defined in Section 3.1 - Step 2 of this Connection Guide.
- Select Apply to validate the changes.
- Press OK to accept IO-Device configuration.



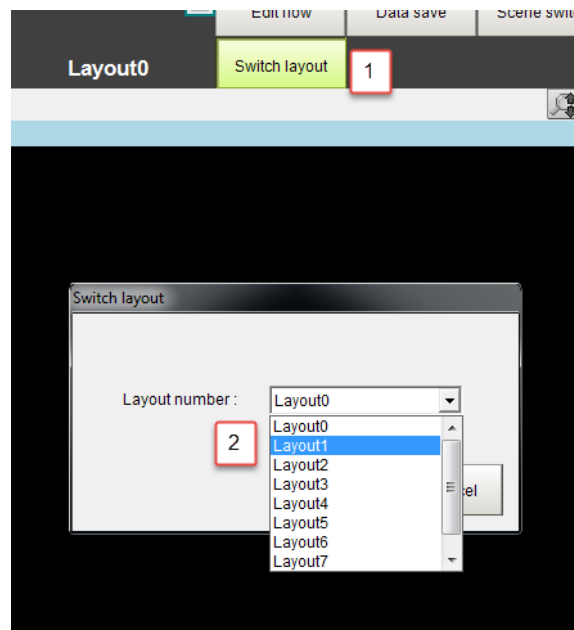
13 Store parameter set to device:

- Select Store Parameter Set to Device option.

PLC will be switched to Program/Run mode respectively.



14 FZ-PanDA: Switch to Layout1 and make sure that the RUN LED is on.



15 Verify communication between PLC and FH-series:

- Open CX-Programmer and connect to PLC.
- Address CIO3300 (bit 5) will be set to 1 (default IO Device Area).

This bit means that FH has switched to RUN mode.

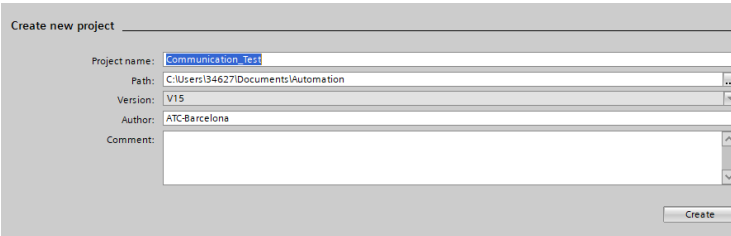
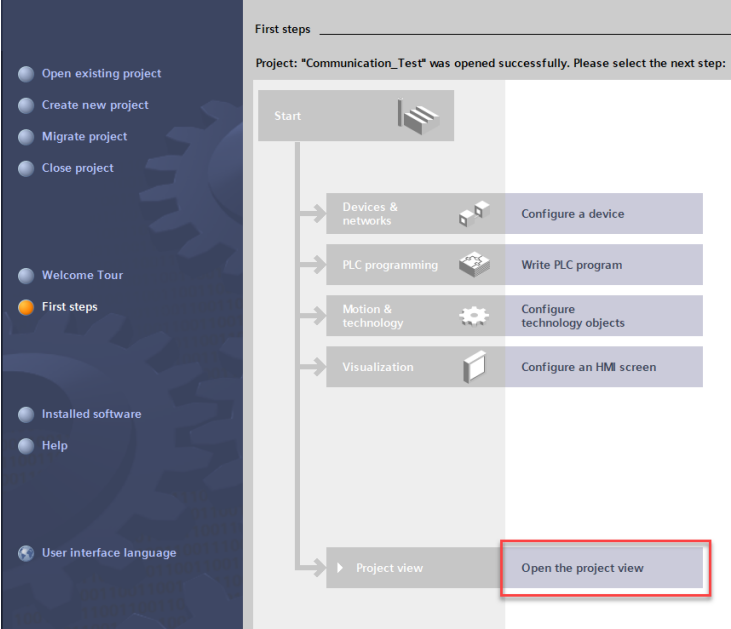
Please check manual Z342 for more information about the memory allocation

CIO3298	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0000
CIO3299	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0000
CIO3300	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0010
CIO3301	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0000
CIO3302	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0000
CIO3303	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0000

First channel in Response Area	Bit																Name				
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0					
+0	E	R	R					X	X	X							RUN	OR	BUSY	FLAG	Control output (2 CH)
+1																				GATE	

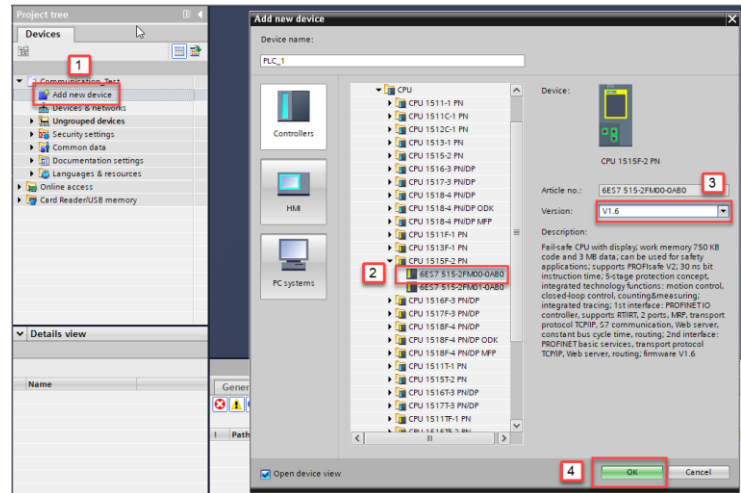
3.3. S7-1500 configuration (TIA Portal):

To configure the IO-Controller it will be used TIA (Totally Integrated Automation) Portal V15. For this communication manual it has been used a CPU 1515F-2 PN V1.6.

<p>1 Startup TIA Portal tool.</p> <p>Create a New Project:</p> <ul style="list-style-type: none"> ➤ Define the Project name, Path and Author of your project. 	
<p>2 Open the project view:</p> <ul style="list-style-type: none"> ➤ Select [Open the project view] under [First steps] configuration tree. 	

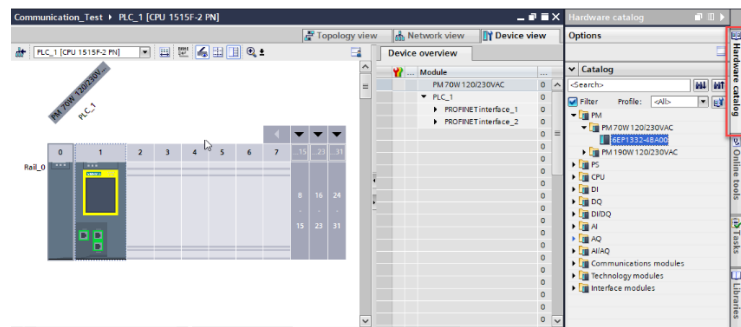
3 Add IO-Controller to the project:

- Add new device – Select CPU model – Define CPU version – Click OK.



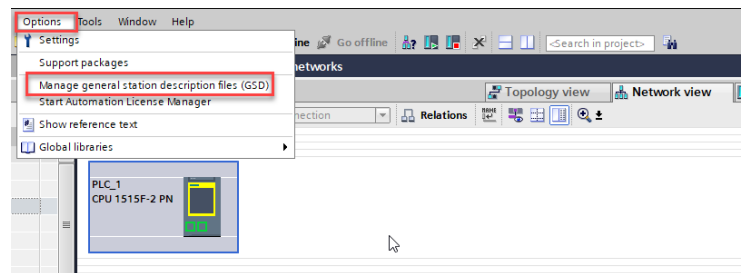
4 IO-Controller HW configuration:

- Add the different modules which are mounted on the IO-Controller with the Hardware catalog.



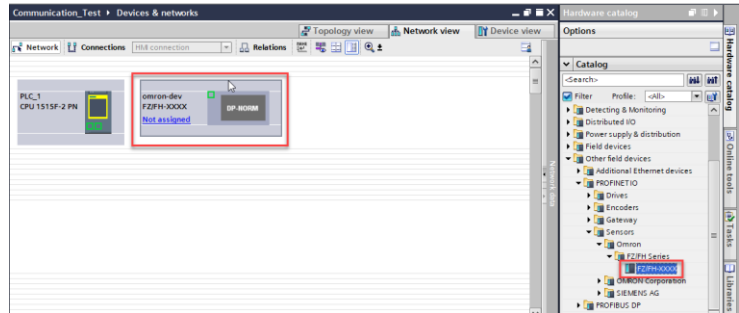
5 Install GSDML file in TIA Portal:

- [Options] – [Manage general station description files (GSD)] – Look for the path where your GSDML file is located – [Install].



6 Add IO-Device to the network:

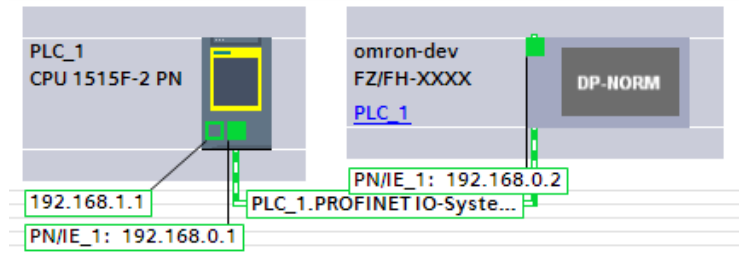
- FH-series can be found under [Other field devices] – [PROFINET IO] – [Sensors] – [Omron] – [FZ/FH Series].
- Double click to add it to the network.



7 Create the ProfiNet network:

- Select the IO-Controller port where your IO-Device is connected to.
- Select the IO-Device port.

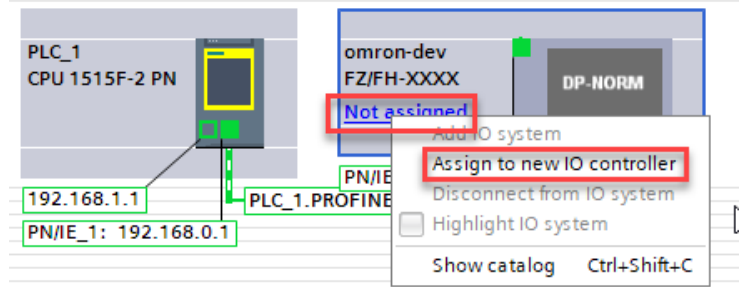
The Network will be created as shown in the picture.



8 Assign IO-Device to IO-Controller:

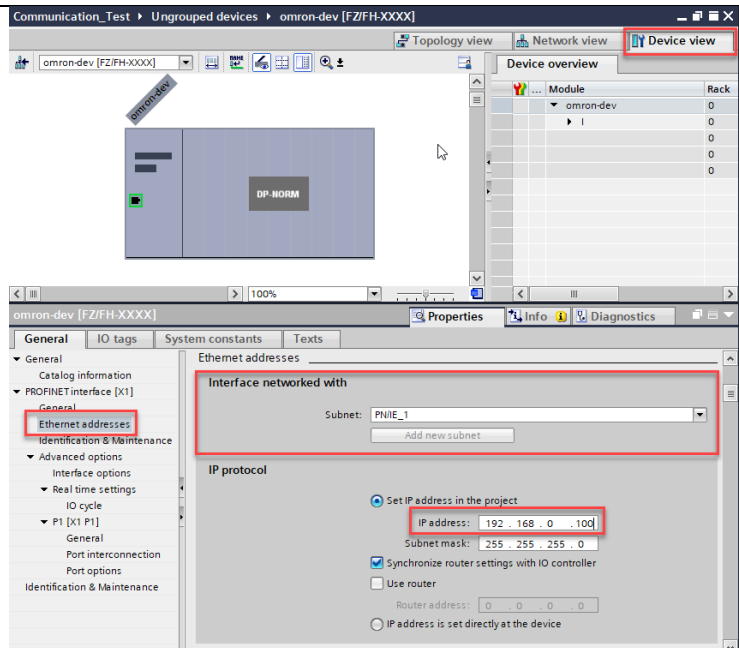
- Right-click on “Not assigned” message shown in blue – [Assign to new IO controller].

Note: This should be carried out in case that the IO-Device is not assigned correctly to the IO-Controller.



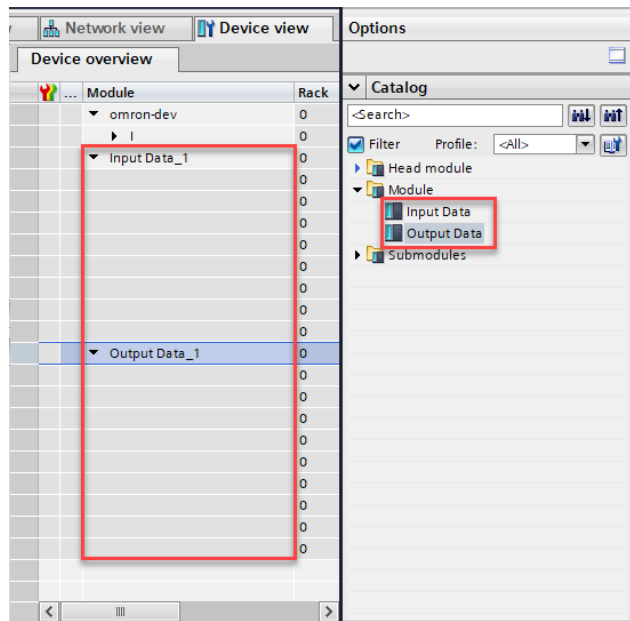
9 Configure IO-Device (I):

- Go to [Device view] of your FH-series IO-Device.
- Configure the Subnet (this is done automatically in Step 8).
- Configure the IP address (192.168.0.100 in this example).



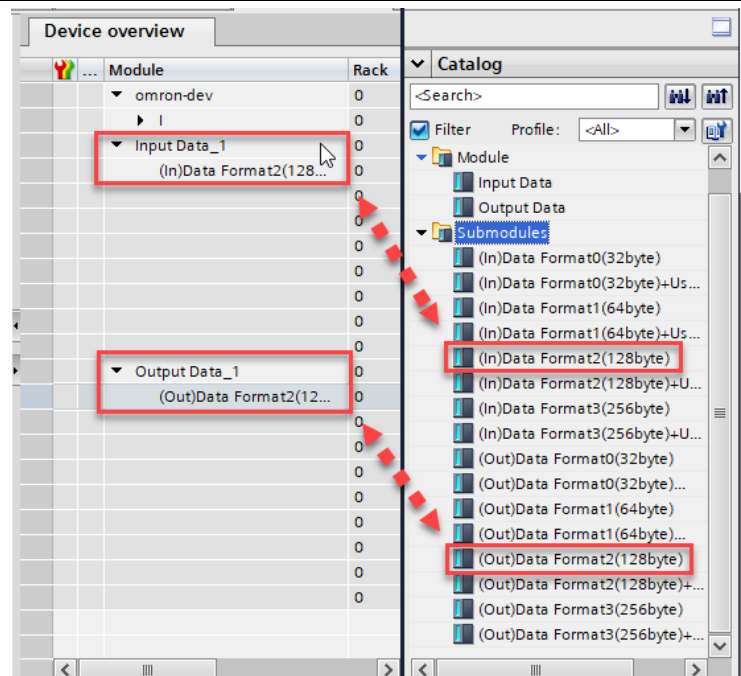
10 Configure IO-Device (II):

- Add Input Data and Output Data modules to the IO-Device with double-click.



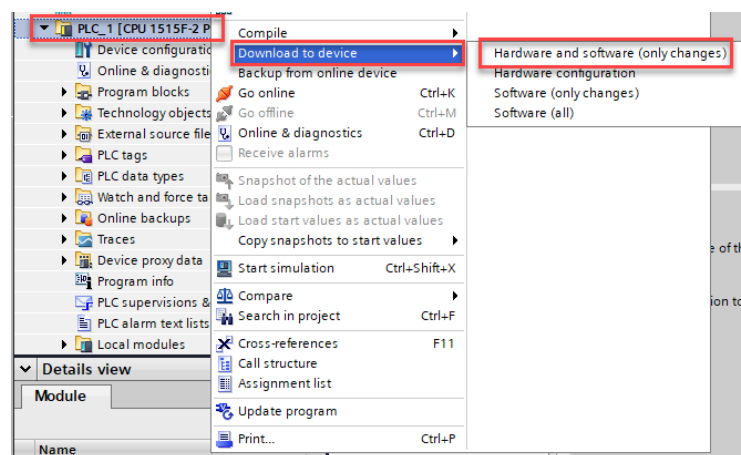
11 Configure IO-Device (III):

- Add Submodule: Select Data Format previously defined in Section 3.1 - Step 2 of this Connection Guide.



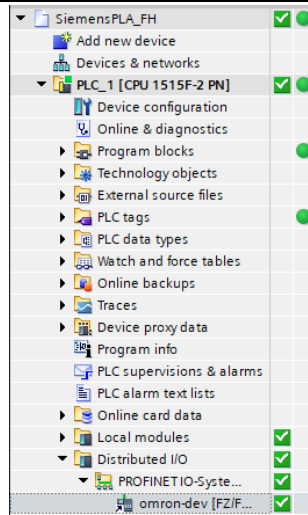
12 Store parameter set to device:

- Right-click on PLC folder – [Download to device] – [Hardware and software (only changes)] – [Load].

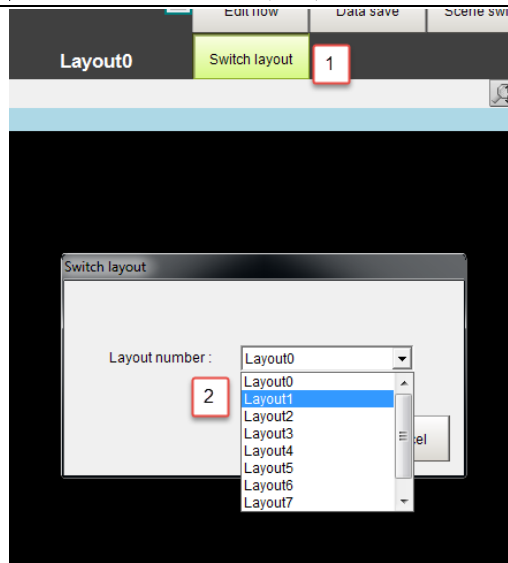


13 Verify communication between Siemens PLC and FH-series (I):

- Verify that the offline configuration matches with the online configuration data.



14 FZ-PanDA: Switch to Layout1 and make sure that the RUN LED is on.



15 Verify communication between Siemens PLC and FH-series (II):

- Verify that IO-Controller is receiving and sending information/trigger to IO-Device.

Notes:

1. Create a Watch Table and check ID0 – bit 5 (Run).
2. Set QB3 to #02 (Step) and a trigger should be sent to FH-series to perform a measurement.

Address	Display format	Monitor value	Modify value
%ID0	Bin	2#0000_0000_0000_0000_0000_0000_0001_0000	
%QD0	Hex	16#0000_0000	
%QB3	Hex	16#00	16#02
-<Add new>			

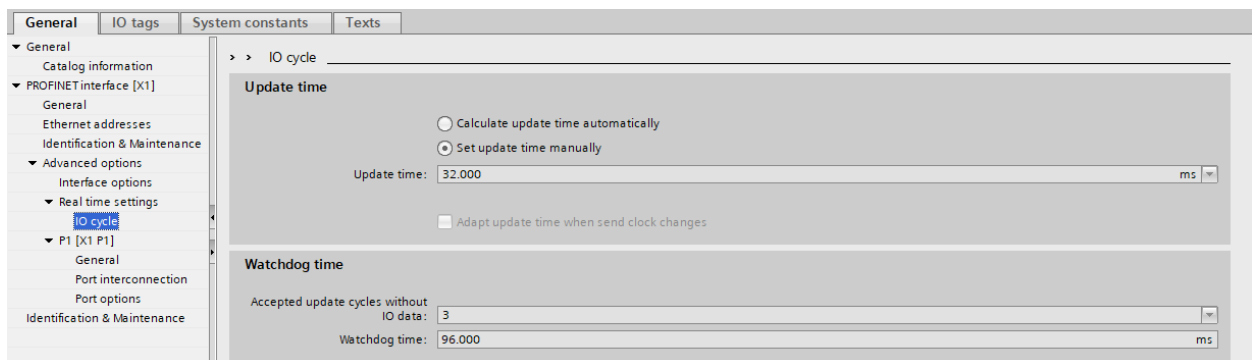
3.3.1. Fine tuning the time settings

Two important parameters when configuring the connection are:

- **Update time:** An IO device / IO controller in the PROFINET IO system is supplied with new data from the IO controller / IO device within this time period. The update time can be separately configured for each IO device and determines the time interval in which data is transmitted from the IO controller to the IO device (outputs) as well as data from the IO device to the IO controller (inputs).
- **Watchdog time:** If the IO device is not supplied with input or output data (IO data) by the IO controller within the watchdog time, it switches to the safe state.
Do not enter the watchdog time directly, but as "Accepted number of update cycles when IO data is missing". This makes setting easier because the update time can be shorter or longer, depending on the power of the IO device or the setting.

Adjust the timing of 'Update time' so it is coherent with the processing time of the vision system. Example: If the vision system takes 200ms to process it does not make sense to have the 'Update time' to 1 or 2ms. Instead select a bigger time, like 16 or 32ms. This will cause the system to be more relaxed.

Adjust as well the 'Watchdog time' to a reasonable number. Usually a factor of 3 is enough.



Remember when using PROFINET communications in multi-line random trigger mode with three lines or more, it is recommended to use FH-3050/5050 series.

3.3.2. Memory allocation

It is important to take into account the assignment of the memory because the way on Omron and Siemens is different. See the example below on an assignment to a Siemens S7-1500.

On the device overview it is possible to see the Q address for each line. In the case below it starts at 0 and expands up to 19. On the examples below this will be the reference value. If a different memory allocation is used please take the new value as a reference.

Device overview						
...	Module	Rack	Slot	I address	Q address	Type
	omron-dev	0	0			FHV7
	I	0	0 X1			omron-dev
	Input Data_1	0	1	0...47		Input Data
	(In)Data Format0(32byte)	0	1 1	0...47		(In)Data Format0(3...
		0	1 2			
		0	1 3			
		0	1 4			
		0	1 5			
		0	1 6			
		0	1 7			
		0	1 8			
	Output Data_1	0	2		0...19	Output Data
	(Out)Data Format0(32by...	0	2 1		0...19	(Out)Data Format0...

The allocation is as follows on the next image. To trigger the camera (STEP signal) it is needed to switch the state of bit 3.1 from FALSE to TRUE.

● Command Area

Set the first channel in Command Area.	Bit															Name	
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1		0
+0	E	R					X								S	E	Control input (2 CH)
	R	C					E								T	E	
	L						X								E		
	R						E								P		
+1																D	
																S	
																A	
+2																Command Code (2 CH)	
+3	CMD-CODE																

The next example shows how to implement a command code. In this case it is the switch scene command.

Set the first channel in Command Area.	Bit															Name
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
+2	6						7									Command Code (2 CH)
+3	CMD-CODE						5									

First word in Command Area	Command code	Bit				Description
		15 - 12	11 - 8	7 - 4	3 - 0	
+2	1000	0001	0000	0000	0000	Command code
+3	0030	0000	0000	0011	0000	
+4	-	0000	0000	0000	0000	Scene No.
+5	-	0000	0000	0000	0000	

Command parameters and User Input Area will be implemented in the same way as the Command code.

3.3.3. Reading User Input Area

Access to the data written on the User Input Area is accessible only through a Macro routine.

```

Dim BUF&(7)
Dim DATA_DINT&(3)
Dim DATA_LREAL#(1)
Rem Loads PROFINET memory.
ReadPlcMemory "PROFINET", 0, 10, 16, BUF&()
Rem Gets DINT type data and LREAL type data from buffer
GetPlcData "PROFINET", BUF&(), 0, 4, DATA_DINT&(0)
GetPlcData "PROFINET", BUF&(), 4, 4, DATA_DINT&(1)
GetPlcData "PROFINET", BUF&(), 8, 4, DATA_DINT&(2)
GetPlcData "PROFINET", BUF&(), 12, 4, DATA_DINT&(3)
GetPlcData "PROFINET", BUF&(), 16, 8, DATA_LREAL#(0)
GetPlcData "PROFINET", BUF&(), 24, 8, DATA_LREAL#(1)

```

3.3.4. Writing to the User Output Area

In order to write data to the User Output Area it is needed a Macro Subroutine

```
Dim BUF&(7)
Dim DATA_DINT&(3)
Dim DATA_LREAL#(1)
DATA_DINT&(0) = 100
DATA_DINT&(1) = 200
DATA_DINT&(2) = 300
DATA_DINT&(3) = 400
DATA_LREAL#(0) = 12.34
DATA_LREAL#(1) = 56.78
Rem Sets DINT type data and LREAL type data to buffer
SetPlcData "PROFINET", BUF&(), 0, 4, DATA_DINT&(0)
SetPlcData "PROFINET", BUF&(), 4, 4, DATA_DINT&(1)
SetPlcData "PROFINET", BUF&(), 8, 4, DATA_DINT&(2)
SetPlcData "PROFINET", BUF&(), 12, 4, DATA_DINT&(3)
SetPlcData "PROFINET", BUF&(), 16, 8, DATA_LREAL#(0)
SetPlcData "PROFINET", BUF&(), 24, 8, DATA_LREAL#(1)
Rem Writes PROFINET memory
WritePlcMemory "PROFINET", 0, 24, 16, BUF&()
```

4. Revision History

Revision Code	Date	Revised Content
01	October 2018	Original production
02	May 2020	Revision adding FHV7 and examples on memory allocation