

#### **Knowledge Base Document**

Technical Support Department, U79, Newtown

#### Title: Unidrive M & SI-PROFINET with Siemens S7-1200 PLC

Document	Communications
Category:	

Product Category: Communications: Profinet

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#### **Revision History**

Revision	Date	<b>Revising Author</b>	Authorised By	Comments
1	09/05/18	Joe Richardson		

#### **Summary of Contents**

This document provides a step-by-step *Getting Started* guide for using the Siemens TIA Portal to configure a Unidrive M fitted with a SI-PROFINET (RT or V2) option module to communicate over a PROFINET network with a Siemens S7-1200 PLC.

#### The following topics are covered in this document:

- > Setting up a Unidrive M fitted with a SI-PROFINET RT or V2 option module.
- Setting up the PROFINET Controller interface using the Simatic Step 7 / TIA Portal V12 software.
- Setting up flexible IO modules for user selection of the menu and parameter used over PROFINET.
- SI-PROFINET V2 ONLY selecting option module parameters for use over PROFINET.
- > Running a simple transfer test program with Simatic Step 7 / TIA Portal V12 software.
- > Running a ramp test program with Simatic Step 7 / TIA Portal V12 software.

### **Document Requirements**

#### <u>Requirements – User</u>

- Previous experience of using PLCs.
- Previous experience of using Siemens Step 7 / TIA Portal PLC configuration software, specifically V12 upwards, would be a distinct advantage.
- The PLC handles the data transfer automatically; therefore no ladder/test logic is required to initiate data transfer between the PLC CPU & the PROFINET field device. However some example programs are provided for reference and further testing of the setup.

#### <u> Requirements – Hardware</u>

- Siemens Simatic S7-1200 PLC (1215C DC/DC/DC CPU V1 with firmware V3.0.2 used for this document).
- A PC to PLC interface (Auto-Cross-Over functionality built into the CPU hence a standard or crossover **Ethernet cable** can be used for the interface).
- **PROFINET Controller interface** if not fitted as standard (depending upon the specific variant of PLC used this may require extra hardware however the PLC used in this document has built in PROFINET ports).
- Unidrive M M200-400 or M600-M700 (Unidrive M700 used in this document)
- SI-PROFINET RT option module (hardware version 4.0 and V01.01.05.24 firmware used in this document) or alternatively SI-PROFINET V2 option module. <u>NOTE</u>: Unidrive M200-M400 is only compatible with SI-PROFINET V2. Furthermore as most features of the two versions overlap, the name SI-PROFINET will refer to both, hence unless otherwise stated assume any instructions apply to both versions of the module.
- **PROFINET connection cable(s)** should be shielded twisted pair (STP) which as a minimum meets TIA Cat 5e requirements and is <u>certified for use on a PROFINET network</u>, to connect between CPU and SI-PROFINET module (and for Unidrive M to Unidrive M connection(s) if required).
- <u>OPTIONAL</u>: **SI-Applications Plus module** (Firmware V02.04.00) to explore reading/writing to an option module over PROFINET network. <u>NOTE</u>: Currently this feature is not supported by either module but is coming to the SI-PROFINET V2 module in a future firmware update.

#### **Requirements – Software & Firmware**

- Simatic Step 7 Manager / TIA Portal (V12 SP1 used for this document).
- <u>GSDML</u> & icon files for the drive model used (GSDML-V2.3-CT-UniDriveM-20140821.xml used in this document). Ensure that the correct GSDML file for the drive, SI-PROFINET module (RT/V2) and version of Siemens Step 7 / TIA Portal used is acquired before starting this document.

If required, all of the Step 7 / TIA Portal PLC programs used throughout this document can be provided archived in a zipped folder, obtainable from your drive support centre or the Customer Support Suite. The archived programs can be added by navigating to **Project>Retrieve**, from within the 'Project view' of Step 7 / TIA Portal.

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The Card Reader/USB memory	•	

#### NOTE

Although specific products are mentioned in this document, Control Techniques does not endorse or recommend any third party product, it is the responsibility of the user to select appropriate equipment for the application.

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### 1: Hardware setup and connections

Connect up the system hardware as shown below in Figure 1-1.

The **1215C DC/DC/DC CPU** used has a 2-port Ethernet switch built into it; these ports are used as either the Ethernet programming port or the PROFINET communication port(s). The programming cable should be connected between the programming PCs Ethernet port (or a USB-Ethernet adapter for multiple network connections) and one of the CPUs **RJ45 ports**.

The CPU used in this document has the PROFINET IO Controller Interface built in therefore no addition communication modules are required to be added to the setup. A **PROFINET certified cable** (Cat 5e or higher) is simply used to connect between one of the CPUs RJ45 Ports and the PROFINET field device (**SI-PROFINET module**). Any additional PROFINET field devices can be linked from SI-PROFINET module to SI-PROFINET module using the same standard of cabling.

For the physical installation of the option module use the manual provided for the Unidrive M variant used or the SI-PROFINET manual, however for the purpose of this document the SI-PROFINET module was installed in option slot 3 (unless otherwise stated). For the initial PLC physical setup please use the documentation provided by Siemens, as this is not covered in this documentation.





#### NOTE

If a different CPU is used then the hardware configuration may be different to the one shown, in which case, the CPU documentation should be consulted to determine the correct connection details.



#### Figure 1-1: Hardware configuration

### 2: Configuring the Unidrive M SI-PROFINET Interface

The entire PROFINET configuration is performed by the PLC rather than directly on the SI-PROFINET interface, therefore unless your application requires custom timeout events and actions, steps 2-4 can be ignored.

 Power up all Unidrive M drives connected to the PROFINET network. As discussed all the key configuration is performed by the PLC, however it is still advised to default the SI-PROFINET module(s) now to ensure the same setup parameters are used as in this document, by setting **#S.00.008** to **On** before resetting the module – see <u>Step 2.4</u>.



#### NOTE

The module's menu 0 is also displayed in menu 15, 16 or 17 depending on which slot the module is installed to. Table 2-1 below shows the location of the module's menu 0 on the drive.

Option slot number	Menu 0 locations
1	15
2	16
3	17

#### Table 2-1: SI-PROFINET menu 0 locations on Unidrive M

- 2. Depending upon your application any other necessary module settings should now be configured. However as discussed all PROFINET settings are configured by the PLC, therefore it is only the timeout action and event that can be modified if required, from within **#S.05.0XX**.
- 3. On the Unidrive M to avoid loss of the configured settings when the drive is powered down it is required to set **mm.00** to 'Save parameters' or '1000' and press the red reset button to perform a drive save.
- Changes made to the SI-PROFINET configuration parameters will not take effect until the SI-PROFINET module is reset, by setting S.00.007 or Pr MM.007 to On.
- 5. The Unidrive M SI-PROFINET module is now ready for the PLC to be configured and the network initialised to connect the drive to the PROFINET network.



# **3:** Configuring the PLC to create a PROFINET network using standard IO modules

 Creating the project - Run the Simatic Step 7 / TIA Portal V12 software and select Create new project from the start screen. Enter the Project name (and any other details required) as shown below (for this example the name 'PROFINET Setup' is used), then click the Create button.

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				Totally Integrated Automation PORTAL
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networks		Open existing project	Path:	C:\Users\RICHJO01\Documents\Profinet Setup guide\Trial Programs
		Create new project	Author:	Joe Richardson
PLC programming		Migrate project	Comment:	Configuring a PROFINET network between a Unidrive M700 and Simatic S7-1200 (using SI-PROFINET)
Motion & technology				Create
Visualization				
Online & Diagnostics	1			
		💮 Welcome Tour		

2. Entering Project view - Select Open the project view or Project view as illustrated below.

VA Siemens - PROFINET Setup		_ □ ×
		Totally Integrated Automation PORTAL
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Devices & networks PLC programming Motion & technology ***	<ul> <li>Open existing project</li> <li>Create new project</li> <li>Migrate project</li> <li>Close project</li> </ul>	Project: "PROFINET Setup" was opened successfully. Please select the next step: Start
Visualization		Devices & networks     Configure a device       PLC programming     Write PLC program
Diagnostics	<ul> <li>Welcome Tour</li> <li>First steps</li> </ul>	Motion & technology     Configure technology objects       Visualization     Configure an HMI screen
	Installed software	
	O Help	Project view     Open the project view
	🚱 User interface language	

 Adding the PLC to the project - from project view double click on Add new device under the project tree and then within the popup window (under Controllers) locate the correct PLC and CPU used, before selecting OK to add the device to the project.



4. Adding hardware modules – it is required to add any additional modules attached to your PLC to the configuration manually. These are located in the Hardware Catalog and the required device can be added by clicking and dragging it onto the PLC rack. However, for the CPU used in this document the PROFINET communication ports are located on the main unit; therefore no additional communication modules are required for the setup used.



#### NOTE

Ensure that the connected PLC is in "Offline" mode as "Online" mode prevents the required modules from being added to the PLC rack.

#### IMPORTANT

Before proceeding with Step 5 you must ensure that the relevant GSDML files for the Unidrive M have been added to Simatic Step 7 / TIA Portal V12. For further instruction on this see <u>Appendix A</u>.

5. Adding the PROFINET slave device – go to Devices & Networks from the project tree and ensure Network view is selected using the tabs shown below, before opening the Hardware catalog and navigating to find the attached drive used for your setup. The device can then be clicked and dragged to the network view, as illustrated below.

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Conline & diagnostics		PC systems
Program blocks		Drives & starters
Technology objects		Network components
External source files	No.	Detecting & Monitoring
PLC tags	$\sim$	Distributed I/O
PLC data types		Field devices
Watch and force tables		Other field devices
Program info		
i lext lists		Drives
Local modules		Siemens AG
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		PROFIBUS DP

6. Naming the PROFINET field device or controller – from the Network view used in the previous step and shown below, click on the controller (PLC) or field device (SI-PROFINET module) that you wish to name (click anywhere in the area highlighted below for the required device) and ensure the Properties tab is selected. Under the main General menu the name of the device can then be changed. Repeat this step for all the network devices you wish to rename.

NOTE

If the SI-PROFIBUS module used is already named then this must be entered in this step.

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Details view  Name  Program blocks	Ethernet addresses Author: irichjoc Advanced options Comment: Interface options Comment: Io cycle X1 P1 [X1 P2] Diagnostics addresses	n aries					

7. Configuring the programming port – enter the Device configuration window from the project tree and from within the Device View of the PLC double click on the two PROFINET/Ethernet ports on the CPU to enable the properties of the port to be viewed. With a standard setup only the IP protocol will need to be changed, to match the IP address assigned to the PLC (see Siemens guide for detail on assigning an IP Address to the PLC) and to suit the networking configuration of the programming PCs network adapter (whether this is built in or a USB-Ethernet adapter).



#### 8. Configuring the PROFINET ports



**PROFINET IO Controller Configuration (PLC)** 

As the two RJ45 ports on the PLC are used as both Ethernet programming and PROFINET communication ports, the IP address of the PLC defined in <u>Step 3.7</u> is used as the PROFINET controller's IP address. The **PROFINET** specific settings shown above can be changed if necessary, however for this document the default PROFINET setting "Generate the **PROFINET** device name automatically" is used, meaning that the PROFINET name used is taken from the default device name or the name added in <u>Step 3.6</u>.

#### **PROFINET Field IO Configuration (SI-PROFINET)**

To configure the PROFINET slave return to the Network View (as used previously in <u>Step 3.5</u> and <u>Step 3.6</u>) before double clicking on the slave unit in the area illustrated below.

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e.	Dev	vice configuration			Not assigned	
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This then shows the properties of the SI-PROFINET module, and enables the Ethernet addresses menu to be opened where the IP address for the SI-PROFINET module should be set (ensure that this address does not clash with those used by any other devices on the same network, e.g. master, slaves and even the programming PCs network adapter). For this document the default PROFINET setting "Generate the PROFINET device name automatically" is again left selected to automatically generate the PROFINET device name from the default device name or that configured in <u>Step 3.6</u>.



Return to the **Network view** and click on **Not assigned**, before selecting the required IO controller (in this case named **PLC\_1.PROFINET interface\_1**). This should complete the network setup, giving the network view shown in the figure below.





9. Configuring the network topology – the PLC must be configured to support device replacement, this is an option in the properties of the PROFINET port of the PLC. From Network view click the PROFINET port on the controller (PLC). From within the Advanced options properties, open up Interface options and ensure the option 'Support device replacement without exchangeable medium' is selected.

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The network topology must now be configured by entering the **Topology View**. Then using 'drag and drop', connect the relevant device ports together to match the physical network wiring. Once the PLC has been configured, if a device is replaced then the new device will be automatically configured with the original device's properties, including the device name and IP address.



#### NOTE

For the discovery protocol to work, the replacement device must not have a device name programmed, i.e. it must be blank or unused. If a device name exists in the module and that name is different to the device name set in the network configuration then the PLC will indicate a configuration error and will not enter data exchange with it.

10. Adding standard cyclic IO parameters – to add the PROFINET IO parameters to the hardware configuration double click on the required field device in the network view, to open the device view (as used for the <u>PROFINET Field IO Configuration</u>). Then navigate in the Hardware catalog to the Unidrive M used. In this folder will be all of the parameter modules required to configure the PROFINET network. *NOTE: if Filter is selected the relevant modules for the selected slave should already be shown.* Then simply click and drag any IO parameters into the module rack under 'Device Overview'. For this example Menu 20.01 (In) and Menu 20.02 (Out) are used, as illustrated below.

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✓ Details view						Menu 20.12 (In)	
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📑 Add new device				100 N 100 N		Menu 20.16 (In)	
📥 Devices & networks				100 N.		Menu 20.17 (In)	
57-1200 S7-1200				1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 -		Menu 20.18 (In)	
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11. Downloading the Hardware Configuration to the PLC – right click on the PLC in the project tree, select Download to device and then Hardware configuration. A popup box will enable the PLC to be connected to the PC for loading the hardware setup. Select the Type of PG/PC interface as PN/IE and set PG/PC interface to the network adapter used to connect to the PLC. A scan for the PLC IP Address specified in <u>Step 3.7</u> is then performed and the compatible devices will then be shown. Select the PLC in the list and then press Load.





Next a 'Load preview' window should appear in which it is outlined what processes will occur when the hardware configuration download occurs. If any of the Actions listed have not already been confirmed then adjust these before clicking Load.

Load pro	eview			×
<b>?</b>	Check	before loading		
Status	1	Target	Message	Action
<b>↓</b>	l 🔮 👻 PLC_1		Ready for loading.	
	0		The modules are stopped for downloading to device.	Stop all
	0		Depending on the objects to be downloaded and the current dialog settings, download to device "PLC_1" is only possible if the device was set to STOP mode prior to download. Select "Stop all" in the "Action" column to perform the download.	
	0	<ul> <li>Device configuration</li> </ul>	Delete and replace system data in target	Download to device 💌
	0		Delete and replace existing device configuration for "PLC_1" in the target system?	1
<			III	>
				Refresh
			Finish	Load Cancel

The program will then be loaded onto the PLC and the 'Load results' shown, as illustrated below. Then select Start and click Finish, this will put the PLC into run mode and complete the configuration of the PLC for use with the standard PROFINET parameter modules.

tatus	1	Target	Message	Action
4	- 🔨	<ul> <li>PLC_1</li> </ul>	Downloading to device completed without error.	
		<ul> <li>Start modules</li> </ul>	Start modules after downloading to device.	Start all
			The module "PLC_1" can be started.	Start
5			III.	

### 12. Checking the setup for successful PROFINET communication

Once the hardware configuration has successfully downloaded to the PLC and it is in 'Start' mode, there should only be a green LED present as shown near right. However if the configuration is incorrect you will see a flashing orange LED as shown far right, indicating an error, meaning the configuration used should be double checked.





If the PLC is reporting no errors then **S.02.003**, **S.02.004** and **S.05.004** on the drive should also be checked to ensure that the PROFINET network is operating correctly, where they should display that the network is active, has a cyclic data rate greater than 0 and no configuration error has occurred.



#### NOTE

If at any point the expected output is not observed at the drives, before assuming that there is an error with the software/hardware setup, it is often worth resetting the SI-PROFINET module (**S.00.007**) and/or stopping and restarting the program on the PLC using the Simatic Step 7 / TIA Portal interface, to ensure that both the PLC and drive are running the most recent version of your program and setup. It is <u>recommended</u> to perform this step before each testing stage in this document.

### 4: Configure Flexible IO modules for user selection of Menu/Parameter – if the

required parameter is not contained within the list of standard modules provided by the GSDML file (as used in <u>Step 3.10</u>) a 'Flexible Module' can be used to enable you to define the menu and parameter you wish to use over the PROFINET network.

#### NOTE – supported in a future SI-PROFINET V2 firmware update

If the SI-PROFINET V2 module is used with compatible firmware and the relevant GSDML files are installed into Simatic Step 7 / TIA Portal, then the use of Flexible IO modules also enables the slot used to be defined, allowing option module parameters to be used over the PROFINET network (if supported by the option module) – see <u>Step 4.2</u>.

 Adding flexible IO modules to the field device overview – go to the device view of the SI-PROFINET module (used previously in <u>Step 3.10</u>). From the Hardware catalog open Flexible Modules and add any Input/Output parameters required to the Device Overview as shown earlier in <u>Step 3.10</u>. In this case Input and Output 16-bit parameters were added.

Siemens - PROFINET Setup - flexible mode	es	_ *
[] [] [] Save project ] [] [] [] [] [] [] [] [] [] [] [] [] [	(객 호 🙀 🖥 🔃 🔐 🔛 🥖 Go online 🖉 Go offline 🏭 🖪 🕼 🧩 🚍 🛄	Totally Integrated Automation PORTAL
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Devices	🛃 Topology	Options
	📸 👬 SI-PROFINET 💌 🖽 嫣 🗄 🔍 🛨 100%	
		✓ Catalog
PROFINET Setup - flexible modules	∧ nut	itii (tii
Add new device	and t	Filter
Devices & networks	<u>9</u> ^	T Head module
✓ []] PLC_1 [CPU 1215C DC/DC/DC]		
Device configuration		▼ Module
Conline & diagnostics		Menu 1
Program blocks		Menu 2
Ichnology objects	DP-NORM	Menu 3
External source files		Menu 4
PLC tags		Menu 5
PLC data types		Menu 6
Watch and force tables		Menu 8
Program into		Menu 10
E Text lists		Menu 14
Local modules	Device overview	Menu 18
Distributed I/O	Module Rack Slot Laddress Q address Type	Menu 19
▼ PROFINETIO-System (100): PN/IE_1	windowie     windowie	Menu 20
▼ U SI-PROFINE I	X1 0 0 X1 SUPROFINET	Defined Module
Device configuration	User Defined 16-bit Read 1 0 1 68 69 User Defined 16-bit	
Conline & diagnostics	User Defined 16-bit Write 1 0 2 68 69 User Defined 16-bit	T Input Parameter
SIPROFINET		User Defined 8-bit Read
User Defined 16-bit Read_1		User Defined 16-bit Read
User Defined 16-bit Write_1	9 Property	User Defined 32-bit Read
Common data	General	Output Parameter
Documentation settings		User Defined 8-bit Write
Languages & resources		User Defined 16-bit Write
• Um Online access	No 'properties' available.	User Defined 32-bit Write
✓ Details view	No 'properties' can be shown at the moment. There is either no object selected or the selecte	
	properties.	
Name Type Add	229	
1990 1000		

2. Setting the Menu/Parameter for the Flexible Module - from the properties of the field device, click on the required module under Device overview, select Module parameters and within this menu select the menu, parameter and whether the parameter used should be signed or unsigned (if you select a flexible module size that is not the same size as the parameter used, you can choose to treat it as a signed or unsigned value as necessary). It is shown below which parameters are used for this part of the document (as you may note these are the same parameters selected from the standard list in <u>Step 3.10</u>, therefore do not actually need to use 'Flexible Modules', but are used for consistency in this document).

聈	Siemens - PROFINET Setup - flexible modules													-	T X
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	<ul> <li>Ger Program blocks</li> <li>Ger Exemplisher files</li> <li>Ger Exemplisher files</li> <li>Ger Exemplisher files</li> <li>Ger PLC tags</li> <li>Ger PLC data types</li> <li>Ger Auch and force tables</li> </ul>			•			DP-NORM	I							Online tools
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	<ul> <li>ROFINET</li> </ul>		Y Module			Rack	Slot	I address	Q address	Туре	Order no.	F	firmware	Comment	E
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	SI-PROFINET		User De	fined 15-bit	Kead_1	0	2	6869	60.60	User Defined 16-bit				_	- 1
	User Defined 16-bit Read_1		User De	fined Toble	write_1	U	2		6869	User Defined 16-bit				`	4
	User Defined 16-bit Write_1					-			111						-
	Common data		Jser Defined 16-bit	t Read_1 [I	Vodule					🔍 Propertie	s 🚺 Info (	🔒 🧏 Diag	jnostics		
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	✓ Details view		Inputs		U	er Sele	ection of	Menu/Par	ameter						
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	User Selected Parameter Parameter 1			-			Us	er Selected	Paramete	er: Parameter 2			-		
	Signed or Unsigned Signed			•				Signed	or Unsigne	d: Signed			•		

3. Setting the slot used for the Flexible Module configuration (SI-PROFINET V2 with future firmware only) – the updated SI-PROFINET V2 module enables compatible option module parameters to be used. All of the configuration carried out above in <u>Step 4</u> is the same except that when using the SI-PROFINET V2 module with the latest GSDML files, the option to change the Slot used is accessible (as illustrated below) and can be set to the slot number of an installed option module.

Module parameters			DRIVE	•
			 DRIVE	
User Selection of Menu/Parar	neter		Slot 1 Slot 2	
		<b>K</b>	Slot 3	
Slot Selected	DRIVE	-	Slot 4	
User Selected Menu	No Menu Selected	•		
User Selected Parameter	No Parameter	•		
Signed or Unsigned	UnSigned	•		

4. **Download the custom mapping hardware configuration** - finally download the updated hardware configurations to the PLC as shown previously in <u>Step 3.11</u>. Once the configuration has successfully downloaded to the PLC follow <u>Step 3.12</u> to ensure that the setup is operating correctly.

**5: Example transfer test program (simple)** – a ladder logic program is used to receive the output of a register (on board the drive [or an option module – SI-PROFINET V2 ONLY]) which is then copied back to a different register (again on board the drive [or an option module – SI-PROFINET V2 ONLY]), transferred over the configured PROFINET network. The source and destination used for the transfer can be any compatible parameter, using the standard list of modules (as used in <u>Step 3.10</u>) or using Flexible modules to select different Menus/Parameters as explained in <u>Step 4.2</u> (Drive registers 20.01 and 20.02 are used in this example).

#### NOTE (only applies if using SI-PROFINET V2 module and SI-Applications Plus)

As the SI-Applications Plus module can only be installed in slot 3 of the M700-702, if it is used for this example, the SI-PROFINET V2 module needs to be moved to another available slot.

 Adding the required ladder block function - this program simply requires a MOVE ladder block to be added to a network within the main cyclic block (this block is added by default when the project is created). The input to the block is then linked to the input parameter and the output of the block is linked to the output parameter, both configured earlier (see <u>Step 3</u> or <u>Step 4</u> depending upon the type of parameter you wish to use). However as is illustrated below the version of Simatic Step 7 / TIA Portal used (V12) prevents the output being set directly to the parameter mapping link, quoting 'A constant not permitted here.'.



2. Creating PLC tags linked to the parameter modules - this issue is resolved by creating PLC tags to the parameter module(s) manually. As illustrated on the following page this involves navigating to the device overview page and noting the input (I) and output (Q) address linked to your modules. Then open Show all tags before creating the required tags with a related name. The Data type should be set to reflect the size of the parameter module used and the address of the tags should be set accordingly with the information gathered from any modules used. Ensure that the input and output tag use the correct operand identifier.



3. Amending the ladder function to use the created tags - the MOVE block should then be amended to use the newly created tags as both the input and output of the block, as shown below.

E.	▼ 1 [CPU 1215C DC/DC/DC]	▼ Network 1:	
Ĕ	Device configuration	Comment	
	🛂 Online & diagnostics		
	🕶 🚘 Program blocks		
	💕 Add new block	MOVE FUE	
	💶 Main [OB1]	EN ENO	
	🕨 🙀 Technology objects	%JW68 %JW68	
	External source files		
	👻 🔁 PLC tags		
	🍇 Show all tags		

4. Downloading the hardware and software setup to the PLC - both the hardware configuration and software should then be downloaded to the PLC by right clicking on the PLC, going to Download to device and selecting Hardware and software (only changes), as illustrated below. As in <u>Step 3.11</u> you will need to navigate through the 'Load preview' and 'Load results' to complete downloading the program and start up the PLC.

Vê	Siemens - PROFINET Setup	- basic program drive			_ 0	×
P	roject Edit View Insert On	line Options Tools V	/indow H	lelp	Totally Integrated Automation	
E	🛉 🎦 🔒 Save project ا 🕌	🗎 🖹 🗙 🔊 ± (# ±	<b>n</b> 81	🗓 🗓 🖳 💋 Go online 🖉 Go offline 🛛 🛔 🖪 👫 🚽 🛄	PORTAL	
	Project tree		PROFIN	ET Setup - basic program drive    PLC_1 [CPU 1215C DC/DC/DC]    Program blocks	▶ Main [OB1] _ ■ ■ X	
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l i	PROFINET Setup - basic prog	ram drive	- Plac	k titler – "Main Pressure Courses (Couls)"		<u></u>
me	Add new device		Comm	ent		2
150	Devices & notworks					
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E E	Device configuration	Open in new editor		nment		Los
	Online & diagnostics	Search in PLC and oper	n F7			in
	Program blocks	X Cut	Ctrl+X	MOVE		1
	Main [OB1]	🗓 Сору	Ctrl+C	EN ENO	le la	51
	Technology objects	Paste	Ctrl+V	%/W6 8 %QW6 8	]	7
	External source files	🗙 Delete	Del	"in" — IN 🗰 OUTI == "out"	- 000	sks
	▼ → PLC tags	Rename	F2			
	how all tags	🐙 Go to topology view				
	Add new tag table	🔒 Go to network view		etwork 2:		÷
	💥 Default tag table [2	Compile	•	nment		ŝ
	PLC data types	Download to device	۲.	Hardware and software (only changes)	l l l l l l l l l l l l l l l l l l l	i S di
	Watch and force table	💋 Go online	Ctrl+K	Hardware configuration		
	Program info	🔊 Go offline	Ctrl+M	Software (only changes)		
	iext lists	🧏 Online & diagnostics	Ctrl+D			
	Distributed I/O	🐴 Compare	•	100%		
	PROFINET IO-System	X Cross-references	F11			
	▼ 📺 SI-PROFINET	E Call structure		Properties 1	110 Diagnostics	
	Device config	📗 Assignment list		al Cross-references Compile Syntax		
	😵 Online & diag	昌 Print	Ctrl+P			
	SI-PROFINET	鹶 Print preview		ge Go to	? Date Time	
	User Defined	🔍 Properties	Alt+Enter	nnected to PLC_1, address IP=192.168.1.10.	7/28/2015 11:54:20 AM	

5. **Testing the program** – the system can be tested by inputting a value into the parameter mapped to the input of the PLC and observing that it is copied to the parameter mapped to the output of the PLC.

<u>Drive results</u> – by inputting a value into the configured input parameter (**20.001**) using the keypad (or Unidrive M Connect if desired) the same value should be shown in the configured output parameter (**20.002**), possibly after a very short delay. This shows that both the program and PLC hardware configuration have been configured correctly for using a drive register over PROFINET.



**Option module results (SI-PROFINET V2 ONLY)** – as above, by inputting a value into **3.70.001** and checking it appears in **3.71.001**, the operation of using SI-PROFINET V2 with an option module can be confirmed. However due to the SI-Applications Plus module being a legacy support system the register menus do not currently show on the keypad hence it is necessary to use <u>Unidrive M Connect</u> to see the parameters of the SI-Applications Plus module to view the program running, as shown:

And in case of the local division of the loc		Unidrive M Co	onnect - My P	roject 7					- 0 ×
File Home View									
Add drive Project Devices	ion Set mode Default Set Ren and region parameters model Drive	aame Reset Save parameters in drive	<ul> <li>Tools &amp;</li> <li>Paramete</li> <li>Block Dia</li> <li>Setup &amp; D</li> </ul>	Wizards • er Listings • agrams • Piagnostics	Compare with defaults Pa	New Lo ameter file parameters	ad ter file		
Project	Menu 3.70 : PLC P Registers Menu	u (192.168.0.42) 🗕	• ×	Menu 3.71 : P	LC Q Registers Me	enu (192.168.0.42	) =	. = X	
Menu 03 : Speed Control and I Menu 04 : Torque and current Menu 05 : Motor Control	Menu 03 : Speed Control and I Menu 04 : Torque and current Wiew parameters on the drive and opt Menu 3.70 : PLC P Reg View parameters on the drive and opt								
Menu 06 : Sequencer and Cloc	🔣 🔠 Compare with Defaults 📋 C	Compare with File 🍦 Print	=	📮 🔤 Compare with Defaults 📋 Compare with File 🚔 Print 📮				Ŧ	
Menu 07 : Analog I/O Menu 08 : Digital I/O	₽ Search			Search					
📕 Menu 09 : User Functions 1	Parameter Caption	Categories Value		Parameter	Caption	Categories	Value		
📕 Menu 10 : Status and Trips	3.70.000 P Register	0		3.71.000	Q Register		0	*	
Menu 11 : Miscellaneous	3.70.001 P Register	12	\$	3.71.001	Q Register		12		
Menu 12 : User Functions 2 an	3 70 002 P Register	0		3.71.002	O Register		0		

### **Control Techniques**

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**6: Example ramp test program (extension)** - using the PLC to process and transfer a ramp function over PROFINET to a mapped drive parameter [or option module parameter if SI-PROFINET V2 used]. This program is written entirely using Structured Control Language (SCL), which can be copied and pasted into the relevant program blocks if required (ensure correct formatting of any copied text using screenshots provided).

1: Parameter modules used for this program – the mapping used in this program is shown below, and uses a Standard parameter module, to output to the 32-bit RW long-integer drive register #20.22. However, if required, this can simply be adjusted to output the ramp function to any parameter using the standard modules (following <u>Step 3.10</u>) or Flexible modules if necessary (following <u>Step 4</u>). <u>NOTE</u>: if the SI-PROFINET V2 module is used the ramp function can be outputted to an option module if required (following the setup in <u>Step 4.3</u>).



**2: Tags needed for this program** - as discussed previously in <u>Step 5.2</u>, it is necessary to manually add PLC tags to any mappings used in a program on the PLC to ensure they can be used as both inputs/outputs to blocks and functions. The PLC tag **out1** uses the memory location of the output mapping created above in <u>Step 6.1</u>, and is configured following the process shown in <u>Step 5.2</u>. It is also necessary to create any local variables required for the program, these are; a **max** variable (of Type 'Word' - for setting the limit on the highest ramp value) and **inc** variable (of type 'SInt' - for storing the current increment/decrement value for the ramp function).

Pl	PLC tags											
	-	Name 🔺	Tag table	Data type	Address	Retain	Visibl	Acces	Comment			
1		inc	Default tag table	SInt	%MB72							
2		max	Default tag table	Word	%MW76		$\sim$	<b>~</b>				
3		out1	Default tag table	DWord	%QD68		<b>~</b>	<b>~</b>				
4		<add new=""></add>	-	•			<b>V</b>	<b>V</b>				





**5: Download and Testing** – the program and updated hardware configuration can then be downloaded to the PLC following <u>Step 5.4</u>. The parameter used for the output mapping should then be observed on the keypad or in Unidrive M connect, where it should be seen that the values increase rapidly to your set maximum value before the sign of the increment value flips to bring the value back down zero, before the process repeats. Due to the fast CPU in the PLC and the slower update rate on the keypad display / Unidrive M connect, the values will often jump in large steps. Regardless if this output is viewed on the drive it shows that the PROFINET configuration, PLC program and mappings have been configured correctly.

### Appendix A: Importing GSDML Files into Simatic Step 7 / TIA Portal V12

A GSDML (General Station Description Markup Language) file is required to describe the drive interface to a PROFINET controller or PLC. This is an XML file, the structure of which is specified by the PROFIBUS INTERNATIONAL organization (www.profibus.org).

The GSDML file is used in conjunction with the network configuration software to configure the SI-PROFINET RT module for cyclic data exchange. All relevant drive parameters are available as a 'module' to be added to the cyclic data 'slots'. A non-specific 'module' is also provided so that the user can allocate a parameter within the drive (or option module), that is not directly available as a specific 'module'. Some 'modules' require the slot position to be specified and the menu and parameter to be specified. These options will be available from a drop-down selection list within the 'Parameters' tab of the 'module' properties.

The GSDML files required (for either SI-PROFINET RT or SI-PROFINET V2) can be downloaded from the Control Techniques Support Suite website, providing you are registered, or alternatively, requested from your local Control Techniques Drive Centre or supplier.

#### NOTE

Ensure the correct version of GSDML file is used for both the module used (hardware and firmware version) and the version of Siemens STEP7 or TIA portal used (there is two versions of GSDML files available for each hardware setup, one to support up to Siemens STEP7 V5.5 SP1 and TIA Portal V11 and the other supports from Siemens STEP7 V5.5 SP2 and TIA Portal V12 upwards).

#### **GSDML Files Installation**

This procedure only needs to be performed once or after GSDML file updates.

- 1. Launch the "TIA Portal V12" software.
- 2. Create or open an existing project (see <u>Step 3.1</u>).
- 3. Enter *project view* (see <u>Step 3.2</u>).
- 4. Launch the Hardware catalog by double clicking on "**Devices & Networks**" in the project tree, then selecting the "**Hardware catalog**" from the right hand sidebar.

Weight Siemens         SetupTest           Project         Edit         View         Insert         Online         Op           Image: The project	otions X 5		Totally Integ	_ t rated Automation PORTAL	⊐ X			∎× L
Save project  Sa		⇒	Network view	PORTAL	✓ Hardware catalog I Online tools III Tasks I Lib	<u>⊨</u> ►	PORTA Hardware catalog  PORTA Options Catalog Catalog Catalog Filter Filte	Hardware catalog I Online tools I Tasks

5. In this catalog it should be checked that the required hardware is not already present, to ensure that the manufacturer specific GSDML installation is even required.

₩ Siemens - SetupTest		_ <b>_ X</b>
Project Edit View Insert Online Project ≣ Save project ■ 💥 🗎	Optio <u>n</u> s Iools <u>W</u> indow <u>H</u> elp ∦ <u>S</u> ettings	Go online 🖉 Go offline 🕨 Totally Integrated Automation PORTAL
Project tree	Support <u>p</u> ackages	_ # = X 🗸
Devices	Install general station <u>d</u> escription file (GSD)	Topology view 👗 Network view 🔐 Device view 🕮
▼ SetunTest	Global libraries	►
Add new device		<u>≡</u>
🖞 🕨 🙀 Common data		ا گا ا
Documentation settings		

6. Select **Options** from the menu followed by **Install general station description file (GSD)**.

7. In the "**Install generic station description files**" dialog box, select the folder in which the GSDML files are stored. *Note: the GSD files are often provided in zipped folders, these must be properly extracted before they can be installed.* 

Install general station descr Source path: C:\Users\RICH.	iption file JO01\Documents\Profir	et Setup guid	le\Firmware, config files (	etc\si-profin	Browse For Folder
Content of imported path					
File	Version	Language	Status	Info	Profibus Setup guide
GSDML-V2.3-CT-UniDriveM-2	0140 8/21/2014	English	Not yet installed	Control Tec	
					Saved Games
			Inst	all Cancel	OK Cancel

8. Choose one or more of the .xml files from the displayed list, before clicking the **Install** button.

Install general station description	file			×
Source path: C:\Users\RICHJO01\Do	ocuments\Profin	iet Setup guid	de\Firmware, config files (	etc\si-profin
Content of imported path				
File	Version	Language	Status	Info
GSDML-V2.2-CT-UniDriveM-20140	8/21/2014	English	Not yet installed	Control Tec
			Inst	Cancel

9. The files will then be installed and the Hardware catalog will be refreshed. Note: If any issues occurred in installation the log file can be saved using the **"Save log"** to track down where the errors have occurred.

Install general station description file 🛛 🗙	Install general station description file 🛛 🗙
Source path: C:USersIRICHJOO1\DocumentsIProfinet Setup guideIFirmware, config files etclsi-profin	
Content of imported path	Installation result
File     Version     Lanouage     Status     Info       Installation     ntrol Tec     ntrol Tec       25%     Installation of GSD files       The installation may take some time.	Message     Installation was completed successfully.
Cancel	Save log Install additional files Close

10. You will find the new DP slave(s) installed by means of the GSDML file in a new folder in the hardware catalog, as illustrated below.

- Totally Integrated Automation PORTAL	א יי -
Hardware catalog 🛛 🗖 🛛 🕨	
Options	🖶 Har
✓ Catalog	dwa
init init	Ire ca
Filter	티
Controllers	ĕ
▶ 🔄 HMI	
PC systems	<b>V</b> .
Drives & starters	9
Network components	lin
Detecting & Monitoring	t
Distributed I/O	slo
Field devices	
	H
Siemens AG	Isk
Control Techniques	S
Control Techniques	ы
UniDrive M	
Encoders	bra
▶ 🛅 Gateway	rie
Ident Systems	S
▶ 🛅 Sensors	
PROFIBUS DP	

#### NOTE

Installation of a GSDML file cannot be undone from within STEP7 / TIA Portal. For use of a different release of GSDML files please refer to the built in information system to enable the revision of GSDML file used to be amended. Found under:

*Contents > Editing devices and network > Configuring devices and networks > Creating Configurations*