# Training document for the company-wide automation solution Totally Integrated Automation (T I A)

### **MODULE D1**

### AS- Interface with the SIMATIC S7-300 and the

### CP342-2 / CP343-2

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The following symbols stand for the specified modules:



#### 1. FORWARD



The module D3 is assigned content wise to Industrial field bus systems.



#### Learning goal:

In this module, the reader should learn the fundamental functions of the AS-Interface and interface CP342-2 for the SIMATIC S7-300. A simple example is generated in the following steps:

- Commissioning of the AS-Interface with the CP342-2
- Generation of a project for a PLC SIMATIC S7-300
- Writing an example program
- Debugging the task with the CP342-2 and the SIMATIC S7- 300

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#### Requirements:

For the successful use of this module, the following knowledge is assumed:

- Knowledge in the use of Windows 95/98/2000/ME/NT4.0
- Basics of PLC- Programming with STEP 7 (e.g. Module A3 'Startup' PLC programming with STEP 7)

#### Required hardware and software

- 1 PC, Operating system Windows 95/98/2000/ME/NT4.0 with
  - Minimal: 133MHz and 64MB RAM, approx. 150 MB free hard disk space
  - Optimal: 500MHz and 128MB RAM, approx. 150 MB free hard disk space
- 2 Software STEP 7 V 5.x
- 3 MPI- Interface for the PC (e.g. PC- Adapter)
- 4 PLC SIMATIC S7-300
  - Example configuration:
    - Power supply: PS 307 2A
    - CPU: CPU 314
    - Digital inputs: DI 16x DC24V
    - Digital outputs: DO 16x DC24V / 0.5 A
    - CP 342-2 AS-Interface
- 5 AS-I- Slave 4 inputs allocated with 2 buttons
- 6 AS-I- Slave 4 outputs allocated with 5/2-solenoid valve for the triggering of a cylinder
- 7 AS-Interface power supply 30V
- 8 AS-Interface yellow data cable
- 9 Address device for AS-I slaves



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#### 2. NOTES FOR THE OPERATION OF THE CP 342-2 AND THE AS- INTERFACE

#### 2.1 TECHNICAL DATA TO THE AS- INTERFACE

The Actuator-Sensor-Interface (AS-I) serves as the information transmission in the lowest field area and like the PROFIBUS, is an open standard. A multitude of manufactures offer products and interfaces to the AS-Interface. The AS-Interface enables a simple and extremely cost efficient integration of sensors and actors in the industrial communication and provides these sensors and actors simultaneously with the important auxiliary power. With this system, predominately binary sensors and actors are operated with the controllers. So far it is important for process signals that arise before a location to transfer with conventional parallel wiring over in-/output modules into the controller. AS-I replaces the expensive cable tree by a simple and complete unprotected 2 wire cable for all sensors and actors. Through the robust design in a degree of protection IP65 or IP67, the AS-Interface increases straight in the lowest field area of usual and hard operating conditions.

The technical data and transmission protocols of the AS -Interface are specified in the Norm EN 50 295.

The following performance data for the AS-Interface is specified here:

- Max. 31 AS-I nodes with 4 Bit I/O user data
- Max. 124 I/O sensors and actors
- · Access processing with cyclic polling in the master/slave process
- Max. cycle time 5ms
- Error safe identification and iteration of faulty frames.
- Transmission medium is a usual 2 wire cable (2 x 1,5 mm<sup>2</sup>) for data and a max. of 2A auxiliary power per AS-I pro AS-I cable. The power supply consists of 30 V DC. The signal of the data transmission is modulated. An additional power supply of 24V DC (auxiliary power) is possible.
- Connection and assembly of the AS-I components in an insulation displacement method.
- AS-I slave module with integrated circuit (AS-I chip) that requires no processor and no software. This results in an approximate, delay free processing of the frames and a small construction volume of the slave
- Special AS-I sensors and actors are directly integrated with the AS-I chips.
- Flexible configuration possibilities like in the conduit with cables, stars or tree structures Max. wire length of 100m or 300m (with repeaters)

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#### 2.2 CONFIGURATION OF THE AS-INTERFACE





Additionally the addressing of the AS-I slaves requires one more addressing device:



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The AS-Interface is a single-master system. Therefore there always exists exactly one master and up to 31 slaves in each system with the CP342-2. If more slaves are required, an additional AS-Interface system with an additional master must be inserted.

#### Basic components of an AS-Interface configuration:

The AS-Interfaces occurs modularly under the use of the following components:

• Power supply 30V DC (Power supply)



The 30V power supply is attached directly to the data circuit.

• AS-I data circuit as unprotected 2 wire cable.



The connection of the AS-I components takes place in an insulation displacement method, where the AS-I cable is flattened in order to avoid wiring errors by assembly.

• AS-I master as a connection device for the controlling by the user or a higher level bus system with the corresponding master chips.



Over the AS-I master, the user can have access to the I/O data of the AS-I slave. This occurs at the S7-300 in the user program of the CPU.

AS-I slaves with slave ASIC



For the AS-Interface, there is a large choice in slaves from different manufacturers. Each slave must be assigned by the commissioning of a target AS-I address that is then saved there. The addressing occurs either with the configuration device or over the master in which each slave is written a single connection by addressed frame. This also functions when <u>one</u> slave is exchanged.

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Configuration device for the setting of the slave addresses



With the programming and service unit (PSG), the AS-I slave addresses can be set very easily.

• Optional: Repeater for additional wire length up to 300 m (100m without repeater)



In order to implement a bus configuration with a larger expansion (e.g. by material systems), the repeaters must be interposed. This is connected with the AS-I data circuit.

• Optional: additional power supply 24V DC (power supply) for auxiliary power



When an AS-I slave requires more as 100mA or all slaves require more than 2A of auxiliary power pro AS-I cable, an additional power supply of 24V DC is required. This is connected over the AS-I network cable (black) with the auxiliary power contacts of the slaves.

• AS-I network cable for the auxiliary power as an unprotected black 2 wire cable.



The connection of the auxiliary power occurs in an insulation displacement method where the AS-I cable is flattened in order to avoid wire errors by assembly.

Forward	Notes	Commission	STEP 7- Program	Debug

#### 2.3 TECHNICAL DATA TO THE CP 342-2



The AS-Interface master CP342-2 can be used in the S7-300 or also in a PROFIBUS slave ET 200M by any activation either in the central device or in one of the 3 additional devices and occupies a slot there.

It offers the following functions and characteristics:

- Simpler operation in the I/O address range of the SIMATIC S7-300 and ET 200M
- Configuration of the CPs is not necessary
- Triggering of up to 31 AS-Interface slaves corresponding to the AS-I specification V2.0
- Up to 248 binary elements by the operation of triggerable bi-directional slaves
- Monitoring of the power supply on the AS-Interface cable
- Requires 1 Slot
- 16 bytes are occupied in the I/O operation in the analog address place
- LEDs for the displaying of operation states such as the operational readiness of the connected slaves
- Button for the switching of the operation mode and for the altering of the current configuration
- Connection possibility for the AS-Interface cable over the standard front connector
- Monitoring of the supply voltage on the AS-Interface cable

	Forward	Notes	Commission	STEP 7- Program	Debug
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#### 3. COMMISSIONING OF THE AS-INTERFACE WITH THE CP324-2

The AS-Interface Master CP342-2 can be set in the SIMATIC S7-300 by any activation either in the central device or in one of the 3 additional devices and it occupies a slot there.

The CP342-2 recognizes two modes:

#### Configuration mode:

This mode is set in the delivered state of the CP342-2 (LED CM).

The configuration mode serves for the commissioning of an AS-I installation. In this mode, the CP342-2 can exchange data with each of the connected slaves on the AS-I cable. New incoming slaves are quickly recognized from the master and recorded in the cyclic data exchange.

#### • Protected mode:

One switches into protected mode with the SET- Button.

In this mode the CP342-2 exchanges data only with slaves that are "configured". "Configured" means that slave addresses stored in the CP and configuration data stored in the CP agree with the values of the appropriate slaves.

	Forward	Notes	Commission	STEP 7- Program	Debug
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The following steps must be followed by the user in to bring the AS-Interface into operation with the CP342-2, to setup a project and to set the hardware configuration with the CP342-2 AS-I.

1. First all slaves must be assigned explicit addresses with the programming and service unit (PSG):



- Then the transfer of the yellow data cable and the connection of all slaves of the power supply (30V DC) and the master as well the repeater in the insulation displacement method occur. Therefore the profile of the data circuit must be accounted for.
- 3. When an additional power supply (24V DC) is required, it can be connected to the AS-I slaves with the black AS-I power cable. Therefore the profile must be accounted for by the connection in the insulation displacement method of the power cable.
- 4. Finally you can connect the sensors to the M12 connector for the AS-I slaves and they will be mounted to the slaves.
- 5. Now the AS-I line is ready and the CP342-2 can be setup and parameterized.

		Forward	Notes	Commission	STEP 7- Program	Debug
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- 6. In order to bring the S7-300 with the CP342-2 into operation, you must switch the mode switch on the CPU to STOP.
- Bring the CP342-2 into the configuration mode in which you activate the SET- Button of the CP342-2. The display CM lights now and the recognized slaves are displayed on the diagnostic LEDs of the CP342-2.

![](_page_12_Picture_4.jpeg)

#### Note:

You can also insert or remove additional slaves on the AS-I cable. Newly inserted slaves are quickly recognized and activated from the CP3423-2.

- 8. Activate the SET- Button of the CP342-2. The CP now stores those activated slaves that were indicated. The "actual configuration" as non volatile preset configuration is switched in the protected operation. The LED "CM" lights.
- 9. Now switch the mode switch of the CPU to RUN-P. The system startup of the CP342-2 is now complete .

Forward	Notes	Commission	STEP 7- Program	Debug	
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![](_page_13_Picture_2.jpeg)

Now the hardware configuration can be set with the Software STEP 7.

10. The central tool in STEP 7 is the **SIMATIC Manager**, which is opened here with a double click ( $\rightarrow$  SIMATIC Manager).

![](_page_13_Picture_5.jpeg)

11. STEP 7- Programs are administered in projects . Such a project will be created (  $\rightarrow$  File  $\rightarrow$  New)

SIMATIC Manager	
<u>File</u> PLC <u>View Options</u> <u>Window H</u> elp	
<u>N</u> ew	Ctrl+N
'New Project' Wi <u>z</u> ard	~
Upen Open Version 1 Project	Ctrl+U
S7 Memory Card Memory Card File	
Melloy Cald Tile	,
Delete Reorganize	
Manage	
Árchive	
Retrie <u>v</u> e	
Page Setup	
Labeling fields	
P <u>r</u> int Setup	
<u>1</u> tester (Project) C:\Siemens\Step7\S7proj\tester	
<u>2</u> Convert (Project) C:\Siemens\Step7\S7proj\Convert 2 Testarsiset, EP (Project) C:\Siemens\Step7\S7proj\Convert	
3 Testproject_FB (Project) ~ C:\Siemens\Step7\S7proj\Testproj 4 Testproject_DB (Project) ~ C:\Siemens\Step7\S7proj\Testproj	
	6 h - E 4
	AI(+F4
Creates a new project or a new library.	

Forward	Notes	Commission	STEP 7- Program	Debug	

![](_page_14_Picture_1.jpeg)

12. Give the Name ASI\_CP342\_2 to the project (  $\rightarrow$  ASI\_CP342\_2  $\rightarrow$  OK)

Ne	W		×
	User projects Libra	ies	
	Name	Storage path	▲
	CP342_CP342 CP342_CP342 CP342_FDL CP342_FDL CPU315_CPU315 Cutting apparatus Cutting apparatus Cutting apparatus ET200L	C:\Siemens\Step7\S7proj\Cp3 C:\Siemens\Step7\S7proj\Cp3 C:\Siemens\Step7\S7proj\Cp3 C:\Siemens\Step7\S7proj\Cp3 C:\Siemens\Step7\S7proj\Cp4 C:\Siemens\Step7\S7proj\Cutt C:\Siemens\Step7\S7proj\Cutt C:\Siemens\Step7\S7proj\Cutt C:\Siemens\Step7\S7proj\Et20	42_cp 42_1 42_fd 42_2 315_c ing_2 ing_ est 001
N	la <u>m</u> e:		<u>Т</u> уре:
7	ASI_CP342_2		Project 💌
	torage location (path) C:\Siemens\Step7\S7	): ?proj	<u>B</u> rowse
	OK	Cance	I Help

13. Then insert a SIMATIC 300-Station ( $\rightarrow$  Insert  $\rightarrow$  Station  $\rightarrow$  SIMATIC 300-Station).

![](_page_14_Picture_5.jpeg)

Inserts SIMATIC 300 Station at the cursor position.

Forward         Notes         Commission         STEP 7- Program         Debug
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![](_page_15_Picture_2.jpeg)

14. Open the configuration tool for the **Hardware** with a double click ( $\rightarrow$  Hardware).

SIMATIC Manager - ASI_CP342_2	
<u>File Edit Insert PLC ⊻iew Options Window H</u> elp	
	🗈 < No Filter > 🔽 🌠 🔡 🕅 🕺
SI_CP342_2 C:\Siemens\Step7\S7proj\Asi_cp34	
ASI_CP342_2 SIMATIC 300(1)	
Press F1 to get Help.	

15. Open the hardware catalog with a click on the symbol  $(\rightarrow \square)$ . There you will see the directories are divided into the following:

- PROFIBUS-DP, SIMATIC 300, SIMATIC 400 and SIMATIC PC Based Control, all module racks, modules and interface modules for the configuration of your hardware configuration are made available.

![](_page_15_Picture_7.jpeg)

![](_page_16_Picture_2.jpeg)

16. Insert a **Rail** with a double click(  $\rightarrow$  SIMATIC 300  $\rightarrow$  RACK-300  $\rightarrow$  Rail).

![](_page_16_Figure_4.jpeg)

After the insert, a configurations table for the configuration of the Rack 0 appears automatically.

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![](_page_17_Picture_2.jpeg)

17. Now all modules can be chosen out of the hardware catalog and inserted into the configuration table and are also inserted into your rack.

To insert, you must click on the name of the respective module, hold the mouse button and Drag & Drop the module into a line of the configurations table. We will begin with the power supply **PS 307 2A** ( $\rightarrow$  SIMATIC 300  $\rightarrow$  PS-300  $\rightarrow$  PS 307 2A).

HW Config - [SIMATIC 300(1)	(Configuration) ASI_CP3	42_2]			
<b>©</b> ¶ <u>S</u> tation <u>E</u> dit <u>I</u> nsert <u>P</u> LC <u>V</u> ie	w <u>O</u> ptions <u>W</u> indow <u>H</u> elp				_B×
		<b>8</b>			
(0) UR      1     2     3     4     5     6     7     R					Profile         Standard                ■             PROFIBUS DP             ■             PROFIBUS-PA                 ■             PROFIBUS-PA                 ■             ■
(0) UR					
Slot         Module           1	Order number	Firmware	M I 	Q C	
Insertion possible					Chg //

![](_page_17_Picture_6.jpeg)

**Note:** If your hardware differs from what is shown above, then you must select the appropriate modules from the catalog and insert them into the rack. The part numbers of the individual modules, which are found on the components, are indicated in the footer of the catalog..

Forward	Notes	Commission	STEP 7- Program	Debug

![](_page_18_Picture_2.jpeg)

18. In the next step, we drop the CPU 315-2DP into the second card location. This allows for the part number and version of the CPU to be read off ( $\rightarrow$  SIMATIC 300  $\rightarrow$  CPU-300  $\rightarrow$  CPU 315-2DP  $\rightarrow$  6ES7 315-2AF03-0AB0  $\rightarrow$  V1.1 ).

HW Config - [SIMATIC 300(1)	(Configuration) ASI_CP	342_2]					- O ×
Interpret Station Edit Insert PLC View	v <u>O</u> ptions <u>W</u> indow <u>H</u> elp						_ 뭔 ㅗ
		<b>22</b> N2					
Image: Display state     Image: Display state       1     Image: PS 307 2A       2     3       3     4       5     6       7     2       8     •							Big         CPU 312           Big         CPU 312C           Big         CPU 313C           Big         CPU 313C-2 DP           Big         CPU 313C-2 PP           Big         CPU 313C-2 PP           Big         CPU 314C-2 PP           Big         CPU 314C-2 DP           Big         CPU 315           Big         CPU 315-2 DP           Big         CPU 3
						<u> </u>	6ES7 315-2AF02-0AB0
(0) UR		1-		. 1	- 1	- 1	E
Slot Module	Urder number 6ES7 307-18A00-0AA0	Firmware	M	1	ų	U	V1.2
2	OF OLIVER DATE DATE DATE DATE DATE DATE DATE DATE						
3							6ES7 315-2AF03-0AB0 ▲ ₹<
4							Instructions; MPI+ DP connection
<u>1</u>						_	(DP master or DP slave); multi-tier
Press F1 to get Help.							Chg //

19. In the following window, the integrated PROFIBUS interface can be adjusted. Here we do not use one so we accept the setting with  $OK( \rightarrow OK )$ .

Properties -	PROFIBUS	interface	DP (R0/S2.1)			×
General	Parameters					
<u>A</u> ddress:				If a subnet is selecter the next available ad	d, dress is suggested.	
<u>S</u> ubnet:						
not	networked				<u>N</u> ew	
					Properties	
					Dejete	
OK				Abb	rechen Hilfe	

Forward	Notes	Commission	STEP 7- Program	Debug

![](_page_19_Picture_2.jpeg)

20. In the next step we see the input module for 16 inputs on the fourth slot . Now the order number and version of the model can be read off the front. ( $\rightarrow$  SIMATIC 300  $\rightarrow$  SM-300  $\rightarrow$  DI-300  $\rightarrow$  SM 321 DI16xDC24V).

![](_page_19_Figure_4.jpeg)

![](_page_19_Picture_5.jpeg)

**Note:** Slot number 3 is reserved for interface modules and remains empty. The order number of the module is displayed in the footer of the catalog.

Forward	Notes	Commission	STEP 7- Program	Debug	

![](_page_20_Picture_1.jpeg)

![](_page_20_Picture_2.jpeg)

21. In the next step we see the output module for 16 outputs on the fifth slot. Now the order number and version of the model can be read off the front ( $\rightarrow$  SIMATIC 300  $\rightarrow$  SM-300  $\rightarrow$  DO-300  $\rightarrow$  SM 322 DO16xDC24V/0.5A).

🔣 HW Config - [SIMATIC 300(1)	(Configuration) ASI_CP3	42_2]						. 🗆 ×
Q0 Station Edit Insert PLC Vie	w <u>O</u> ptions <u>W</u> indow <u>H</u> elp							- 8 ×
	🗈 🏜 🛍 🖪	쁂 💦						
Image: State of the s						•	Profile         Standard           D0-300         SM 322 D016xAC120V/0.5A           SM 322 D016xAC120V/0.5A         SM 322 D016xAC120V/0.5A           SM 322 D016xAC120V/0.5A         SM 322 D016xDC24V/0.5A           SM 322 D016xDC24V/0.5A         SM 322 D016xDC24V/0.5A           SM 322 D016xDC24V/0.5A         SM 322 D016xDC24V/0.5A           SM 322 D016xDC24V/0.5A         SM 322 D016xRel.AC120V/2           SM 322 D016xRel.AC120V/2         SM 322 D016xC24V/0.5A           SM 322 D016xC120V/1A         SM 322 D016xC120V/1A           SM 322 D032xDC24V/0.5A         SM 322 D032xDC24V/0.5A           SM 322 D04xDC15V/20mA, E         SM 322 D04xDC15V/20mA, E           SM 322 D04xDC15V/20mA, E         SM 322 D08xAC120V/1A	20,54 307
(0) UR							SM 322 D08xAC230V/2A	
Slot 🚺 Module	Order number	Firmware	M	1	Q	C	SM 322 D08xDC24V/0.5A	
1 S 307 2A	6ES7 307-1BA00-0AA0							
2 CPU 315-2 DP	6ES7 315-2AF03-0AB0	V1.1	2			_		
X2 DP				1023		_	6ES7 322-1BH01-0AA0	_ ₹ <u>≺</u>
4 DI16xDC24V	6ES7 321-78H80-0AB0			01		-	A, grouping 8	。 
Insertion possible								Chg //

![](_page_20_Picture_5.jpeg)

Note: The order number of the module is displayed in the footer of the catalog.

	Forward	Notes	Commission	STEP 7- Program	Debug	
_						

![](_page_21_Picture_2.jpeg)

22. In the next step we see the communication processor for the AS-Interface CP342-2 AS-i in the sixth slot. Now the order number and version of the model can be read off the front (→ SIMATIC 300 → CP-300 → AS-Interface → CP 342-2 AS-i).

![](_page_21_Figure_4.jpeg)

![](_page_21_Picture_5.jpeg)

Note: The order number of the module is displayed in the footer of the catalog.

Forward	Notes	Commission	STEP 7- Program	Debug

![](_page_22_Picture_2.jpeg)

23. The address assignment of the CP342-2 occurs automatically and is bounded to the slots. The addresses can be seen in the lower window and should be noted. The addresses of the CP342-2 lie in the analog address area of the CPU. It occupies the peripheral input values PIW288, PIW290, PIW292 and PIW 302 and the peripheral output values PQW288, PQW290, PQW292 and PQW 302.

HW Config - [SIMATIC 30	00(1) (Configuration) A	6I_CP34	2_2]				
<b>DU</b> <u>Station</u> <u>Edit</u> <u>Insert</u> <u>PLC</u>	<u>V</u> iew <u>O</u> ptions <u>W</u> indow	<u>H</u> elp					_리꼬
D 🖻 🔓 🖳 🖉	🖻 🗈 🏙 🏜 🖻		R 1				
Image: CPU 315-2 DP           X2         DP           3         DI16xDC24V/0.5x           6         CPU 342-2           7         8           3         1						<u>*</u> 	Profile         Standard
(0) UR							
Slot 🚺 Module	Order number	Firmw	MPI ad	I addr	Q addr	Comment	i PS-300
1 PS 307 2A	6ES7 307-1BA00-0AA0						
2 CPU 315-2 DP	6ES7 315-2AF03-0AB0	V1.1	2				
<u>X2</u> DP				1023*			SIMATIC 200
3							SIMATIC PC Station
4 DI16xDC24V	6557 321-78H80-0AB0			101	4 5		
5 DU16xDL24V/0.5A	6ES7 322-TBHUT-UAAU		-	200, 202	45		
b 75 LP 342-2	BGK7 342-2AHUT-UXAU		-	288303	288303		
			+			<u> </u>	
			-				Basic module for AS-i attachment
			1				
	1	-	1	1	1	L	
Press F1 to get Help.							Chg //

Forward	Notes	Commission	STEP 7- Program	Debug	
					-

![](_page_23_Picture_2.jpeg)

24. The configuration table is now compiled and saved with a click on  $\square$  and then downloaded into the PLC with  $\square$ . The switch mode of the CPU must be on STOP! ( $\rightarrow \square \rightarrow \square$ )

HW Config - [SIMATIC 30	DO(1) (Configuration) A	5I_CP34	2_2]				
ung Station Edit Insert PLC	View Options Window	Help					_ 린 쓰
		J 🗈 🤰	🖁 💦				
(0) UR						<b>^</b>	Profile Standard
2 CPU 315-2 DP X2 DP 3							PROFIBUS-PA
4 DI16xDC24V 5 D016xDC24V/0.54 6 H CP 342-2	A						⊡-⊡ C7 ⊡-⊡ CP-300 ⊡-⊡ AS-Interface
7							
<u>1</u>						_	
•						• •	
	_						- 🖻 Gateway
🗲 🔿 (0) UR							
Slot 🚺 Module	Order number	Firmw	MPI ad	l addr	Q addr	Comment	🕀 🧰 PS-300
1 PS 307 2A	6ES7 307-1BA00-0AA0						⊕
2 CPU 315-2 DP	6ES7 315-2AF03-0AB0	V1.1	2				E
$\frac{X2'}{2}$ $DF'$				1125*			E IMATIC PC Based Control 300/400
4 DI16xDC24V	6ES7 321-78H80-0AB0			01			
5 D016xDC24V/0.5A	6ES7 322-1BH01-0AA0				45		
6 🗧 🗧 CP 342-2	6GK7 342-2AH01-0XA0			288303	288303		
7							
8							
3 10							6GK7 342-2AH01-0XA0 €≤
11							
	1		1	1	1	·	
Press F1 to get Help.							Chg //

Forward	Notes	Commission	STEP 7- Program	Debug

![](_page_24_Picture_1.jpeg)

25. The CPU 315-2DP is then activated as the target module for the download activity ( $\rightarrow$  OK).

Select Target Module		×
Module	Racks Slot	
Select <u>A</u> ll		
OK	Cancel	Help

26. Then the MPI address of the CPU for the attachment of the programming connection is accepted with **OK** ( $\rightarrow$  OK).

Select Stat	ion Address
Over which	station address is the programming device connected to the module CPU 315-2 DP?
<u>R</u> ack:	
<u>S</u> lot:	2
Target Stat	ion: 💿 Local
, algor ora	C Can be reached by means of gateway
Conn	ection to target station
Туре	Address
MPI	2
	-
ОК	Cancel Help

![](_page_24_Picture_6.jpeg)

**Note:** This setting is only relevant when more CPUs are attached to the programming device over an MPI network. Here the desired CPU for the download of the configuration can be chosen.

Forward Notes Commission STEP 7- P	Program Debug
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#### 4. WRITING A STEP 7- PROGRAM

![](_page_25_Picture_3.jpeg)

The to be debugged program is written here in statement list (STL). The program should control a stamp cylinder over a spring-return cocked valve 'Y1'. A button 'S1' drives this cylinder forward. A button 'S2' drives this cylinder back again.

#### Assignment list:

l 65.0	S1	Button for cylinder extraction (AS-I slave address 3, IN1)
l 65.1	S2	Button for cylinder retraction (AS-I slave address 3, IN 2)
Q 66.4	Y1	Valve stamp cylinder (AS-I slave address 4, OUT 1)

In order to implement this program with the AS-Interface, you must follow the following steps.

![](_page_25_Picture_8.jpeg)

27. In **SIMATIC Manager** highlight the folder **Blocks** ( $\rightarrow$  SIMATIC Manager  $\rightarrow$ Blocks).

SIMATIC Manager - ASI_CP342	2		_ 🗆 ×
<u>File Edit Insert PLC View Option</u>	is <u>Window</u> Help		
	0 😰 💼 🖭 📰 🏛 🔍 No Filter >		
ASI_CP342_2 C:\Siemens\S	tep7\S7proj\Asi_cp34	-	- 🗆 🗡
ASI_CP342_2  SIMATIC 300(1)  CPU 3152 DP  S7 Program(1)  Sources  Sources  Sources  Sources  State	System data OB1		
Press F1 to get Help.			

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![](_page_26_Picture_2.jpeg)

28. From the SIMATIC Manager, open the data block **OB1** with a double click in the editor LAD, STL, FBD: Program blocks ( $\rightarrow$  OB1)

SIMATIC Manager - ASI_CP342	2_2 Ins Window Help	
	10	⊻ <u></u> ⊻ <b>2</b> 00 <b>№</b>
ASI_CP342_2 C:\Siemens\S	Step7\S7proj\Asi_cp34	
Image: Simple state st	System data	
Press F1 to get Help.		

29. Optional: Enter the properties of the OB1 for documentation and accept with OK (  $\rightarrow$ OK).

Properties - Organization	1 Block		×
General - Part 1 General	- Part 2 Calls Attributes		
<u>N</u> ame:	OB1		
<u>S</u> ymbolic Name:			
Symbol <u>C</u> omment:			
Created in Language:	STL		
Project path:			1
Storage location of project:	C:\Siemens\Step7\S7proj\Asi_cp	1	
Data analad	Code	Interface	
Last modified:	07/02/2001 03:03:43	15/02/1996 04:51:12	
C <u>o</u> mment:	"Main Program Sweep (Cycle)"	×	
OK		Cancel	Help

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e.g.:

![](_page_27_Picture_2.jpeg)

The CP342-2 occupies 16 inputs and 16 outputs in the I/O analog address range of the PLC. The start address is assigned through a slot of the CP342-2 and can be extracted from the configurations table (here PIW288 and PQW 288).

From the in- and outputs of the AS-I slaves, the SIMATIC S7-300 can be accessed like it is from the standard modules of the analog peripherals through S7 download and transfer instructions. This access can only be word or double word-oriented from system intrinsic principles.

L	PIW X	//Load peripheral input word X
L	PID X	//Load peripheral input double word X
Т	PQW X	//Transfer peripheral output word X
Т	PQD X	// Transfer peripheral output double word X

Thus no access can occur here directly on individual bits in the STEP 7 program.

With load/transfer instructions you can transmit the inputs of the AS-I slaves in any words (Data, memory bits, inputs).

Using the same method, you can transmit any words (Data, memory bits, outputs) with the load/transfer instructions into the outputs of the AS-I slaves.

The input signals of the AS-Interface should be downloaded to the input byte 64 in the process-image. They are in the address area of the CP342-2 which can be read from the hardware configuration (here from PIW288).

The output signals for the AS-Interface area readout to the output byte 64 from the process-image. These signals must be read from the hardware configuration and then must be written into the address area of the CP342-2 (here from PQW288).

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![](_page_28_Picture_1.jpeg)

1

Four bits (a nibble) are assigned to each slave on the AS-I line. The assignment of the individual slaves to the address is as follows:

Inputs		IN /	OUT		IN / OUT				Address	Outputs
PII	7	6	5	4	3	2	1	0	CP342-2	PIQ
	In4	In3	ln2	ln1	In4	In3	ln2	ln1	(PI/PQ)	
	Out4	Out3	Out2	Out1	Out4	Out3	Out2	Out1		
64	Reserved for diagnostics					Slav	/e01		288	64
65		Slav	/e02			Slav	/e03		289	65
66		Slav	/e04			Slav	/e05		290	66
67		Slav	/e06			Slav	/e07		291	67
68		Slav	/e08		Slave09			292	68	
69		Slav	/e10		Slave11			293	69	
70		Slav	/e12		Slave13				294	70
71		Slav	/e14		Slave15				295	71
72		Slav	/e16		Slave17			296	72	
73		Slav	/e18		Slave19			297	73	
74		Slav	/e20		Slave21			298	74	
75		Slav	/e22		Slave23				299	75
76		Slav	/e24		Slave25				300	76
77		Slav	/e26		Slave27			301	77	
78		Slav	/e28		Slave29			302	78	
79		Slav	/e30			Slav	/e31		303	79

![](_page_28_Picture_5.jpeg)

Note: This assignment applies for the inputs and outputs to the AS-I slaves.

Now, for example, the address of the first output in the AS-I slave 4 to be acquired is given as follows:Byte address for Slave04 from the PIQ:66Bit address for Out1:4

Resulting address:

Q 66.4

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Note:

![](_page_29_Picture_2.jpeg)

30. With LAD, STL, FBD: Program blocks, you now have an editor which gives you the possibility to generate your STEP 7- Program. Here the organization block OB1 was already opened with the first network.

 $\triangle$ 

In the first network, the input signals of the AS-Interface are downloaded here into the process-image input table (PII) starting from input word IW64. In the last network the signals from the process-image output table starting from output word QW64 area readout and written in the outputs of the AS-Interface. In the networks between, the signal can be accessed from the addresses of the AS-I slaves.

談	LAD/STL/	FBD - [C	B1 AS	I_CP342_	2\SIMA	TIC 300(	1)\CPU 3	15-2 DP	]					_ 🗆 ×
	<u>F</u> ile <u>E</u> dit	Insert P	<u>L</u> C <u>D</u> ebu	ug <u>V</u> iew j	<u>O</u> ptions	<u>W</u> indow	<u>H</u> elp							_ 8 ×
	0 🖻 🖁	~ 🔒 🤞	3	Pa 🛍	<b>N</b> C4	68 🛍		₽ !≪	»! 🗄	) <u>₩</u>	 -0 [		Fi 💦	
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	Comment:													
13	Jotzevk 1			CD242 2	read									
	Comment.	: Input	S LLOM	CF342-2	reau									
	commerce.													
Ι.	L	PID	288											
L .	Т	ID	64											
L .	L	PID	292											
L .	L	PID	296											
L .	Т	ID	72											
L .	L	PID	300											
L .	1	т	70											
L .														
L .														
1 1	letwork 2	: Progr	am with	access	to the	AS-I a	ddresse:	3						
11	Comment:													
1	A	I	65.0											
L .	S	Q	66.4											
L .	A	I	65.1											
L .	R	Q	66.4											
L .														
L .														
l à	Metwork 3	: Outpu	ts of t	he CP342	-2 wri	tten								
l i	Comment:													
Ľ	L	QD	64								_			
L .	Т	PQD	288											
L .	L	QD	68											
L .	Т	PQD	292											
L .	Т	POD	296											
L .	L	QD	76											
	Т	PQD	300											
L	_													
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		1: Error )	2: Info /											
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ries	ss Pitto get P	teip.								omine	ADS	JNW3 LN9	Jinse	at ung //

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#### 5. DEBUGGING A STEP 7- PROGRAM

![](_page_30_Picture_3.jpeg)

The to be debugged STEP 7- Program must be downloaded into the PLC. In our case it is only the block OB1.

31. Save the organizational block with  $\square$  and clock on download  $\square$ . The mode switch of the CPU must be on STOP! ( $\rightarrow$ ,  $\square$ ,  $\rightarrow$ )

	500 I/		00040	0101111	TIC 000		045	0.0.01							
KAU75TL7 CLEIN Edit	FBD - [L Incert P	JBT ASI_ LC Debug	UP342	_2\SIMA	Window	Help	315-	ZUPJ							
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	<u>      (</u>	<b>3</b> <u></u> <u></u>		<b>N</b> CH	Cit M		60.	!« »:		<u> </u>	11-11	-[-0]I	패머니카드	<u>.</u>	
UBI: M	ain Sav	e <mark>cam poe</mark>	ер (су	сте)											
Comment:															
Network 1	: Input	s from C	P342-2	read											
Comment:															
L	PID	288													
Т	ID	64 202													
L T	TD	68													
L	PID	296													
Ť	ID	72													
L	PID	300													
т	ID	76													
Network 2	: Progr	am with	access	to the	AS-I a	ddress	es								
Comment:															
commeric:															
A	I	65.0													
s	0	66.4													
A	ī	65.1													
R	0	66.4													
	•														
Network 3	: Outpu	ts of th	e CP34	2-2 wri	tten										
Comment:															
L	QD	64													
Т	PQD	288													
L	QD	68													
Т	PQD	292													
L	QD	72													
Т	PQD	296													
L	QD	76													
Т	PQD	300													
															- D
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	T: Error A	2: Info /													
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32. Through the switching of the mode switch to RUN, the program is started. The program can be monitored in the 'OB1' with a click on the symbol  $\boxed{60^{\circ}}$  for monitoring ( $\rightarrow$ ).

🔝 LAD/STL/FBD - [@OB1 ASI C	342 2\SIMATIC 300(1)\CPU 315-2 DP] ONLINE	
III <u>F</u> ile <u>E</u> dit <u>I</u> nsert P <u>L</u> C <u>D</u> ebug <u>V</u> ie	w <u>O</u> ptions <u>W</u> indow <u>H</u> elp	
		-H-#-OFF 5-1-1 K?
OB1 : "Main Program Sweep (	Cycle)"	
Comment:		
		_
Network 1: Inputs from CP342	-2 read	_
Comment:		
T DTD 288		-
T ID 64		
L PID 292		VKE STA STANDARD
T ID 68		
L PID 296		
L PID 300		
T TD 76		0 1 0
		0 1 0
Network 2: Program with acce	ss to the AS-I addresses	
Comment:		
		_
A I 65.0		1 1 0
S Q 66.4		1 1 0
A I 65.1		8 0 0
R U 66.4		0 1 0
Network 3: Outputs of the CH	342-2 written	
Comment:		
L 0D 64		0 1 1000
T PQD 288		0 1 1000
L QD 68		0 1 0
T PQD 292		0 1 0
L QD 72		0 1 0
T PQD 296		
L UD 76		
1 PQD 500		
K I D 1: Error 2: Info		
Press F1 to get Help.	🕲 🔂 🔂 🛄 🔍 📕 🛄 N	Abs

Forwar	d Notes	Commission	STEP 7- Program	Debug