# Training Document for Comprehensive Automation Solutions

### **Totally Integrated Automation (TIA)**

### **MODULE E08**

### **PROFIsafe and PROFINET**

### with

### IO Controller CPU315F-2 PN/DP

### and

### IO Device ET200S

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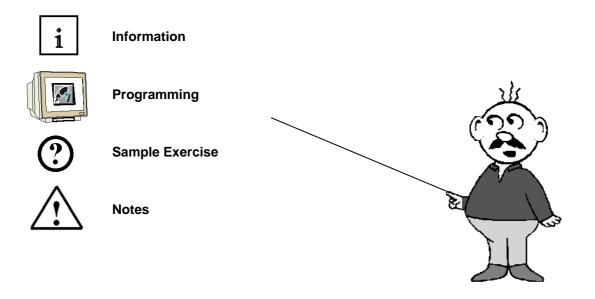
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We would like to thank the following: Michael Dziallas Engineering, the teachers at vocational schools, and all others who helped to prepare this document.

#### PAGE

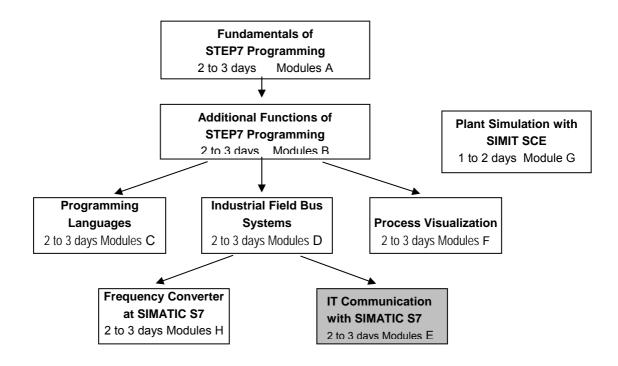
1.	Preface	4
2.	Notes on Using the CPU315F-2 PN/DP	8
3.	Notes on Using the ET200S with IM151-3 PN HF	11
4.	Starting Up PROFIsafe with CPU 315F-2 PN/DP and ET200S	12
5.	Program Example	42

The following symbols are provided as a guide through Module E08:



### 1. PREFACE

In terms of its contents, Module E08 is part of the teaching unit entitled '**IT Communication with SIMATIC S7**'.



### Learning Objective:

In Module E08, the reader learns how a safety-related application is started up on the PROFINET (PROFIsafe). On the PROFIBUS, the CPU 315F-2 PN/DP is used as IO Controller with an ET200S as IO device, in order to monitor the safety door at a press. An Emergency Stop is also implemented with the ET200S. Module E08 shows the method in principle, using a brief example.

### Prerequisites:

To successfully work through Module E08, the following knowledge is assumed:

- Knowledge in handling Windows
- Fundamentals of PLC programming with STEP 7 (for example, Module A3 'Startup' PLC Programming with STEP 7)
- Fundamentals of network engineering (for example, Appendix V Basics of Network Engineering)

Preface	Notes	StartUp	Programming	

#### Hardware and software required

- 1 PC, operating system Windows 2000 Professional starting with SP4/XP Professional starting with SP1/Server 2003 with 600MHz and 512RAM, free hard disk storage 650 to 900 MB, MS Internet Explorer 6.0
- 2 Software STEP7 V 5.4
- 3 Software S7 Distributed Safety V5.4
- 4 PLC SIMATIC S7-300 with CPU 315F-2 PN/DP Sample configuration:
  - Power supply: PS 307 2A
  - CPU: CPU 315F-2 PN/DP
- **5** Distributed periphery ET 200S for PROFIsafe with digital inputs and digital outputs Sample Configuration:
  - Interface Module IM151-1 PN HF for interfacing with PROFINET
  - Power module PM-E DC 24V
  - Digital input module 2DI DC 24V for connecting a button and a switch
  - Digital input module 2DI DC 24V for connecting a feedback circuit of a consumer
  - Digital output module 4DO DC 24V/0.5A for connecting 2 lamps
  - Power module PM-E DV 24V ...48V/AC24V...230V

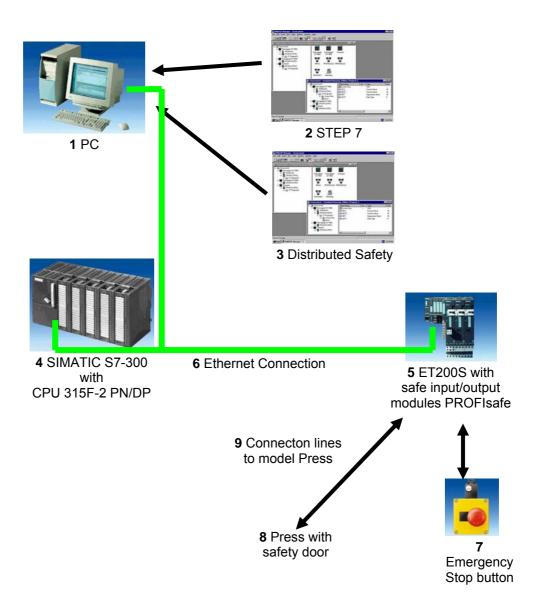
- Fault tolerant digital input module 4/8 F-DI DC 24V for connecting a 2-channel Emergency Stop and two safety door contacts

- Fault tolerant digital output module 4 F-DO DC 24V/2A for connecting a consumer to two contactors K1 and K2 that can be switched off separately fail-safe. Here, the consumer is the supply voltage for a press.

- 6 Ethernet connection between PC, CPU 315F2 PN/DP and ET200S with IM 151-3 PN HF
- 7 Emergency Stop button 2-channel wired to the F-DI module of the ET200S
- 8 Press with safety door; scan of safety door by means of two contacts wired to the F-DI module
- 9 Connection lines to the model Press and to the Emergency Off button

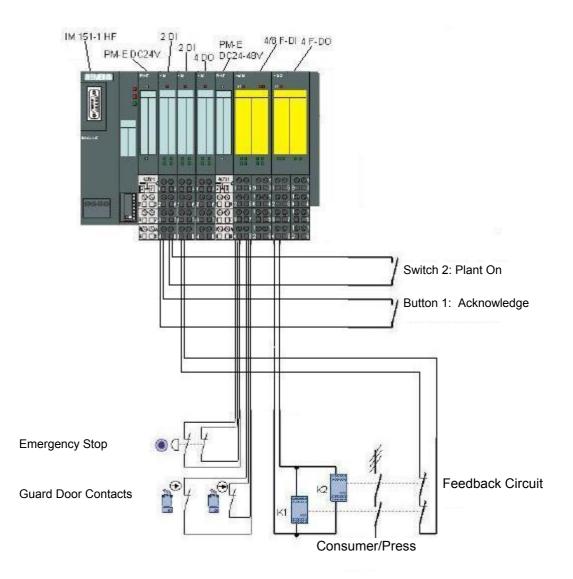
	Preface	Notes	StartUp	Programming	
TIA Training Do	ocument	Page 5	of 64		Module





		Preface	Notes	StartUp	Programming	
T E(	I A Training Document		Page 6 of	64		Module
	sued: 02/2008		PROFIsafe and PROF	INET with IO Cont	roller CPU 315F-2 PN/DP and IC	Device ET 200S

### Wiring Diagram



	Preface	Notes	StartUp	Programming	
TIA Training Document		Page	7 of 64		Module
Issued: 02/2008		PROFIsafe and Pl	ROFINET with IO Contr	oller CPU 315F-2 PN/DP and I	O Device ET 200S

i

### 2. NOTES ON USING THE CPU 315F-2 PN/DP

The CPU315F-2 PN/DP is a CPU that is shipped with two integrated interfaces.

- The first interface is an MPI/PROFIBUS DP interface that can be used on the PROFIBUS DP as master or as slave for connecting distributed IO/field devices with very fast response timing. In addition, the CPU can be programmed here by means of the MPI or by using PROFIBUS DP
- The second interface is an integrated PROFINET interface It makes it possible to use the CPU as PROFINET IO controller for operating distributed IO on the PROFINET. The CPU can be programmed by means of this interface also!
- At both interfaces, failsafe IO devices with PROFIsafe profile can be used.
- Single bus concept; transmission of F-signals and standard signals by means of a bus medium (PROFIBUS DP or PROFINET)
- Fault tolerant IO modules of the ET200M/S/eco can be connected decentralized
- Mixed configuration of F-modules and standard modules in one station
- Field devices by other manufacturers can be connected.
- Standard modules for applications that are not safety oriented can be operated centrally as well as decentralized
- Meets safety requirements up to SIL 3 according to IEC 61508, AK 6 according to DIN V 19250 and Kat. 4 according to EN 954-1
- Standard as well as safety-relevant tasks can be solved with only one CPU

The CPU 315F is based on a standard CPU (F means fault-tolerant) whose operating system was expanded by different protective mechanisms to allow for processing safety oriented user programs. This is needed for setting up fault-tolerant automation systems in plants with increased safety requirements. Fields of application are primarily production engineering. The distributed IO devices ET200S PROFISafe with fault-tolerant IO modules can be connected to the integrated PROFIBUS DP/PROFINET interfaces as well as external PROFIBUS/PROFINET CPs. Safety-oriented communication takes place by means of PROFIBUS DP/PROFINET with *PROFI*safe profile.

	Preface	Notes	StartUp	Programming	
TIA Training Document		Page 8	of 64		Module

## 1

#### Safety Concept

The safety functions of the CPU 315F are contained in the CPU's F-program and in the fail-safe signal modules. The fail-safe modules can be used in the distributed IO systems ET200M and ET200S.

The fail-safe signal modules monitor output and input signals with discrepancy analyses and test signal injections.

The CPU checks the correct operation of the controller through periodic self tests, instruction tests, as well as logical and time-related program execution checks. In addition, the IO is checked by life signs being requested.

If an error is diagnosed in the system, the system is taken to a safe mode. No f\_runtime license is required for running the CPU 315F.

In addition to the fail-safe modules, standard modules can also be used.

This makes it possible to set up a fully integrated control system for a plant in which standard areas exist in addition to the safety-oriented areas.

The entire plant is configured and programmed with the same standard tools.

#### Programming

Issued: 02/2008

The CPU 315F is programmed like other SIMATIC S7 systems. The user program for plant components that are not fail-safe is generated with the proven programming tools of STEP7. For programming the safety-oriented programs, the software package "S7 Distributed Safety V5.4" is indispensable. It contains all the elements you need for engineering.

The CPU 315F is programmed with the STEP7 languages F-LAD and F-FBD. Here, the following safety functions can be implemented, for example:

- User programmable safe combination of sensors and actuators
- Selectively and safely switching off actuators

The functionality regarding operations and data types is limited.

Through a special input during compilation, a safety-oriented, password protected program is generated. In addition to the fault-tolerant program, a standard program can also run parallel (coexistence) on a CPU that is not subject to restrictions.

An additional part of this software package is the F-library with the pre-prepared program examples for safety-oriented functions, approved by the TÜV (German Technical Inspectorate). The user can change these functions, but they have to be recertified.

	Preface	Notes	StartUp	Programming	
TIA Training Document		Page 9	9 of 64		Module

i

### **Option Package S7 Distributed Safety**

The package contains all required functions and blocks for generating an F-program. For "S7 Distributed Safety V5.4" to run, STEP7 starting with V5.3+SP3 has to be loaded to the PG/PC. The F-program with the safety functions is wired in F-FBD or F-LAD, or with special function blocks from the F-library. Using F-FBD or F-LAD simplifies configuring and programming the system; and, because of the system-overreaching, uniform representation, the acceptance inspection is simplified also. The programmer can concentrate completely on configuring the safety-oriented application, without having to use additional tools.

#### Notes:

- In Module E08, the CPU 315F-2 PN/DP is used on the PROFINET as IO controller. \_
- F-modules as well as standard modules are incorporated.
- A micro memory card is required for operating this CPU! \_
- The addresses for the input and output modules can be parameterized at this CPU.

	Preface	Notes	StartUp	Programming	
I A Training Document		Page 10 of 64			Module

#### NOTES ON USING THE ET200S WITH IM 151-3 PN HF 3.



The SIMATIC ET200S is a decentralized IO device, configured in a highly modular mode. It can be operated with different interface modules:

IM 151-1 BASIC, IM 151-1 STANDARD and IM 151-1 FO STANDARD for connecting a maximum of 63 IO modules (all types except PROFIsafe) to the PROFIBUS DP; alternatively, bus connection with RS 485 Sub-D connector or by means of an integrated fiber-optic connection

IM 151-1 HIGH FEATURE for connecting a maximum of 63 IO modules (all types, including clocked mode for PROFIsafe) to PROFIBUS DP; bus connection with RS485 Sub-D connector

IM 151-3 PN for connecting a maximum of 63 IO modules (all types, except PROFIsafe) to PROFINET IO controllers; bus connection by means of RJ45 connector

IM 151-3 PN HF (HIGH FEATURE) for connecting a maximum of 63 IO modules (all types; including the clocked mode for PROFIsafe) to PROFINET IO controllers; bus connection with 2 x **RJ45** connector

IM 151-7/F-CPU. IM 151-7/CPU or IM 151-7/CPU FO for connecting a maximum of 63 IO modules (all types; PROFIsafe only with IM151-7/F CPU) to PROFIBUS DP; alternatively bus connection with RS 485 Sub-D connector or by means of an integrated fiber-optic connection; with integrated CPU 314 of the SIMATIC S7-300, for preprocessing process data.

The following IO modules can be used:

Power modules for individual grouping of load and encoder supply voltages and their monitoring Digital electronic modules for connecting digital sensors and actuators

Analog electronic modules for connecting analog sensors and actuators

Sensor module for connecting IQ sense sensors

**Technology modules** Electronic modules with integrated technological functions, such as counting, positioning, data exchange, etc.

#### Frequency converters and motor starter modules

For training purposes, an integrated system is provided, suitable for teaching many technologies

#### Notes:

- In Module E08, the interface module IM151-3 PN HF is used as PROFINET IO device.
- F-modules as well as standard modules are inserted.
- A micro memory card is required for running the IM151-3 PN HF!

	Preface	Notes	StartUp	Programming	
TIA Training Document		Page 11	1 of 64		Module
Issued: 02/2008		PROFIsafe and PR	ROFINET with IO Contr	oller CPU 315F-2 PN/DP and	O Device ET 200S

### 4. STARTING UP PROFISAFE WITH THE CPU 315F-2 PN/DP AND ET 200S



Below, the startup of a PROFIsafe application is shown. The CPU 315F-2 PN/DP is used on the PROFINET as an IO controller, with an ET 200S as IO device, to monitor the safety door at a press. Emergency Stop is also implemented using the ET200S.



Issued: 02/2008

1. The central tool in STEP 7 is the 'SIMATIC Manager'. It is called here with a double click. ( $\rightarrow$  SIMATIC Manager)



	Preface	Notes	StartUp	Programming	
TIA Training Document	:	Page 1	2 of 64		Module



2. STEP7 programs are managed in projects. We are now setting up such a project. ( $\rightarrow$  File  $\rightarrow$  New)

Datei Zielsystem Ansicht Extras Fenster Hilfe     Neu Ctrl+N    Assistent 'Neues Projekt' Öffnen Ctrl+o S7-Memory Card S7-Memory Card Memory Card-Datei Löschen Reorganisieren Verwalten Verwalten Dearchivieren Seite einrichten Seite einrichten 1 Erreichbare Teilnehmer PROFIBUS 2 PROFIsafe02 (Projekt) F:\0_57_Projekte\PROFIs_2 Beenden Alt+F4	SIMATIC Manager		
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	1 Erreichbare Teilnehmer PROFIBUS		
Beenden Alt+F4	2 PROFIsafe02 (Projekt) F:\0_S7_Projekte\PROFIs_2		
	Beenden	Alt+F4	
	stellt ein neues. Projekt oder eine neue Bibliothek.		

3. Now, we are assigning the 'Name' 'CPU315F\_PROFIsafe' to the project. ( $\rightarrow$  CPU315F\_PROFIsafe  $\rightarrow$  OK)

Name Ablagepfad	
n aktuelles Multiprojekt einfügen	
Name:	Тур:
Name:	Тур: Projekt
In aktuelles Multiprojekt einfügen Name: CPU315F_PROFIsafe Ablageort (Pfad) :	

Preface	Notes	StartUp	Programming	
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4. Highlight your project and insert an 'Industrial Ethernet Subnet'. ( $\rightarrow$  CPU315F\_PROFIsafe  $\rightarrow$ Insert  $\rightarrow$  Subnet  $\rightarrow$  Industrial Ethernet)

SIMATIC Manager	- [CPU315F_PROFIs	afe D:\00_STEP7_Prog\CPU315_1]	
Datei Bearbeiten	Einfügen Zielsystem	Ansicht Extras Fenster Hilfe	_ 8 ×
🗅 🧭 🔡 🛲	Station	🕨 🖳 🖳 🖦 🕮 🖬 🦛 🛛 < Kein Filter >	- 🏹 🔡 🖲
EPU315F_PRO	Subnetz	▶ 1 MPI	
	Programm	2 PROFIBUS     3 Industrial Ethernet	
	57-Software	4 PTP	
	S7-Baustein	·	
	M7-Software	<u> </u>	
	Symboltabelle		
	Textbibliothek	▶0	
	Externe Quelle		
	WinCC flexible RT	•	
		-	
Fügt Industrial Ethernet	an der Cursorposition ei	٦.	1

5. Then, after highlighting your station again, insert a 'SIMATIC 300 Station'. ( $\rightarrow$ CPU315F\_PROFIsafe  $\rightarrow$  Insert  $\rightarrow$  Station  $\rightarrow$  SIMATIC 300 Station)

🔁 Datei Bearbeiten		ife F:\0_S7_Projekte\CPU Ansicht Extras Fenster Hilf	APRICATION CONTRACTOR	
D 🗃 🖺 🥅	Station Subnetz Subnetz S7-Software S7-Baustein M7-Software	1 SIMATIC 400-Station 2 SIMATIC 300-Station 3 SIMATIC H-Station 4 SIMATIC PC-Station 5 SIMATIC HMI-Station 6 Andere Station	< Kein Filter >	• <u>7</u> 20
	Symboltabelle Textbibliothek Externe Quelle WinCC flexible RT	7 SIMATIC 55 8 PG/PC	]	
		_		

	Preface	Notes	StartUp	Programming	
TIA Training Document		Page <sup>-</sup>	14 of 64		Module
Issued: 02/2008		PROFIsafe and P	ROFINET with IO Cont	roller CPU 315F-2 PN/DP and	IO Device ET 200S



6. With a double click, open the configuration tool for the 'Hardware'. ( $\rightarrow$  Hardware)

SIMATIC Manager - [CPU315F_PR0FIsafe F:\0_57_Proje	te\CPU315F_]
🞒 Datei Bearbeiten Einfügen Zielsystem Ansicht Extras Fen	teres teresteres
	🎬 💼 < Kein Filter > 💽 🏹 🔡 🍘 🦉
CPU315F_PROFIsafe	
Drücken Sie F1, um Hilfe zu erhalten.	PC Adapter(MPI)

	Preface	Notes	StartUp	Programming	
TIA Training Document		Page 1	5 of 64		Module

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7. Now, open the hardware catalog by clicking on the symbol  $\frac{1}{100}$ ,  $(\rightarrow 100)$ 

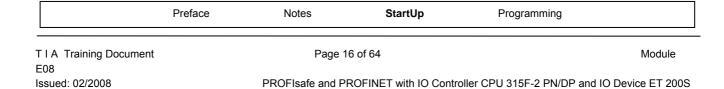
There, arranged in the directories:

- PROFIBUS DP **PROFIBUS PA** •
- **PROFINET IO** •
- SIMATIC 300
- SIMATIC 400 •
- SIMATIC PC Based Control .
- SIMATIC PC Station

all racks, modules and interface modules are provided to configure your hardware. Insert 'Rail' with a double click. ( $\rightarrow$  SIMATIC 300  $\rightarrow$  RACK 300  $\rightarrow$  Rail)

🔣 HW Konfig - [SIMATIC 300(1) (Konfiguration) CPU315F_PROFIsafe]	<u>_   ×</u>
💵 Station Bearbeiten Einfügen Zielsystem Ansicht Extras Fenster Hilfe	×
L	Suchen: M† M↓
	Profil: Standard
×	
SIMATIC 300(1)	
Steckplatz Bezeichnung	SIMATIC HMI Station
	6ES7 330-1???0-0AA0 In verschiedenen Längen lieferbar €≤
, Drücken Sie F1, um Hilfe zu erhalten.	Änd //

After that, a configuration table is displayed automatically for configuring Rack 0.



8. From the hardware catalog, you can now select all modules that are also in your real rack, and insert them in the configuration table.

To this end, click on the name of the respective module, hold the mouse key and drag the module to a line in the configuration table.

We are starting with the power unit '**PS 307 2A**'. ( $\rightarrow$  SIMATIC 300  $\rightarrow$  PS 300  $\rightarrow$  PS 307 2A)

🖳 HW Konfig - [SIMATIC 300(1) (Ko 🕅 Station Bearbeiten Einfügen Zie							 	
■(0) UR						<u> </u>	Suchen:	n X
1 PS 307							Profil: Standard	•
						T		
(0) UR Steckplatz	Bestellnummer	l Fi	M	E	Δ	<u>)</u>   К		•
I         P         P         P           1         P         PS 307 2A         2         3           3         4         4         4         4	6ES7 307-1BA00-QAA0							₹ <u>₹</u>
Einfügen möglich							JI Änd	-



Issued: 02/2008

**Note:** If your hardware differs from the one displayed here, simply select the corresponding modules from the catalog and insert them in your rack. The order numbers of the individual modules -that are also indicated on the components- are displayed in the footer of the catalog.

	Preface	Notes	StartUp	Programming	
TIA Training Document		Page 1	7 of 64		Module



9. Next, we are dragging the 'CPU 315F-2 PN/DP' to the 2nd slot. The order number and version of the CPU can be read off the front of the CPU. (  $\rightarrow$  SIMATIC 300  $\rightarrow\,$  CPU 300  $\rightarrow\,$  CPU 315F-2 PN/DP  $\rightarrow$  6ES7 315-2FH10-0AB0  $\rightarrow$  V2.3)

HW Konfig - [SIMATIC 300(1) (Kon Station Bearbeiten Einfügen Zielsy								_ D ×
= (0) UR 1					^	S <u>u</u> chen Profil:	: Standard	  
3 4 5 6 7 7 					× •		CPU-300 CPU 312 CPU 312 CPU 312 CPU 312 CPU 312C CPU 313C CPU 313C CPU 313C2 Pf CPU 313C2 Pf CPU 314C2 Pf CPU 314C2 Pf CPU 314C2 Pf CPU 314C2 Pf CPU 315	,
Steckplatz         Baugruppe           1         PS 307 2A           2         3           4         5           5         6           7         8           9         9	Bestellnummer 6ES7 307-1BA00-0AA0	Fi	M E      	A Ku	ommen			/DP FH10-0AB0

	Preface	Notes	StartUp	Programming	
TIA Training Document		Page 1	8 of 64		Module

Issued: 02/2008



Issued: 02/2008

10 When entering the CPU, the window below appears. In this window, do the following: Assign an 'IP Address' to the CPU 315F-2 PN/DP, specify the 'Subnet Screen Form', and select the 'Ethernet' network that has already been generated.

Optional: a '**Router Address**' can also be selected for network-overreaching communication. Confirm your input with '**OK**' ( $\rightarrow$  New  $\rightarrow$  IP Address: 192.168.1.10  $\rightarrow$  Subnet screen form: 255.255.255.0  $\rightarrow$  Ethernet(1)  $\rightarrow$  Use Router  $\rightarrow$  Address: 192.168.1.1  $\rightarrow$  OK)

	Ethernet Schnittstelle rameter		
		Bei Anwahl eines Subnetzes werden die nächsten freien Adressen vorgeschlagen	
IP-Adresse: Subnetzmaske	192.168.1.10 255.255.255.0	Netzübergang     Keinen Router verwenden     Router verwenden     Adresse: 192,168,1.1	1
Subnetz: nicht vern	ietzt	Neu	1
Ethernet(1)		Eigenschaften	
			_

	Preface	Notes	StartUp	Programming	
TIA Training Documen	t	Page 1	9 of 64		Module



Notes on Networking on the Ethernet (additional information is provided in Appendix V of the training document):

### MAC Address:

The MAC address consists of a permanent and a variable part. The permanent part ("Basis MAC Address") identifies the manufacturer (Siemens, 3COM, ...). The variable part of the MAC address differentiates the different Ethernet stations, and should be assigned uniquely world-wide. On each module, a MAC address specified by the factory is imprinted.

#### Value range for the IP address:

The IP address consists of 4 decimal numbers from the value range 0 to 255 which are separated by a period; for example 141.80.0.16

### Value range for the subnet screen form:

This screen form is used in order to recognize whether a station or its IP address is part of the local subnet, or can be accessed only by means of a router.

The subnet screen form consists of 4 decimal numbers from the value range 0 to 255 which are separated by a period; for example, 255.255.0.0

In their binary representation, the 4 decimal numbers of the subnet screen form have to contain from the left a series of gapless values "1" and from the right a series of gapless values "0".

The values "1" determine the area of the IP address for the network number. The values "0" determine the area of the IP address for the station address.

Example:

Correct values:	255.255.0.0 decimal = 1111 1111.1111 1111.0000 0000.0000 0000 binary
	255.255.128.0 decimal = 1111 1111.1111 1111.1000 0000.0000 0000 binary
	255.254.0.0 decimal = 1111 1111.1111 1110.0000 0000.0000.00
Incorrect value:	255.255.1.0 decimal = 1111 1111.1111 1111.0000 000 <i>1</i> .0000 0000 binary

### Value range for the address of the network transition (Router):

The address consists of 4 decimal numbers from the value range 0 to 255 which are separated by a period; for example, 141.80.0.1.

### Relationship of IP addresses, router address, and subnet screen form:

The IP address and the address of the network transition may differ only in positions that have a "0" in the subnet screen form.

Example:

You entered: for the subnet screen form 255.255.255.0; for the IP address 141.30.0.5, and for the router address 141.30.128.1.

The IP address and the address for the network transition are to have a different value only in the 4th decimal number. In the example, however, the 3rd position already differs.

In the example, you have to change alternatively:

- the subnet screen form to: 255.255.0.0 or
- the IP address to: 141.30.128.5 or
- the address of the network transition to: 141.30.0.1

Preface	Notes	StartUp	Programming	



Issued: 02/2008

11. By double clicking on the '**CPU 315F-2 PN/DP**', you are opening its property catalog. ( $\rightarrow$  CPU 315F-2 PN/DP)

HW Konfig - [SIMATIC 300(1) (Konfig	uration) Cl	PU315F	_PROF	[safe]					
III Station Bearbeiten Einfügen Zielsyst	em Ansicht	Extras	Fenste	r Hilf	e				_ 8 ×
	4. A. B.		9 10						
			Se l Ree						
						-			
(0) UR     PS 307 2A	FI	thernet(1	) PBOF	NET-	0-System (100)		S <u>u</u> chen:		nt ni
2 S CPU 315F-2 PN/DP			j. 1 1 0 1 1				Profil:	Standard	•
X1 MPI/DP								1	
<u>X2</u> PN-10							1 S T T	CPU-300	
3							E	EPU 312	
5								主 🧰 CPU 312 IFM 中 🧰 CPU 312C	_
								+ 🦲 CPU 3120	
							12 B.S.	∓- <b>⊡</b> CPU 313C	
								n CPU 314	
								T CPU 314 IFM	
						-		T CPU 314C-2 DP	
•					×		12 B.C.	T CPU 314C-2 PtP	
						_	13 B.C	T CPU 315	
(0) UR								T 🦲 CPU 315-2 DP	
		14			2	- 28		+ CPU 315-2 PN/DF	
Steckplatz 🚺 Baugruppe	Bestell	Fi M	E	A	Kommentar			🗄 🧰 CPU 315F-2 DP	
1 PS 307 2A	6ES7 307-	14.22	3		·	-		🗄 🦲 CPU 315F-2 PN/D	P
2 CPU 315F-2 PN/DP	6ES7 31 V		- 1		C			🚊 🧰 6ES7 315-2FH	10-0AB0
X1 MFI/DP		2	204;					🚺 V2.3	-
X2 I FINHO			2046				6ES7 31	5-2FH10-0AB0	₹_
3							Arbeitssp	eicher 192KB; 0,1ms/kAV	1: 33
4			_					ET Anschluss; S7-	
5	1 1	9	1	1			Kommuni	ikation (ladbare FBs/FCs);	<b>_</b>
Einfügen möglich									Änd //

	Preface	Notes	StartUp	Programming	
TIA Training Documen	nt	Page 2	1 of 64		Module



Issued: 02/2008

- 12. Under the tab 'Protection', do the following for setting the 'Protection Level':
- Below the option button '1: Access Protection for the F-CPU', select the option 'Can be canceled with a password'.
- Activate the option button '2: Write protection'.
- Below the option button '3: Write/read protection', enter the password (8 characters maximum) for the F-CPU; for example, "pw\_fcpu". Repeat your input in the field 'Reenter'.
- Activate the option box 'CPU contains safety program'.

 $(\rightarrow$  Can be cancelled with password  $\rightarrow$  Write protection  $\rightarrow$  pw\_fcpu  $\rightarrow$  pw\_fcpu  $\rightarrow$  CPU contains safety program)

Schutzstufe 1: Zugriffsschutz für F-CPU 2: Schreibschutz 3: Schreibs-/Leseschutz Paßwort: ********* Nochmalige Eingabe: ********* CPU enthält Sicherheitsprogramm		sige Zykluszeiterhöhung Testfunktionen:	<u>5</u> ms
--	--	--	-------------

	Preface	Notes	StartUp	Programming	
I A Training Document 08		Page 22 of 64			Module



- 13. Under the tab 'Cycle/clock flag', make the following settings:
- At "OB85 call if there if an IO access error" select 'Only for coming and going errors'.
- Activate the option box **'Clock flag'** and enter the '0' as flag byte. ( $\rightarrow$  Cycle/Clock flag  $\rightarrow$  Only for coming and going errors  $\rightarrow$  0)

Allgemein Anlauf Zyklus / Taktr	Schutz Kommunikation F-Parameter nerker Remanenz Alarme Uhrzeitalarme
Zyklus	
☑ 0B1-Prozeßabbild zyklisch aktualisiere	n
Zyklusüberwachungszeit [ms]:	150
Mindestzykluszeit [ms];	0
Zyklusbelastung durch Kommunikation [%]	: 20
Größe des Prozeßabbilds	×
0885-Aufruf bei Peripheriezuariffsfehler:	Nur bei kommenden und gebenden Fehlern
0885-Aufruf bei Peripheriezugriffsfehler:	Nur bei kommenden und gehenden Fehlern
0885:Aufruf bei Peripheriezugriffsfehler: Taktmerker	Nur bei kommenden und gehenden Fehlern
	Nur bei kommenden und gehenden Fehlern
Taktmerker	Nur bei kommenden und gehenden Fehlern

14. Change to the tab '**Time Interrupts**' and set the call time for the time interrupt OB35. (The safety program is called at fixed time intervals in the time interrupt OBs.) ( $\rightarrow$  Time Interrupts  $\rightarrow$  OB35  $\rightarrow$  50)

0831: 0 2000 0832: 0 1000 0833: 0 500	Phasenverschi 0 0 0	ebung	Einheit ms 💌 ms 💌	Teilpr	ozeßabbild
0B30: 0 5000 0B31: 0 2000 0B32: 0 1000 0B33: 0 500		ebung	ms 💌		ozeßabbild
0B31: 0 2000 0B32: 0 1000 0B33: 0 500	0		ms 💌		¥
0832: 0 1000 0833: 0 500	0				-
0833: 0 500				-	
	0		ms 💌		~
OB34; 0 200			ms 💌		-
	0		ms 💌		7
OB35: 12 50	0		ms 💌		-
0836; 0 50	0		ms 💌		7
OB37: 0 20	0		ms 💌		7
OB38: 0 10	0		ms 🔻		-

Preface	Notes	StartUp	Programming	
TIA Training Decument	Page 2	2 of 64		Modulo



- 15. Move to the tab 'F-Parameters' and set the following parameters:
- The basis for the PROFIsafe addresses
- A number band for F-data blocks
- A number band for F-function blocks
- The local data volume used by the F-system

Confirm with 'OK'. ( $\rightarrow$  F-Parameter  $\rightarrow$  OK)

Parameter	Wert
🖃 🔄 Parameter	
👍 🔄 PROFIsafe	
└ Basis für PROFIsafe-Adressen	2000
🔁 🦳 F-Datenbausteine	
- 🗐 von (DB)	600
L is (DB)	1000
⊨ 🔄 F-Funktionsbausteine │ ⊢ 🗐 von (FB)	600
	1000
□ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □	1000
LE Größe	992



**Note**: When the safety program is generated, F-blocks are added automatically to generate a runnable safety program. For these automatically added F-blocks, you have to reserve a number band here.

16. Now, close the message window for the necessary '**Regeneration of the safety program**'. ( $\rightarrow$  Close  $\rightarrow$  OK)

Dbjekteigenschaften	
Liste der Meldungen:	
Achtung, Sie haben eine sicherheitsrelevante Projektierung geände	ert, wenn sie die Anderung ub
4	Þ
Meldung	Þ
Meldung Dbjekteigenschaften (997:1032)	Hilfetext
Objekteigenschaften (997:1032)	
Objekteigenschaften (997:1032)           Achtung, Sie haben eine sicherheitstelevante           Achtung geändert, wenn sie die Änderung	Hilfetext
Objekteigenschaften (997:1032)	
Objekteigenschaften (997:1032)           Achtung, Sie haben eine sicherheitstelevante           Achtung geändert, wenn sie die Änderung	Hilfetext
Objekteigenschaften (997:1032)           Achtung, Sie haben eine sicherheitstelevante           Achtung geändert, wenn sie die Änderung	Hilfetext

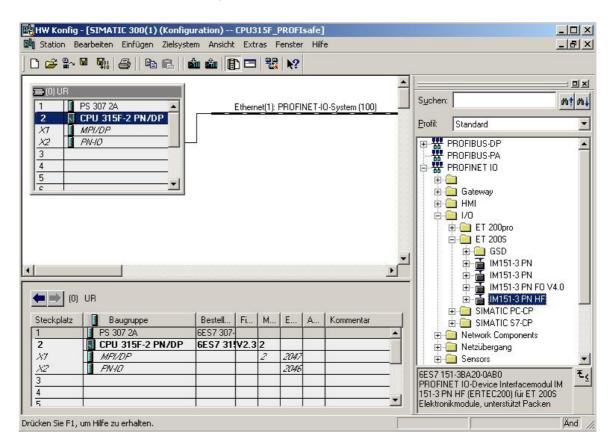
		Preface	Notes	StartUp	Programming	
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Issued: 02/2008

17. After you have accepted the network settings and the parameters of the '**CPU 315F-2 PN/DP**', a bar appears to the right of the CPU315-2 PN/DP, the '**PROFINET IO System**', where you can arrange PROFINET IO devices.

To do his, click on the desired module (here, the **'ET 200S'** with **'IM151-3PN HF'**.) in the hardware catalog in the path **'PROFINET IO'** and drag it to the **'PROFINET IO System'**. ( $\rightarrow$  PROFINET IO  $\rightarrow$  I/O  $\rightarrow$  ET 200S  $\rightarrow$  IM151-3PN HF)



	Preface	Notes	StartUp	Programming	
TIA Training Document		Page 2	25 of 64		Module

Station Bearbeiten Einfügen Zielsystem Ansicht Extras Fenster Hilfe     Station Bearbeiten Einfügen Zielsystem Ansicht Extras Fenster Hilfe     Profile     Profile     Suchen:        Suchen:			uration) CPU315F_PROFIs					
Image: CPU 315F-2 PN/DP         X2       CPU 315F-2 PN/DP         X2       PN/IO         3       Image: CPU 315F-2 PN/DP         4       Image: CPU 315F-2 PN/DP         5       Image: CPU 315F-2 PN/DP         2       PN/IO         3       Image: CPU 315F-2 PN/DP         4       Image: CPU 315F-2 PN/DP         5       Image: CPU 315F-2 PN/DP         Image: CPU 315F-2 PN/DP       Image: CPU 315F-2 PN/DP         3       Image: CPU 315F-2 PN/DP         3       Image: CPU 315F-2 PN/DP         4       Image: CPU 315F-2 PN/DP         5       Image: CPU 315F-2 PN/DP         4       Image: CPU 315F-2 PN/DP         5       Image: CPU 315F-2 PN/DP         6       Image: CPU 315F-2 PN/DP         14       Image: CPU 315F-2 PN/DP         15       Image: CPU 315F-2 PN/DP         170       Image: CPU 315F-2 PN/DP         170	0 Station B	earbeiten Einfügen Zielsyst	em Ansicht Extras Fenster	Hilfe			_	8 >
Image: CPU 315F-2 PN/DP         X1         MPI/DP         X2       PN-IO         3         4         5         c         Gateway         HMI         Image: CPU 315F-2 PN/DP         X1         MPI/DP         X2         PN-IO         3         4         5         c         Image: CPU 315F-2 PN/DP         Image: CPU 315F-2 PN/D	🗅 🖨 🔓	<b>- 5</b>   4 6	🛍 🋍 🗊 🗖 器 k?					
1       PS 307 2A       Ethernet(1): PROFINET-IO-System (100)         2       CPU 315F-2 PN/DP         X7       MPV/DP         X2       PN/AD         3	- MILIP	1			<u> </u>			· 믜×
2       CPU 315F-2 PN/DP         X7       MPV/DP         X2       PN/AD         3       PROFIBUS-DP         4       •         5       •         c       •         Gateway       •         •		PS 307 2A	Ethernet(1): PROFIN	ET-IO-System (10	on 📕	S <u>u</u> chen:	0	nt mi
X2       PN+10         3       +         4       +         5       -         c       -         Gateway       +         HMI       +         -       - <tr< td=""><td></td><td></td><td></td><td></td><td></td><td>Profil:</td><td>Standard</td><td>•</td></tr<>						Profil:	Standard	•
	4				₹ ▶		Gateway HMI I/O ET 200pro ET 200pro ET 200S B→ IM151-3 PN B→ IM151-3 PN	
E SIMATIC PC-CP	<b>(1)</b>	1						
Steckplatz Baugruppe Bestellnummer E A D K	Steckplatz			and the second s	CO.12 20122020			
0 ☐ ////15/39/WHF 6ES7/15/38/20/0480 2044 ▲ • • • • • • • • • • • • • • • • • •	Steckplatz			and the second s	CO.12 20122020			
0         i         IM/15/39NHF         6E.S7 15/38420:0480         2044         I	Steckplatz			and the second s	CO.12 20122020	±	Netzübergang	
0         i	Steckplatz			and the second s	CO.12 20122020	€ES715 PROFIN	Netzübergang Sensors 1-38A20-0AB0 ET 10-Device Interfacemodul IM	₹.

19. To each IO device, a 'Device name' that is unique within the PROFINET IO system has to be assigned, und an IP address on the 'Ethernet'. ( $\rightarrow$  Device name: IM151-3PNHF  $\rightarrow$  Ethernet)

urzbezeichnung:	IM151-3PNHF	
urzuezeichnung.		terfacemodul IM 151-3 PN HF (ERTEC200) für ET 200S 🔺
estell-Nr:	6ES7 151-3BA20-0AB0	
amilie:	ET200S	
ierätename:	IM151-3PNHF	
Teilnehmer / PN-IO	System	
Gerätenummer:	1 💌	PROFINET-IO-System (100)
IP-Adresse:	192.168.1.11	Ethernet
🔽 IP-Adresse durc	h 10-Controller zuweisen	
ommentar:		

	Preface	Notes	StartUp	Programming	
TIA Training Document		Page 2	26 of 64		Module
Issued: 02/2008		PROFIsafe and P	ROFINET with IO Contr	roller CPU 315F-2 PN/DP and	O Device ET 200S





20. After you assigned the 'IP Address', accept is with 'OK'.  $(\rightarrow$  IP Address: 192.168.1.11  $\rightarrow$  OK  $\rightarrow$  OK)

Eigens		151-3PNHF hernet Schnittstell	e IM151-3PNHF			
Allge	mein Parar	meter				
este						
amili						
ierät						
Teil IP-4	dresse:	192.168.1.11	Netzübe	ergang en Router verv		
Ger Sub	netzmaske:	255.255.255.0	and the second sec	ter verwenden	venden	
IP-/			Adres	sse: 192.16	8.1.1	
I⊽ Sub	netz:				10 10	
	- nicht vernetz iernet[1]	zt			Neu.	
omm					Eigenscha	aften
					Lösch	ien

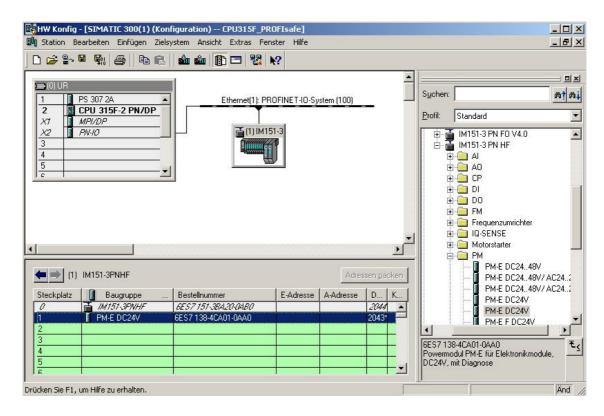
	Preface	Notes	StartUp	Programming	
TIA Training Document		Page 2	7 of 64		Module
Issued: 02/2008		PROFIsafe and PF	ROFINET with IO Contr	oller CPU 315F-2 PN/DP and I	O Device ET 200S





Issued: 02/2008

21. Now, the modules inserted in the ET200S have to be dragged to the configuration table and inserted there. We are starting with the power module '**PM-E DC24V**'; it is dragged to Slot 1. By double clicking on the '**PM-E DC24V**', its properties are opened. ( $\rightarrow$  PROFINET IO  $\rightarrow$  I/O  $\rightarrow$  ET 200S  $\rightarrow$  IM151-3 PN HF  $\rightarrow$  PM  $\rightarrow$  PM-E DC24V  $\rightarrow$  PM-E DC24V)



22. Under Parameters, activate the 'Diagnosis: Load voltage L+ missing' with a  $\checkmark$ . ( $\rightarrow$  Diagnosis: Load voltage missing L+  $\rightarrow \checkmark \land \circ$  OK)

		Wert	
∃ 🔄 Parameter └ Diagnose	: fehlende Lastspannung L+		

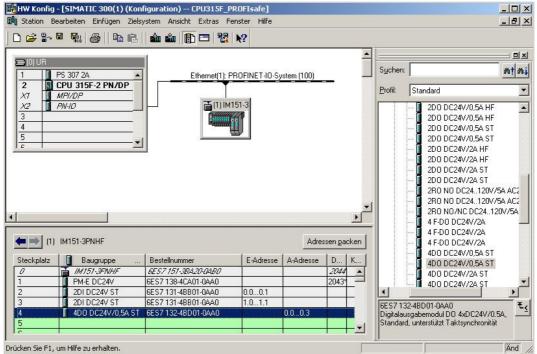
	Preface	Notes	StartUp	Programming	
TIA Training Document E08		Page 2	28 of 64		Module



23. Next, we are dragging the digital input module '**2DI DC 24V ST**' to the 2nd and the 3rd slot. The order number and the version can be read off the module. ( $\rightarrow$ PROFINET IO  $\rightarrow$  I/O  $\rightarrow$  ET 200S  $\rightarrow$  IM151-3 PN HF  $\rightarrow$  DI  $\rightarrow$  2DI DC 24V ST  $\rightarrow$  2DI DC 24V ST)

	-	figuration) CPU315F_PF ystem Ansicht Extras Fe	Charles .						_ D ×
	<b>\$</b>    <b>\$</b>    <b>\$</b>   <b>\$</b>   <b>\$</b>   <b>\$</b>   <b>\$</b>   <b>\$</b>   <b>\$</b>   <b>\$</b>	📩 🏜 📳 🗖 😤	<b>N</b> ?						
2 (0) UR 1 P 2 C ×7 M	S 307 2A PU 315F-2 PN/DP IPI/DP NHD		ROFINET-IO-Sy	ste <u>m (100)</u>	_			Standard ET 200pro ET 200S	□×  
5	<u>&gt;</u>					_		GSD GSD M151-3 PN M151-3 PN M151-3 PN M151-3 PN FO V4.0 M151-3 PN HF M151-3 PN HF M151-3 PN HF M151-3 PN HF M151-2 PN M151-2 PN M15	
	M151-3PNHF			Adres	sen <u>p</u> ack	• en		2DI AC120V 2DI AC230V 2DI DC24V H	ST F
Steckplatz	🚺 Baugruppe	Bestellnummer	E-Adresse	A-Adresse	D			2DI DC24V H	
0	M151-3FWHF	6ES7 151-38A20-04B0			2044	-		2DI DC24V S	
1	PM-E DC24V	6ES7 138-4CA01-0AA0			2043*	_		4 DI NAMUR	-
2	2DI DC24V ST	6ES7 131-4BB01-0AA0	0.00.1		-				•
3 4 5 6	2DI DC24V ST	6ES7 131-48801-0440	1.01.1					1-4BB01-0AA0 gabemodul DI 2xDC24V,	₹ <u>₹</u>
, Auswählen der Ha	rdware						p.		Änd

24. Then, we drag the digital output module '4 DO DC 24V/0.5A ST' to the 4th slot. The order number and the version can be read from the module. ( $\rightarrow$ PROFINET IO  $\rightarrow$  I/O  $\rightarrow$  ET 200S  $\rightarrow$  IM151-3 PN HF  $\rightarrow$  DO  $\rightarrow$  4 DO DC 24V/0.5A ST)

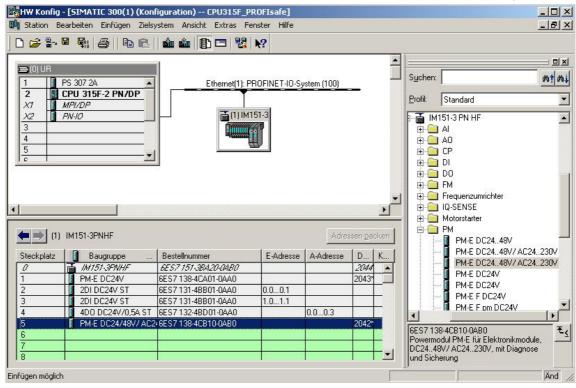


	Preface	Notes	StartUp	Programming	
TIA Training Documer	nt	Page 2	9 of 64		Module



25. Now, another power module '**PM-E DC 24...48V/AC 24...230V**' is taken to the 5th slot. The order number and the version can be read off the module. By double clicking on the '**PM-E DC** 

**24...48V/AC 24...230V'**, its properties are opened. ( $\rightarrow$  PROFINET IO  $\rightarrow$  I/O  $\rightarrow$  ET 200S  $\rightarrow$  IM151-3 PN HF  $\rightarrow$  PM-E DC 24...48V/AC 24...230V  $\rightarrow$  PM-E DC 24...48V/AC 24...230V)



26. Under Parameters, activate the 'Diagnosis: Load voltage L+ missing' with a  $\checkmark$ . ( $\rightarrow$  Diagnosis: Load voltage L+ missing  $\rightarrow \checkmark \rightarrow OK$ )

	Wert	
- 🔄 Parameter - 📋 Diagnose: fehlende Lastspannung L+	<u>~</u>	
—≝ Diagnose: Sicherungsfall —≝ Spannungstyp		

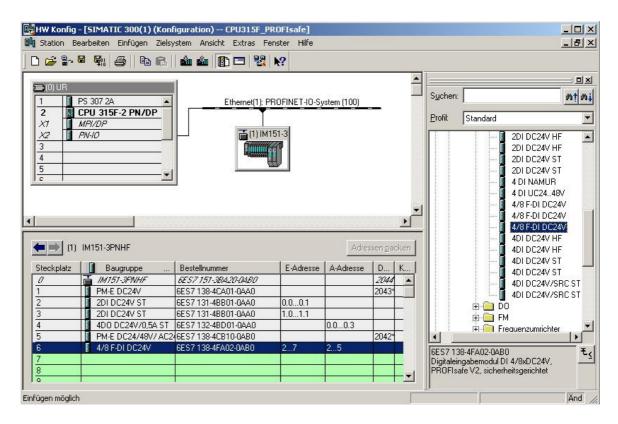
	Preface	Notes	StartUp	Programming	
TIA Training Document		Page 3	0 of 64		Module

Issued: 02/2008



Issued: 02/2008

27. Next, we are dragging the fail-safe digital input module '4/8 F-DI DC 24V' to the 6th slot. The order number and the version can be read off the module. Double clicking on the '4/8 F-DI DC 24V', opens its properties. ( $\rightarrow$ PROFINET IO  $\rightarrow$  I/O  $\rightarrow$  ET 200S  $\rightarrow$  IM151-3 PN HF  $\rightarrow$  DI  $\rightarrow$  4/8 F-DI DC 24V  $\rightarrow$  4/8 F-DI DC 24V)



28. Under the tab 'Addresses', you can change the module's address areas. However, it has to be ensured that identical values are assigned to the start addresses of the output and input data areas. ( $\rightarrow$  Addresses  $\rightarrow$  200  $\rightarrow$  200)

Anfang:	200	Prozeßabbild:	
Ende:	205	OB1-PA	
Ausgänge			
Anfang:	200	Prozeßabbild:	
Ende:	203	OB1-PA	

	Preface	Notes	StartUp	Programming	
T I A Training Document E08		Page 3	31 of 64		Module

PROFIsafe and PROFINET with IO Controller CPU 315F-2 PN/DP and IO Device ET 200S



- 29. Under the tab 'Parameters', you can change the following parameter values:
- F-Parameters for PROFIsafe •
- Module parameters •
- Channel-specific parameters •

Here, a 2-channel emergency stop switch is to be connected to channels 0 and 4, and the position switches for monitoring a 2 channel safety door to channels 1 and 5. Perform the following settings, and then accept them with 'OK'. ( $\rightarrow$  Parameters  $\rightarrow$  OK)

Parameter	Wert
🖨 🔄 F-Parameter	
– F_Quell_Adresse	2000: CPU 315F-2 PN/DP
–≝ F_Ziel_Adresse	1022
–≝) DIL-Schalterstellung (90)	1111111110
└ F_Überwachungszeit (ms)	200
🗄 🔄 Baugruppenparameter	
Eingangsverzögerung	3 (ms)
—🗐 Kurzschlusstest	zyklisch
–🗐 Verhalten nach Kanalfehlern	Passivieren der gesamten Baugruppe
📥 🔄 Kanal 0, 4	
Aktiviert	
–🖹 Auswertung der Geber	2v2-Auswertung
— 🗐 Art der Geberverschaltung	2-kanalig äquivalent
— 🗐 Diskrepanzverhalten	0 - Wert bereitstellen
Diskrepanzzeit (ms)	100
🔁 🔄 Kanal 1, 5	
Aktiviert	
– 🗐 Auswertung der Geber	1v1-Auswertung
Ten Art der Ceberverscheltung	1 kapalia

	Preface	Notes	StartUp	Programming	
TIA Training Document		Page 32	? of 64		Module
Issued: 02/2008		PROFIsafe and PR	OFINET with IO Contr	oller CPU 315F-2 PN/DP and I	IO Device ET 2005



#### Notes regarding "F-Parameters":

The PROFIsafe addresses have to be unique network-wide and station-wide. To prevent wrong parameter assignments, the addresses are assigned automatically. The PROFIsafe

**'F\_Destination\_Address**' has to be set at the F-module with a DIL switch. The PROFIsafe **'F\_Source\_Address**' is specified by the F-CPU (F-Parameters 'Basis for PROFIsafe Addresses'). Within the monitoring time, a valid current safety message has to be received from the F-CPU. Otherwise, the F-module enters the safe mode.

On the one hand, the F-monitoring time should be long enough so that message delays are tolerated; on the other hand, low enough so that the process can respond as fast as possible if there is an error, and continues running without detriment. Help for establishing the timing is provided through calculation tables which SIEMENS is making available on the Internet (http://www4.ad.siemens.de/ww/view/de/ under the Contribution ID 19138505).

#### Note regarding "Module Parameters":

When a cyclical short circuit test is performed, you have to use the internal encoder supplies for all encoders connected to the F-module, und deactivate channels that are not used. Otherwise, errors are recognized on these channels. For our example, leave the settings of the module parameters unchanged.

**Note regarding "Channel x, y" Parameters: 'Evaluation of the encoders'** and **'Type of encoder wiring**' are to be parameterized corresponding to the encoder wiring. Encoder wiring and the safety quality of the encoder are decisive for the attainable safety class. Deactivate the unused channels 2, 6 and 3, 7.

#### Note regarding 2of2 evaluation, discrepancy performance, and discrepancy time:

If at two associated input signals ('**2of2 evaluation**' of the encoders), different levels (if checked for non-equivalence: same levels) are recognized, the '**Discrepancy time**' that can be parameterized here starts. While the discrepancy time is running within the module, the '**last valid value**' or '**0**' - depending on how the discrepancy time was parameterized- is made available to the F-CPU by the affected input channel.



30. Now, close the message window for the necessary '**Regeneration of the safety program**'. ( $\rightarrow$  Close  $\rightarrow$  OK)

Liste der Meldungen:	
Achtung, Sie haben eine sicherheitsrelevante Pro	ektierung geandert, wenn sie die Anderung
•	1
· · · · · · · · · · · · · · · · · · ·	
- Meldung Objekteigenschaften (4052:2070)	Hilfetext
	wante
Objekteigenschaften (4052:2070)  Achtung, Sie haben eine sicherheitsrele Projektierung geändert, wenn sie die År	wante

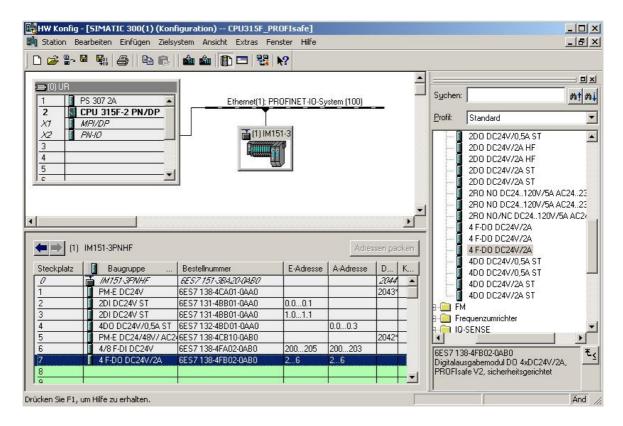
		Preface	Notes	StartUp	Programming	
-						
т	LIA Training Decument		Baga 3	2 of 64		Modulo





Issued: 02/2008

31. Next, we are dragging the fail-safe digital output module '**4 F-DO DC 24V/2A**' to the 7th slot. The order number and the version can be read off the module. By double clicking on the '**4 F-DO DC 24V/2A**', you open its properties. ( $\rightarrow$ PROFINET IO  $\rightarrow$  I/O  $\rightarrow$  ET 200S  $\rightarrow$  IM151-3 PN HF  $\rightarrow$  DO  $\rightarrow$  4 F-DO DC24V/2A  $\rightarrow$  4 F-DO DC24V/2A)



	Preface	Notes	StartUp	Programming	
TIA Training Document		Page 3	4 of 64		Module



32. In addition to the '**Addresses**' that are changed here to 210, the following parameter values can be changed under the tab '**Parameters**':

- F-parameters for PROFIsafe
- Module parameters/channel specific parameters

Here, on Channel 0, the press -our consumer- is to be operated indirectly by means of two contactors. Perform the following settings, and then accept them with '**OK**'. ( $\rightarrow$  Parameters  $\rightarrow$  OK)

Parameter	Wert	
🗄 🔄 Parameter		
E Serameter		
- E F_Quell_Adresse	2000: CPU 315F-2 PN/DP	
–≝ F_Ziel_Adresse	1021	
– 🗐 DIL-Schalterstellung (90)	1111111101	
└ F_Überwachungszeit (ms)	200	
🗄 🔄 Baugruppenparameter		
—📰 Verhalten nach Kanalfehlern	Passivieren der gesamten Baugruppe	
🖨 🦳 DO-Kanal 0		
- Aktiviert		
—🗐 Rücklesezeit	1 (ms)	
🗆 🖾 Diagnose: Drahtbruch		
🖨 🔄 DO-Kanal 1		
Aktiviert		
–🗐 Rücklesezeit		
Diagnose: Drahtbruch		
🖃 🛅 DO-Kanal 2		
Aktiviert		
- Dücklocozoit		



### Note regarding "DO Channel x" parameters:

Each output channel has its own parameterizable readback time. This time specifies the maximum duration of the shut-down test for the corresponding channel, and therefore also the readback time for the channel's shutdown cycle. Use a wire break check for monitoring the connection from the output to the consumer. Deactivate channels you are not using.

	Preface	Notes	StartUp	Programming	
TIA Training Document		Page 35	5 of 64		Module
Issued: 02/2008		PROFIsafe and PR	ROFINET with IO Control	oller CPU 315F-2 PN/DP and I	O Device ET 200S



33. Now, close the message window for the necessary '**Regeneration of the safety program**'. ( $\rightarrow$  Close  $\rightarrow$  OK)

Liste der Meldungen: Achtung, Sie haben eine	e sicherheitsrelevante Projektierung geände	ert, wenn sie die Änderung ü
Meldung		<u>•</u>
Objekteigenschaften	(4052:2070)	Hilfetext
Jobleweidenscharten		
Achtung, Sie	haben eine sicherheitsrelevante geändert, wenn sie die Änderung st eine Neugenerierung des	Gehe zu

34. By clicking on (), the configuration table is saved and converted. ( $\rightarrow$  )

Station Be		n <mark>figuration) CPU315F_</mark> PI system Ansicht Extras Fe	the second s					
) 🚅 🔓 🛛	<b>9</b> 🔛 🥌 🗎 🖻 🖻	🏜 🛍 📳 📼   器	₩?					
	Speichern und über:	setzen				<b></b>		
🚍 (0) UR	PS 307 2A	T Ethernet(1): P	ROFINET-IO-S	uters (100)		S <u>u</u> chen	c 🗌	mt m.
2	CPU 315F-2 PN/DP	Ethemet(I).		/s(ciii (100)		Profil:	Standard	
	MPI/DP	[]	51.3				1	
<u>X2</u> 1	PN-10						2D0 DC24V/0,5A ST 2D0 DC24V/2A HF	-
4							2D0 DC24V72A HF 2D0 DC24V72A HF	
5							2D0 DC24V72A HF 2D0 DC24V72A ST	
<u>c</u>		1					2D0 DC24V/2A ST 2D0 DC24V/2A ST	
							2R0 N0 DC24, 120V/5A A	024.25
							2R0 N0 DC24120V/5A /	1000000
							2R0 N0/NC DC24120V/	
					<u> </u>		4 F-D0 DC24V/2A	din ioc
10 B				22			4 F-D0 DC24V/2A	
(1)	IM151-3PNHF			Adres	ssen <u>p</u> ackei	1	4 F-D0 DC24V/2A	
		1.5	1.5.1	1	In fr	T   -	4D0 DC24V/0,5A ST	
Steckplatz	Baugruppe	Bestellnummer	E-Adresse	A-Adresse	D K	- II - I	4D0 DC24V/0,5A ST	
0	IN151-JFWHF	6ES7 151-3EA20-0AB0			2044 -	1 .	4D0 DC24V/2A ST	
	PM-E DC24V	6ES7 138-4CA01-0AA0	0.0.01		2043*		4D0 DC24V/2A ST	
2 3	2DI DC24V ST 2DI DC24V ST	6ES7 131-4BB01-0AA0 6ES7 131-4BB01-0AA0	0.00.1			🛛 🗐 🚰 F	2003.0	
	4D0 DC24V 51	6ES7 131-48801-0AA0	1.01.1	0.00.3			requenzumrichter	
4 5		246ES7 132-4BD01-0AA0	-	0.00.3	2042*	10	D-SENSE	
5 6	4/8 F-DI DC24V	6ES7 138-4CB10-0AB0	200205	200203	2042			
	4 F-D0 DC24V/2A	6ES7 138-4FB02-0AB0	210214	210214			38-4FB02-0AB0	t.
		0L01100-41002-0400	210214	210214	1		usgabemodul DO 4xDC24V/2	А, —
7 8 9	410000241725					- IPBOFI	afe V2, sicherheitsgerichtet	

	Preface	Notes	StartUp	Programming	
_					



35. Now, after being highlighted, the IO device has to be assigned the device name 'Assign device name'. ( $\rightarrow$  IM151-3PNHF $\rightarrow$  PLC  $\rightarrow$  Ethernet  $\rightarrow$  Assign device name)

🗲 🔐 I	<b>9 9</b> 11 <b>6</b> 3    <b>1</b> 6	Laden in Baugruppe Laden in PG		Ctrl+L		
	PS 307 2A	Baugruppen-Identifikation lac Baugruppen-Identifikation lac			stem (100)	Suchen:
	CPU 315F-2 PN/D	Gestörte Baugruppen				Profil: Standard
	PN-10	Baugruppenzustand Betriebszustand Urlöschen Uhrzeit stellen Beobachten/Steuern		Ctrl+D Ctrl+I	(1) IM151-3	
		Firmware aktualisieren	rd speichern			
- 12		Ethernet	ra spolenom m	•	Ethernet-Tei	inehmer bearbeiten 24V/2A
🔿 (1)	IM151-3PNHF	PROFIBUS		•		n überprüfen 24V/2A //0.5A.ST
eckplatz	Baugruppe	Servicedaten speichern			and the state of the	n vergeben //0,5A ST
	PM-E DC24V	6ES7 138-4CA01-0AA0			2043*	4D0 DC24V/2A ST
	2DI DC24V ST	6ES7 131-4BB01-04A0	0.00.1		2043	4D0 DC24V/2A ST
	2DI DC24V ST	6ES7 131 4BB01 0AA0	1.01.1			E EM
	4D0 DC24V/0.54		1.91.1	0.00.3		Frequenzumrichter
		AC246ES7 138-4CB10-0AB0		0.00.0	2042*	IO-SENSE
	4/8 F-DI DC24V	6ES7 138-4FA02-0AB0	200205	200203		
	4 F-D0 DC24V/2		210214	210214		6ES7 138-4FB02-0AB0 Digitalausgabemodul D0 4xDC24V/2A,
	La no o o coutina		arenal't	are and the		PROFIsafe V2, sicherheitsgerichtet



**Note:** A precondition for this is that the PG/PC interface is set to TCP/IP and the network card of the PC is configured correctly. For example, IP address 192.168.1.99, Subnet 255.255.255.0 and router address 192.168.1.1. (Refer to Module E02!)



Issued: 02/2008

**Note:** Make sure that your programming device is connected to the ET200S by means of the Ethernet!

	Preface	Notes	StartUp	Programming	
TIA Training Docume	ent	Page 3	7 of 64		Module



36. Now, the ET200S has to be selected in order to assign a name 'Assign name'. ( $\rightarrow$  ET200S  $\rightarrow$  Assign name)

	IM151-3PNHF	<b>_</b> _	Gerätetyp:	ET 2005	
handene Ger -Adresse   M	äte: IAC-Adresse	Gerätetyp	Gerätename	]	Name zuweisen
0	8-00-06-99-04-DE	ET 200S	noname		T. 1
					Teilnehmer-Blinktest
					Dauer (Sekunden): 3
					Blinken ein Blinken aus
					Blinken ein Blinken aus
		-			
nur Gerate g	leichen Typs anzei	gen I nu	ir Gerate ohne	Namen anzeigen	
Aktualisiere	en Exn	ortieren	1		
	ar Lop	ordoron	100 00		



**Note:** If several IO devices are on the network, the device can be identified with the imprinted MAC address.



37. The new device name is then displayed in the area 'Available devices'. Then, 'Close' the dialog. ( $\rightarrow$  Close)

IP-Adresse MAC-Adress 08-00-06-99-	e Gerätetyp			Name zuweisen	
	04-DE ET 2005	Gerätename IM151-3PNHF		Hamo Zumoisell	1
			[	– Teilnehmer-Blinktest-	
				Dauer (Sekunden):	3 💌
					or i
				Blinken ein	Blinken aus
nur Geräte gleichen Tur	is anzeigen 🔲 nui	' Geräte ohne Na	men anzeigen		

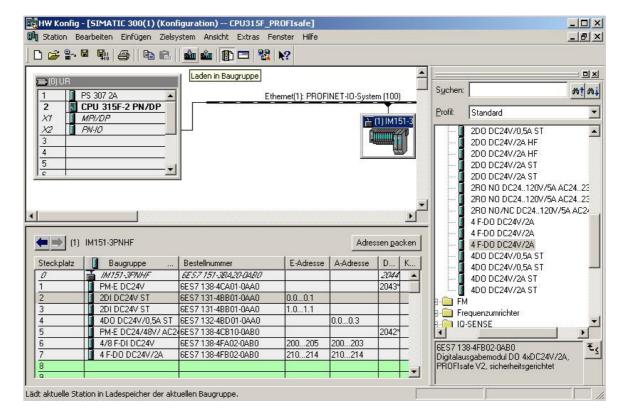
 Preface
 Notes
 StartUp
 Programming

 T I A Training Document
 Page 38 of 64
 Module

 E08
 Bisued: 02/2008
 PROFIsafe and PROFINET with IO Controller CPU 315F-2 PN/DP and IO Device ET 200S



38. By clicking on ' $\overset{()}{\blacksquare}$ ', the configuration table can be loaded to the PLC. The operating mode switch should be on Stop! ( $\rightarrow$ )





Issued: 02/2008

Note: Make sure that your programming device is connected to the CPU by means of the Ethernet!

	Pretace	Notes	StartUp	Programming	
TIA Train	ing Document	Page 39	9 of 64		Module



39. The CPU 315F-2 PN/DP is confirmed as destination module for loading the configuration table. (  $\rightarrow$  OK)

Baugruppe	Träger	Steckplatz
:PU 315F-2 PN/DP	0	2
AU		
Alles markieren		

40. In the dialog box below, you can have the devices displayed that are connected to the network 'Display'. ( $\rightarrow$  Display)

	e auswählen			
Über welche Teilnel	nmeradresse ist das Pl	G mit der Baugruppe CF	PU 315F-2 PN/DI	P verbunden
Baugruppenträger:				
Steckplatz:	2 🚊			
Zielstation:	🕲 Lokal			
	C Über Netzüberg	ang zu erreichen		
Anschluß an Ziels	Carl Science I have been been and the set		12	10
IP-Adresse	MAC-Adresse	Baugruppentyp	Stationsname	CPU-Name
192.168.1.10				
٠[				D
<u>د[</u>		Anzeigen		D

	Preface	Notes	StartUp	Programming	
TIA Training Documen	t	Page 4	10 of 64		Module
Issued: 02/2008		PROFIsafe and P	ROFINET with IO Contr	roller CPU 315F-2 PN/DP and	IO Device ET 200S



41. Then, the CPU's MAC address on the Ethernet network is selected. If you are connected to only one CPU, just accept with '**OK**' ( $\rightarrow$  OK)

08-00-06-68-A2-D8 57-300	eilnehmeradress	e auswählen			
Steckplatz: 2	Über welche Teilnel	nmeradresse ist das PG n	nit der Baugruppe CF	PU 315F-2 PN/D	P verbunden
Zielstation: C Lokal C Über Netzübergang zu erreichen Anschluß an Zielstation eingeben: IP-Adresse MAC-Adresse Baugruppentyp Stationsname CPU-Nam 08-00-06-68-A2-D8 \$7-300 Erreichbare Teilnehmer: IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	Baugruppenträger:	0 =			
C Über Netzübergang zu erreichen Anschluß an Zielstation eingeben: IP-Adresse MAC-Adresse Baugruppentyp Stationsname CPU-Nam 08-00-06-68-A2-D8 \$7-300	Steckplatz:	2 #			
Anschluß an Zielstation eingeben: IP-Adresse Baugruppentyp Stationsname CPU-Nam 08-00-06-68-A2-D8 \$7-300 Tereichbare Teilnehmer: 08-00-06-68-A2-D8 \$7-300 Altualisieren	Zielstation:	🖲 Lokal			
IP-Adresse MAC-Adresse Baugruppentyp Stationsname CPU-Nam 08-00-06-68-A2-D8 \$7-300		C Über Netzübergang	g zu erreichen		
08-00-06-68-A2-D8 57-300	Anschluß an Ziels	tation eingeben:			
	IP-Adresse			Stationsname	CPU-Name
08-00-06-68-A2-D8   \$7-300		08-00-06-6B-A2-D8	57-300		
Aktualisieren	Erreichbare Teilneh		1 \$7.200		
		00-00-00-00-42-0-0	0.000		
	4				•
		Ak	tualisieren		
OK Abbrechen Hilfe	ОК			Abbrechen	Hilfe



**Note:** If there are several IO controllers on the network, the device can be identified with the imprinted MAC address.



Issued: 02/2008

42. Now, the correct IP address has to be assigned to the IO controller if it has not yet been set correctly. Confirm this in the dialog box below with 'Yes'. (→ Yes)



<<The selected station does not have an IP address. Do you want to assign the address 192.168.1.10 now?>>

	Preface	Notes	StartUp	Programming	
TIA Training Document		Page 4	1 of 64		Module

#### 5. PROGRAM EXAMPLE



In the safety program below, a press as Consumer 1 is to be switched off safety-related for a production area if:

- A safety door that is monitored by two contacts is opened or
- An emergency stop connected to two-channels is operated

After operating the emergency stop or after opening the safety door, a user acknowledgement on location is necessary in order to restart production.

In our example

- a fail-safe block with a safety door function,
- an emergency stop function (safety circuit for shut down in the case of emergency stop, and open safety door)
- a feedback circuit (as reactivation protection if the consumer is faulty), and
- a user acknowledgement for reintegration

is to be programmed and then generated into a safety program

1

A precondition for programming this block is a hardware configuration that is set up correctly, as described in Chapter 4.

SIMATIC Manager - [CPU315F]	_PROFIsafe F:\0_57_	Projekte\CPU315F_]				
🞒 Datei Bearbeiten Einfügen Zi	elsystem Ansicht Extra:	s Fenster Hilfe				_ & ×
		Kein Filte	r>	· V 28		
E B CPU315F_PROFIsafe	Objektname	Symbolischer Name	Erstellsprache	Größe im Arb	Тур	Version (Hea
E SIMATIC 300(1)	Systemdaten				SDB	
E- CPU 315F-2 PN/DP	🕞 OB1			38	Organisationsbaustein	0.1
🖻 🛐 S7-Programm(2)	5 FB600	F_IO_CGP	F-AWL	15252	Funktionsbaustein	1.0
🔂 Quellen	5 FB601	F_CTRL_1	F-AWL	9574	Funktionsbaustein	1.2
	502 FB602	F_CTRL_2	F-AWL	5300	Funktionsbaustein	1.3
	5 DB600	F_GLOBDB	F-DB	226	Datenbaustein	5.4
	5 DB601	F00200_4_8_F_DI_DC24V	F-DB	664	Instanzdatenbaustein zu FB 600	0.0
	DB602	F00210_4_F_D0_DC24V	F-DB	664	Instanzdatenbaustein zu FB 600	0.0
	41					
Drücken Sie F1, um Hilfe zu erhalten.			PC Adapt	ter(PROFIBUS)		
procisi pionary anthline za entalcen.			live waapo		1	1 //

#### **F-IO Data Blocks**

For each F-IO, an "F-IO DB" is generated automatically in the hardware configuration during compiling and at the same time, a symbolic name is entered for it in the symbol table. You can view the F-IO DBs generated for the sample IO in the block container; these are the F-data blocks DB 601 and DB 602.

The symbolic name of the F-IO DB consists of the permanent prefix "F", the start address of the F-IO, and the names entered in the hardware configuration in the object attributes for F-IO (17 characters maximum).

#### **F-Global DB**

The F-global DB "DB 600" is a fail-safe data block that is inserted automatically and contains all global data of the safety program, as well as additional information that the F-system needs.

	Preface	Notes	StartUp	Programming	
TIA Training Document		Page 4	12 of 64		Module

i

#### Inputs and Outputs in the Safety Program

For programming the sample safety program, the following addresses and fault-tolerant IO DBs are available to you, according to the hardware configuration described in Chapter 4:

You can access the variables of the F-IO DB by means of a "fully qualified DB access"

(that is, by specifying the symbolic name of the F-IO DB and by specifying the name of the variable). **Configured Hardware** Start Address Symbolic Name F-IO DB Digital electronic module 0 2DI DC 24V ST (6ES7 131-4BB01-0AA0) Digital electronic module 1 2DI DC 24V ST (6ES7 131-4BB01-0AA0) 0 Digital electronic module 4DO DC 24V/0.5A ST (6ES7 132-4BD01-0AA0) 200 F00200\_4\_8\_F\_DI\_DC24V DB 601 Fail-safe digital input module 4/8 F-DI DC 24V (6ES7 138-4FA01-0AB0) 210 Fail-safe digital output F00210\_4\_F\_DO\_DC24V\_2A DB 602 module F-DO DC 24V/2A (6ES7 138-4FB01-0AB0)



Issued: 02/2008

1. Now, open the symbol table in your project. ( $\rightarrow$  Symbols)

SIMATIC Manager - [CPU315F_						<u> </u>
🗃 Datei Bearbeiten Einfügen Zie	elsystem Ansicht Extras	Fenster Hilfe				_ 8 ×
		📰 🏦 主 < Kein Filter	> <u> </u>	20 58	<b>1</b> 🕺	
🖃 🎒 CPU315F_PROFIsafe	Objektname	Symbolischer Name	Тур	Größe Autor	Änderungsdatum	4
🖻 📆 SIMATIC 300(1)	🛅 Quellen		Quellordner	1000	17.01.2006 14:33:	.11
🖻 🔛 CPU 315F-2 PN/DP	💼 Bausteine		Bausteinordner offline	1,000	17.01.2006 15:33:	55
⊡-sn S7-Programm(2) ⊡ B Quellen	Symbole		Symboltabelle	3788	17.01.2006 15:26:	57
Bausteine						
	4					×
Drücken Sie F1, um Hilfe zu erhalten.			PC Adapter(PROFIE	3US)	3788 Bytes	

	Preface	Notes	StartUp	Programming	
TIA Training	) Document	Page 4	3 of 64		Module



2. In the symbol table, assign symbolic names to the fail-safe and the standard inputs and outputs as

well as to the flags used. Save the symbol table and close it. (  $\rightarrow$ 

൙ 日	🎒 👗 🖻 💼 🗠 🗠   Al	e Symb	ole			∑∕/ <b>№</b> ?
		Ad	resse	Dat	entyp	Kommentar
1  2	CTRL_1	FB	601	FB	601	F_: Cycle Control and Mode
2	F_CTRL_2	FB	602	FB	602	F_: Test Block and Programme Run Control
3	F_GLOBDB	DB	600	DB	600	F_:F_Global_Data Block
4	F_IO_CGP	FB	600	FB	600	F_: Driver Block In-Output with Channel Granular Passivation
5	F00200_4_8_F_DI_DC24V	DB	601	FB	600	
6	F00210_4_F_DO_DC24V_2A	DB	602	FB	600	
7	HV01-H100	A	210.0	BOG	OL	Verbraucher 1(Pressensteuerung)
3	HV01-H200	A	0.0	BOG	OL	Lampe 1 Quittieren
9	HV01-S209	E	200.0	BOG	DL .	Not-Halt-Schalter 2-kanalig verdrahtet
10	HV01-S210	E	200.1	BOG	DL .	Schutztürkontakt 1
11	HV01-S211	E	200.5	BOG	DL .	Schutztürkontakt 2
12	HV01-S220	E	0.0	BOG	DL .	Taster 1: Quittieren
13	HV01-S221	E	0.1	BOG	DL .	Schalter 2: Anlage Ein
14	HV01-S222	E	1.0	BOG	DL .	Rückführkreis Verbraucher 1
15	Schatten_Ein	M	10.0	BOG	DL .	Betriebsmässiges Einschalten
16						

3. In the SIMATIC Manager, set up an F-FB. ( $\rightarrow$  Blocks  $\rightarrow$  Insert new object  $\rightarrow$  Function block)

	agon 21	elsystem Ansicht Ex		1.111.0			_8
) 🚄 🔡 🛲 👗 🖻	d R		6- 0- 0- 0-0-0- 0-0- 0-0-	🔁 🛛 < Kein Filte	rr ≻	• <u>7</u> <u>8</u> @	
🕘 CPU315F_PROFIsate		Objektname	Symbolische	er Name	Erstellsprache	Größe im Arbeits	Тур
E SIMATIC 300(1)	0.000.0000	🚵 Systemdaten			2 <u>00</u> 2		SDB
🖻 📓 CPU 315F-2 F		🕞 0B1				38	Organisationsbaustein
🖻 🛐 S7-Progra		5 FB600	F_IO_CGP		F-AWL	15252	Funktionsbaustein
	en	58601	F CTRL 1		F-AWL	9574	Funktionsbaustein
🔁 Bau	Aussch	ineiden	Ctrl+X	1	F-AWL	5300	Funktionsbaustein
	Kopier	en	Ctrl+C		F-DB	226	Datenbaustein
	Einfüg	en	Ctrl+V	_F_DI_DC24V	F-DB	664	Instanzdatenbaustei
Lös	Lösche	n	Del	_D0_DC24V	F-DB	664	Instanzdatenbaustei
	Neues	Objekt einfügen	Þ	Organisations	baustein		
	Zielsys	tem	•	Funktionsbaus	stein		
Bau Ref		drahten ine vergleichen nzdaten inkonsistenz prüfen	•	Funktion Datenbausteir Datentyp Variablentabe			
Dru	Drucke	n	+				
	17-20 C 1993	ennen eigenschaften le Objekteigenschaften	F2 Alt+Return				

	Preface	Notes	StartUp	Programming	
— Т	I A Training Document	Page 4	4 of 64		Module



4. Under the tab 'General - Part 1', enter the 'Name' and 'Symbolic Name'. As 'Programming Language' select 'F-FBD' and close the dialog field with 'OK'. (  $\rightarrow$  FB1  $\rightarrow$  FB\_MAIN PROGRAM  $\rightarrow$  $F-FBD \rightarrow OK)$ 

Eigenschaften - Funktion	sbaustein	×
Allgemein - Teil 1 Allgeme	ein - Teil 2   Aufrufe   Attribute	
Name:	FB1	Multiinstanzfähig
Symbolischer Name:	FB_HAUPTPROGRAMM	
Symbolkommentar:		
Erstellsprache:	F-FUP 💌	10 10
Projektpfad:	FUP GRAPH	
Speicherort des Projekts:	F-KOP	
Erstellt am:	Code 21.01.2006 20:03:43	Schnittstelle
Zuletzt geändert am:	21.01.2006 20:03:43	21.01.2006 20:03:43
Kommentar:		* •
ОК		Abbrechen Hilfe

5. By double clicking in the SIMATIC Manager, open 'FB1'. ( $\rightarrow$  FB1)

D 🗃 📰 🛲 👗 🖻 🖻		- 🔠 🏦 主 🛛 < Kein Filte	er >	· 7/ 58 @	
- 🞒 CPU315F_PROFIsafe	Objektname	Symbolischer Name	Erstellsprache	Größe im Arbeits	Тур
E- SIMATIC 300(1)	🚵 Systemdaten				SDB
	🖬 0B1			38	Organisationsbaustein
🖻 🛐 S7-Programm(2)	EB1	FB_HAUPTPROGRAMM	F-FUP	38	Funktionsbaustein
💼 Quellen	5 FB600	F_IO_CGP	F-AWL	15252	Funktionsbaustein
Bausteine	5 FB601	F_CTRL_1	F-AWL	9574	Funktionsbaustein
	5 FB602	F_CTRL_2	F-AWL	5300	Funktionsbaustein
	5 DB600	F_GLOBDB	F-DB	226	Datenbaustein
	5 DB601	F00200_4_8_F_DI_DC24V	F-DB	664	Instanzdatenbaustei
	5 DB602	F00210_4_F_D0_DC24V	F-DB	664	Instanzdatenbaustei
		1			

	Preface	Notes	StartUp	Programming	
TIA Training I E08	Document	Page 4	45 of 64		Module



6. Enter the password (8 characters maximum) twice and accept with '**OK**'. ( $\rightarrow$  pw\_fprog  $\rightarrow$  pw\_fprog)

Altes Passwort	J		
Neues Passwort	******		
Passwort bestätigen	*******		
Zugangsberechtigung			
Gültigkeit (in Minuten):	0	Aut	heben

7. Now, in the editor 'LAD/STL/FBD', set up a static variable with the name 'ENABLE\_SAFETY DOOR'. ( $\rightarrow$  STAT  $\rightarrow$ FRG\_SCHUTZTUER)

🔣 KOP/AWL/FUP - [FB1 "F	B_HAUF	TPROGRAMM" CPI	J315F_PROFIsa	fe\SIMATIC 3	00(1)\CPU 315F-	2 PN/DP\\FB1]
😐 Datei Bearbeiten Einfügen	Zielsy:	stem Test Ansicht B	Extras Fenster	Hilfe		_ B ×
	B			!« »!  🔲	<u>∎</u> <u>#*</u> <u>8</u> ≥	
	Inl	halt von: 'Umgebu	ng\Schnittst	elle\STAT'		
🖃 🕀 Schnittstelle	199	Name	Datentyp	Adresse	Anfangswer	
IN IN	13	FRG_SCHUTZTUER	Bool	0.0	FALSE	
	D					🗄 🔞 Bitverknüpfung
IN_OUT						🗄 💽 Vergleicher
E STAT						🗄 🔄 Umwandler
TEMP						🗄 <u>b</u> DB-Aufruf
	4				•	🗄 💼 Sprünge
р [						🗄 🖭 Festpunkt-Fkt.
FB1 : Titel:					-	🗄 🔁 Verschieben
						🗄 🐨 Programmsteuerung
Netzwerk 1: Titel:						🗄 🎰 🔐 Statusbits
Construction of the second second						🖬 🛱 🚱 Wortverkpüpfung

٠	
-1	

#### Note:

The programming languages F-FBD and F-LAD basically correspond to the standard FBD/LAD. The standard *FBD/LAD-Editor* is used in *STEP* 7 for programming.

F-FBD and F-LAD essentially differ from the standard through limitations in the operation set and regarding the usable data types and operand areas.

The following is displayed in the F-program element catalog:

- The operations that are supported
- F-FBs and F-FCs from the block container of your S7 program
- F-blocks from F-libraries, such as F-application blocks of the f-library *Distributed Safety* (V1), for protective monitoring, etc.
- Multi-instances

	Preface	Notes	StartUp	Programming	
TIA Training Document	t	Page 4	16 of 64		Module



8. Now do the following: Insert the fail-safe application block **FB 217 "F\_SFDOOR"** (safety door) from the block container **'F-Application Blocks'**, set up the instance DB, and initialize the inputs and outputs, as shown in the figure below. ( $\rightarrow$  Libraries  $\rightarrow$  F-Application Blocks  $\rightarrow$  FB217  $\rightarrow$  DB217  $\rightarrow$  Yes)

KOP/AWL/FUP - [FB1 "FB_HAUPTPROGRAMM" CPU315F_PROFIsafe\SIMATIC 300(1)\CPU 315 Datei Bearbeiten Einfügen Zielsystem Test Ansicht Extras Fenster Hilfe	F-2 PN/DP\\FB1]
D <b>22-0 5 XBB &gt; 7 MM 7 2</b> 61 (×>! <b>6 8</b>	
Inhalt von: 'Umgebung\Schnittstelle\STAT'       Schnittstelle     Name     Datentyp     Adresse     Anfar A       IN     Image: Schnittstelle     Image: Schnittstelle     Adresse     Anfar A       In     Image: Schnittstelle     Image: Schnittstelle     Image: Schnittstelle       In     Image: Schnittstelle     Image: Schnittstelle       In     Image: Schnittstelle     Image: Schnittstelle       Image: Schnittstelle     Image: Schnittstelle     Image: S	
FB1 : Sicherheitstechnisches Hauptprogramm         Metzwerk 1: Schutztürüberwachung         DB217         "F_SFD00R"         EN         "HV01-S210" - IN1         "F00200_4.8_F_         DI_DC24V".QBAD_QBAD_IN1         "F00200_4.8_F_         DI_DC24V".QBAD_QBAD_IN2	
"F_CLOEDB".VKE1 OPEN_NEC ACK_REQ "F_CLOEDB".VKE1 ACK_NEC DIAG @"HV01-S220" ACK ENO	
	Programmelemente
X     X <td>h λ 6: Diagnose λ 7: Vergleich / Abs &lt; 5.2 Nw 1 Einfg Änd //</td>	h λ 6: Diagnose λ 7: Vergleich / Abs < 5.2 Nw 1 Einfg Änd //
KOP/AWL/FUP (30:150)         Der Instanz-Datenbaustein DB 217 existiert nicht. Soll er generiert werden?         Ja       Nein         Hilfe	

<<Instance data block DB217 does not exist. Do you want to generate it?>>

The non-safe "acknowledgement button" signal from the standard program is marked yellow.



Issued: 02/2008

**Notes**: If you need the Boolean constants "0" and "1" in your safety program for initializing parameters when calling blocks, you can access the variables "RLO0" and "RLO1" in the F-global DB by means of a fully qualified DB access ("F\_GLOBDB".RLO0 or "F\_GLOBDB".RLO1). In our example, the F-global DB has the number "DB 600" in the block container.

In the case of fault-tolerant programming, the enable input EN and the enable output ENO must not be wired, initialized with "0", or evaluated!

	Preface	Notes	StartUp	Programming	
— Т I Е0	A Training Document	Page 4	17 of 64		Module

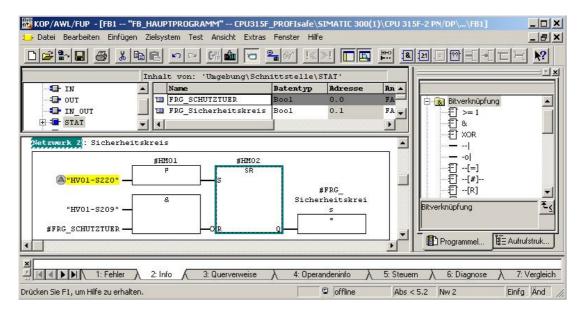
#### Connections of the FB 217:

Inputs	Parameters	Data Type	Description	Default
"HV01-S210"	IN1	BOOL	Safety door contact 1	0
"HV01-S210"	IN2	BOOL	Safety door contact 1	0
"F00200_4_8_F_DI_DC24V".QBA	QBAD_IN1	BOOL	QBAD signal from F-IO	0
D			DB of input IN1*	
"F00200_4_8_F_DI_DC24V".QBA	QBAD_ IN2	BOOL	QBAD signal of F-IO	0
D			DB of input IN2*	
"F_GLOBDB".VKE1	OPEN_NEC	BOOL	Fully qualified access to	1
			variable RLO1 from F-global	
			DB**	
"F_GLOBDB".VKE1	ACK_NEC	BOOL	Fully qualified access to	1
			variable RLO1 from F-global	
			DB**	
"HV01-S220"	ACK	BOOL	User acknowledgement (using	0
			the button)	
Outputs	Parameters	Data Type	Description	Default
#FRG_SCHUTZTUER	Q	BOOL	Enable safety door	0
	ACK_REQ	BOOL	Acknowledgement request	0
	DIAG	BYTE	Service information	B#16#0

\* = Both inputs QBAD\_IN1 and QBAD\_IN2 have to be wired; in our example both with the QBAD signal from the F-IO DB of the 4/8 F-DI, to which the safety door position switches are connected. You can obtain the block number of the F-IO DB by means of the symbolic name in the symbol table, or in the *SIMATIC Manager*. \*\* = OPEN NEC: 1 = OPEN required for startup/ACK NEC: 1 = acknowledgement required.



9. Set up the static variables "Enable\_Safety Circuit" (Freigabe Sicherheitskreis), "HM01" and "HM02" as auxiliary flags. Insert a 'New Network', and generate a program for the safety circuit, as shown below ( $\rightarrow$  Enable\_Safety Circuit  $\rightarrow$  HM01  $\rightarrow$  HM02  $\rightarrow$  New Network)



Preface Notes StartUp **Programming** 



10. In the 'SIMATIC Manager', open the F-library *Distributed Safety* (V1) and copy the F-application block F\_TOF (FB 186) from the block container '**F-Application Blocks**' 'Blocks' to the block container of your S7 program. It is needed by the following fault-tolerant application block. ( $\rightarrow$  FB186)

atei Bearbeiten Einfügen Zielsy	vstem Ansicht Extra	as Fenster Hilfe			
			< Kein Filter >	<u>V 200 5</u>	
Distributed Safety (¥1) D:	\Programme\Siemi	ns\5 <u>_   ×</u>	CPU315F_PROFIsafe F:\0	_57_Projekte\CPU315	F O ×
⊡ 🥪 Distributed Safety (V1)	Objektname	Symboli:	🖃 🎒 CPU315F_PROFIsafe	Objektname	Symbolisch
😑 🛐 F-Application Blocks	5 FB179	F_SCA_	🖻 🎆 SIMATIC 300(1)	Systemdaten	
Source Files	5 FB181	F_CTU	🖻 📓 CPU 315F-2 PN/DF		
Blocks	5 FB182	F_CTD	🖻 🛐 S7-Programm(2)	🔂 FB1	FB_HAUPT
🗄 🛐 F-System Blocks	55 FB183	F_CTUE	🕞 Quellen	5 FB186	
	50 FB184	F_TP	💼 Bausteine	🗗 FB217	F_SFDOOF
	🗗 🚰 FB185	F_TON		58600 FB600	F_IO_CGP
	5 FB186	F_TOF		58601	F_CTRL_1
	50 FB187	F_ACK_		58602	F_CTRL_2
	50 FB188	F_2HAN		DB217	
	58189	F_MUTI		5 DB600	F_GLOBDI
	58190	F_1002[]		🔂 DB601	F00200_4_
	50 FB211	F_2H_E		DB602	F00210_4_
	50 FB212	F_MUT_			
	58215 FB215	F_ESTC			
	FB216	F_FDBA			
	50 FB217	F_SFDC			
	FB223	F_SENC			
	1 mm			•	•

11. In your project, open the 'Object Properties' of FB 186. ( $\rightarrow$  FB186  $\rightarrow$  Object Properties)

tei Bearbeiten Einfügen Zielsys	stem Ansicht Extr	as Fenster Hilfe			
			< Kein Filter >		?
Distributed Safety (V1) D:\	ProgrammeSiem	ens\St 🗆 🗙	CPU315F_PROFIsafe F:\0_S	7_Projekte\CPU315F_	
Image: Source Fless           Image:	Objektname           ↓         FB179           ↓         FB181           ↓         FB182           ↓         FB182           ↓         FB182           ↓         FB183           ↓         FB184           ↓         FB186           ↓         FB186           ↓         FB187           ↓         FB180           ↓         FB180           ↓         FB211           ↓         FB212           ↓         FB215           ↓         FB215           ↓         FB217           ↓         FB217           ↓         FB217           ↓         FB223           ↓         FB224           ↓         FB224	Symbolisc ▲ F_SCA_J F_CTU F_CTU F_CTUD F_TP F_TON F_TOF F_ACK_0 F_ACK_0 F_ACK_0 F_ACK_0 F_ACK_0 F_ACK_0 F_ACK_0 F_ACK_0 F_ACK_0 F_ACK_0 F_ACK_0 F_SCD0 F_S	CPU315F_PROFisale □ III SIMATIC 300(1) □ III CPU 315F-2 PN/DP □ III CPU 315F-2 PN/DP □ IIII CPU 315F-2 PN/DP □ IIIII CPU 315F-2 PN/DP □ IIII CPU 315F-2 PN/DP □ III	Systemdaten	hbolischer Name HAUPTPROGRAMM Ctrl+Alt+O Ctrl+X Ctrl+C Ctrl+Y Del

	Preface	Notes	StartUp	Programming	
-					



12. Assign the symbolic name '**F**\_**TOF**' to the F-application block FB 186. ( $\rightarrow$  F\_TOF  $\rightarrow$  OK)

1	ein - Teil 2 Aufrufe Attribute	1
Name:	FB186	Multiinstanzfähig
Symbolischer Name:	FTOF	
Symbolkommentar:		
Erstellsprache:	F-AWL	
Projektpfad:	CPU315F_PROFIsafe\SIMA PN/DP\S7-Programm(2)\Bat	
Speicherort des Projekts	F:\0_S7_Projekte\CPU315F	<u>.</u>
	Code	Schnittstelle
Erstellt am:	21.01.2006 20:26:04	
Zuletzt geändert am:	02.08.2005 10:05:05	05.03.2004 15:47:38
Kommentar:	F_: Timer Switch Off Delay CRC=14b4/IDB=980d Build S7_S7FFUP_V05.04.0 10:05:04	0.00_03.10.00.01; 2.08.2005

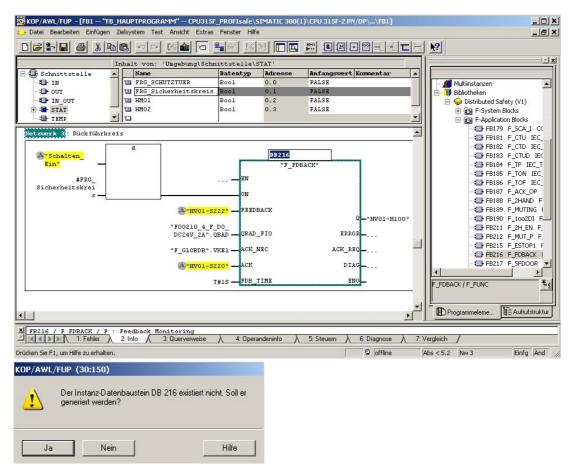
	Preface	Notes	StartUp	Programming	
TIA Training Docume	ent	Page 5	50 of 64		Module







13. Set up a '**New Network**' and insert the fail-safe application block **FB 216 "F\_FDBBACK**" (feedback monitoring) from the block container '**F-Application Blocks**'. Set up the instance DB and initialize the inputs and outputs as shown in the figure below. ( $\rightarrow$  New Network  $\rightarrow$  Libraries  $\rightarrow$  F-Application Blocks  $\rightarrow$  FB216  $\rightarrow$  DB216  $\rightarrow$  Yes)



<<The instance data block DB 216 does not exist. Do you want to generate it now?>>

1

**Notes**: If you need the Boolean constants "0" and "1" in your safety program for initializing parameters when calling blocks, you can access the variables "RLO0" and "RLO1" in the F-global DB by means of a fully qualified DB access ("F\_GLOBDB".RLO0 or "F\_GLOBDB".RLO1). In our example, the F-global DB has the number "DB 600" in the block container.

In the case of fault-tolerant programming, the enable input EN and the enable output ENO must not be wired, initialized with "0", or evaluated!

	Preface	Notes	StartUp	Programming	
TIA Training Document		Page 8	51 of 64		Module
Issued: 02/2008		PROFIsafe and P	ROFINET with IO Cont	troller CPU 315F-2 PN/DP and IO	Device ET 200S

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#### Connections of the FB 216:

Inputs	Parameters	Data Type	Description	Default
"Switch_ON"	ON	BOOL	Enable conditions for	0
and			Consumer 1/press	
#ENA_SafetyCircuit				
"HV01-S222"	FEEDBACK	BOOL	Readback input	0
"F00210_4_F_DO_DC24V_2A".Q	QBAD_FIO	BOOL	QBAD signal from F-IO DB of	0
BAD			output Q*	
"F_GLOBDB".VKE1	ACK_NEC	BOOL	Fully qualified access to the	1
			variable RLO1 from F-global	
			DB**	
"HV01-S220"	ACK	BOOL	User acknowledgement	0
			(through button)	
T#1s	FDB_TIME	TIME	Readback time	T#0ms
Outputs	Parameters	Data Type	Description	Default
"HV01-H100"	Q	BOOL	Consumer 1/press	0
	ERROR	BOOL	Readback error	0
	ACK_REQ	BOOL	Acknowledgement request	0
	DIAG	BYTE	Service information	B#16#0

\* = In our example, this is the QBAD signal from the F-IO DB of the F-DO to which the consumer (the contactors) is connected. The block number of the F-IO DB can be obtained by means of the symbolic name in the symbol table, or in the *SIMATIC Manager*.

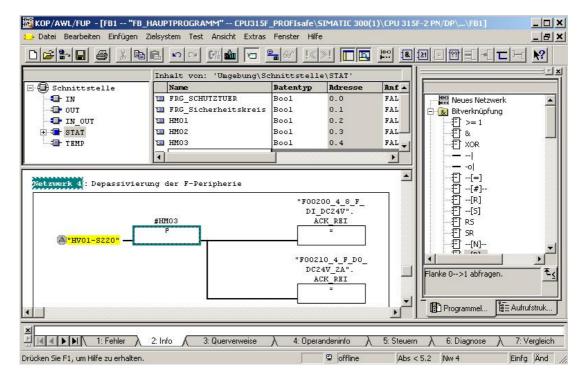
\*\* = ACK\_NEC: 1 = Acknowledgement required.

	Preface	Notes	StartUp	Programming		
TIA Training Document		Page 52 of 6	4		Module	



14. Set up the static variable **"HM03"** as auxiliary flag. Insert a '**New Network**', and generate in your safety program for each F-IO a user acknowledgement for reintegration by means of the variable ACK\_REI of the respective F-IO DB, as shown in the figure below. Then save the FB1500. ( $\rightarrow$  HM03

 $\rightarrow$  New Network  $\rightarrow$   $\blacksquare$ )





**Note**: To reintegrate the F-IO (that is, to switch from the substitute values (0) to process values) after the errors are remedied, a user acknowledgement with a positive edge at the variable ACK\_REI of the F-IO DB is required:

- After communication errors always

- After F-IO/channel errors only if ACK\_NEC = 1 is parameterized



 $\rightarrow$  (

15. Confirm the following message with '**YES**' and close the FB1 and the FBD/LAD Editor. ( $\rightarrow$  Yes

!	Die Schnittstelle des Bausteins wurde geändert. Nach Speichern führt dies zum Schnittstellenkonflikt mit den Bausteinen, die diesen referenzieren. Die zugehörigen F-Bausteine müssen neu übersetzt werden.
	Speichern fortsetzen ?

<<The interface of the block was changed. After the save, this causes an interface conflict with the blocks that reference this block. The associated F-blocks have to be recompiled. Continue the Save?>>

Preface	Notes	StartUp	Programming	
 reining Degument	Dogo 5	2 of 64		Madula



16. Now, open the safety program. ( $\rightarrow$  Blocks  $\rightarrow$  Options  $\rightarrow$  Edit safety program)

🞒 Datei Bearbeiten Einfügen Zi	elsystem Ansicht	Extras Fenster Hilfe		_ 8 ×
	🛍 🖸 🖳 🕯	Einstellungen Ctrl+Alt+E	🖸 🏹 🔡 🎯	
CPU315F_PROFIsafe Image: SIMATIC 300(1) Image: ST-Programm(2) Image: ST-Programm(2) Ima	Objektname Systemdaten OB1 FB1 FB1 FB186	Textbibliotheken       >         Sprache für Anzeigegeräte       Texte mehrsprachig verwalten         Umverdrahten       >         Ablaufeigenschaften       >	Größe im Arbeits 38 420 294	Typ SDB Organisationsbaustein Funktionsbaustein Funktionsbaustein
	₩ FB216 FB217 FB600 FB601 FB602	Bausteine vergleichen Referenzdaten • Globaldaten definieren Netz konfigurieren	340 Funktionsbe 15252 Funktionsbe 9574 Funktionsbe 5300 Funktionsbe 70 Instanzdate 42 Instanzdate 226 Datenbaust	Funktionsbaustein Funktionsbaustein Funktionsbaustein Funktionsbaustein Funktionsbaustein
	DB216 DB217	Baugruppen simulieren Prozeßdiagnose projektieren		Instanzdatenbaustei Instanzdatenbaustei
	다. DB600 다. DB601	Sicherheitsprogramm bearbeiten		Instanzdatenbaustei
	DB602	PG/PC-Schnittstelle einstellen	664	Instanzdatenbaustei

#### 17. Then, click on '**F-Sequence Groups**'. ( $\rightarrow$ F-Sequence Groups)

augruppenträger: 0	Steckplatz: 2					Aktueller Modus
iesamtsignatur aller F-Bausteine m	nit F-Attribut des Bausteir	ncontainers:	345728BC			[nicht bekannt]
iesamtsignatur des Sicherheitspro		(	)			-
ktuelle Generierung:	2					Pietrakaitakatiak
	: A des leteten Constant					Sicherheitsbetrieb
) as Sicherheitsprogramm wurde se	sit der letzten Genenerur	ng geandert.				
-Bausteine:		1		-		
F-Ablaufgruppe/F-Baustein	Symb. Name	Funktion im Sicherheitspro	Signatur	Know How S		Vergleichen
Sicherheitsprogramm						
⊡- 🔁 Gesamt						Berechtigung
: FB1	FB_HAUPTP	F-FB	DD39			
🚁 FB186		F-Applikationsbaustein	14B4			F-Ablaufgruppen.
🛃 FB216	F_FDBACK	F-Applikationsbaustein	F521	V		
🛃 FB217	F_SFDOOR	F-Applikationsbaustein	86DA	V		Generieren
<b>FB600</b>	F_IO_CGP	F-Systembaustein	C554	<b>N</b>		Generieren
- FB601	F_CTRL_1	F-Systembaustein	EF3F	<b>N</b>		
FB602	F_CTRL_2	F-Systembaustein	7A69	V		Laden
DB216		I-DB für F-Applikationsba	C4C8	F		
DB217	8	I-DB für F-Applikationsba	1F9A			
	F_GLOBDB	F-Global-DB	D560	V		
	F00200 4 8	E-Perinherie-DB	A540		-	Drucken

	Preface	Notes	StartUp	Programming	
TIA Training Docume	nt	Page 5	64 of 64		Module
Issued: 02/2008		PROFIsafe and P	ROFINET with IO Cont	roller CPU 315F-2 PN/DP and I	O Device ET 2008



18. By clicking on 'New', 'Specify a new F-sequence group' and then perform the following settings for the F-sequence group:

Specify the "FC1" as F-call block F-CALL for the new F-sequence group. This FC is set up automatically as soon as you exit the dialog field "Edit F-sequence groups" with "OK".

Specify the F-program block of the F-sequence group by selecting from the drop down menu • the previously programmed FB that you want to specify as F-program block of the F-sequence group; in our example, "FB1".

Since in our example, the F-program block is a function block, assign an instance DB to it (for • example "DB 1"). This I-DB is set up automatically as soon as you exit the dialog field "Edit Fsequence modules" with "OK".

Set "200 ms" as the maximum cycle time for the F-sequence group.

Accept with 'OK'. ( $\rightarrow$ New –	$\rightarrow$ FC1 $\rightarrow$ FB1 $-$	$\rightarrow$ DB1 $\rightarrow$ 200ms	$\rightarrow$ OK)
---	---	---------------------------------------	-------------------

	×
FC1	•
FB1	•
DB1	
200	
	•
chen	Hilfe
	FB1 DB1 200



**Notes**: The F-CALL is the F-block for calling the F-sequence group from the standard user program. The F-CALL contains the call for the F-program block and the calls for the automatically added Fblocks of the F-sequence group. Although you are setting up the F-CALL, you can not edit it. The program block is an F-FC or F-FB (with instance DB) that becomes an F-program block by being assigned to the F-CALL. You can do the following in the F-program block:

- Program the safety program with F-FBD or F-LAD
- Call additional, generated F-FBs/F-FCs for structuring the safety program
- Insert F-blocks of the block container F-Application Blocks
- Insert F-blocks from "User generated F-libraries"

Within the F-program block, you determine the call sequence of the F-blocks.

	Preface	Notes	StartUp	Programming	
TIA Training Document		Page \$	55 of 64		Module
Issued: 02/2008		PROFIsafe and P	ROFINET with IO Cont	troller CPU 315F-2 PN/DP and IC	Device ET 200S



19. When you have confirmed the automatic generation of the missing blocks with **'Yes'**, return to the dialog field "Edit F-sequence groups" which now looks like this. Close it with **'OK'**. ( $\rightarrow$  Yes  $\rightarrow$  OK)

Ablaufgruppe	e/Parameter	Wert
-🗀 Sicher	heitsprogramm	
🖂 🔂 🖂	Ablaufgruppe FC1	FB1 - 200ms - kein Aufruf gefunden
	F-CALL Baustein	? FC1
	Symbolischer Name F-CALL Baustein	· · · · · · · · · · · · · · · · · · ·
	F-Programmbaustein	🕂 FB1 💽
(iii)	Symbolischer Name F-Programmbaustein	FB_HAUPTPROGRAMM
	I-DB für F-Programmbaustein	? DB1
	Symbolischer Name I-DB für F-Programmbaustein	
	Max. Zykluszeit der F-Ablaufg Aufruf F-Ablaufgruppe in	wamm hearbeiten (220-258)
(E)	Aufruf F-Ablaufgruppe in	ramm bearbeiten (526/250)
	Aufrufzeit der F-Ablaufgruppe	n fehlende Bausteine (F-CALL Baustein, I-DB für
8	Datenbaustein für F-Ablaufgr. 🕂 F-Pro	ogrammbaustein, Datenbaustein für
	Symbolischer Name DB für F-	laufgruppenkommunikation) erstellt werden?
Neu	Löschen Ja	Nein

<<Do you want to generate the missing blocks (F-CALL block, I-DB for F-program block, data block for F-sequence group communication)?>>

20. The safety program is prepared, but not yet generated. The overall signature of all F-blocks with F-attribute of the block container and the overall signature of the safety program differ. Now, '**Generate**' your safety program. ( $\rightarrow$  Generate)

augruppenträger: 0	Steckplatz: 2					Aktueller Modus:
esamtsignatur aller F-Bausteine mit I	F-Attribut des Bausteir	ncontainers:	45728BC			[nicht bekannt]
esamtsignatur des Sicherheitsprogra						
ktuelle Generierung:	 ว					Tana I
-	r 					Sicherheitsbetrieb
as Sicherheitsprogramm wurde seit	der letzten Generierur	ig geändert.				
Bausteine:						
F-Ablaufgruppe/F-Baustein	Symb. Name	Funktion im Sicherheitspro	Signatur	Know How S		Vergleichen
∃-🧀 Sicherheitsprogramm						
⊞- F-Ablaufgruppe FC1						Berechtigung
🖃 – 🗁 Gesamt	8			1		
- <b>FC1</b>		F-CALL	838E			F-Ablaufgruppen
- <b>FB1</b>	FB_HAUPTP	F-Programmbaustein	DD39			- Therease grapper and
🚁 FB186		F-Applikationsbaustein	14B4	V		Generieren 🖵
🚁 FB216	F_FDBACK	F-Applikationsbaustein	F521	<b>N</b>		
FB217	F_SFDOOR	F-Applikationsbaustein	86DA	Erzeugen eines ka	onsister	nten Sicherheitsprogramms
🚁 FB600	F_IO_CGP	F-Systembaustein	C554			Laden
🚁 FB601	F_CTRL_1	F-Systembaustein	EF3F	V		
🚁 FB602	F_CTRL_2	F-Systembaustein	7A69	<b>N</b>		
▲ DB1		I-DB für F-Programmbaus	6A19	V		1
- DB216		I-DB für E-Annlikationsha	C4C8		-	Drucken

21. When the safety program is generated, a consistency check of the sequence-relevant F-blocks is performed; that is, the safety program is checked for errors. Possible error messages are read out in an error window. After the successful consistency check, the F-system blocks that are needed in addition are generated automatically and added to the sequence group, in order to generate a runnable safety program. Now, '**Close**' the message list. ( $\rightarrow$  Close)

onsistenzprüfung für F-Ablaufgruppe FC1. onsistenzprüfung für FB1.	
enerieren des Sicherheitsprogramms. bersetzen des FB1.	
bersetzen des FB217.	
bersetzen des FB216. bersetzen des FC1.	
austeinabgleich des Sicherheitsprogramms.	1
rfolgreich generiert am 21.01.2006 20:45:57 mit der F-Compiler-Vers	sion V5.4 / V5.4 (0 Wa
Meldung	
Übersetzen des Sicherheitsprogramms (320:22)	Hilfetext
Frolgreich generiert am 21.01.2006 20:45:57 mit der Frompiler-Version V5.4 / V5.4 (0 Warnung(en)).	1
The completer contract to the transmighting.	Gehe zu
V	

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Issued: 02/2008

22. After generation was successful, a consistent safety program that consists of all F-blocks with Fattribute is always present in the block container. The 'Overall signature of all F-blocks with Fattribute of the block container' and the 'Overall signature of the safety program' are now the same. You now have a consistent safety program that is valid for acceptance. Confirm with 'Close'.  $(\rightarrow Close)$ 

augruppenträger: 0 S	teckplatz: 2					Aktueller Modus:
esamtsignatur aller F-Bausteine mit F-/ esamtsignatur des Sicherheitsprogram			E8F9CCE E8F9CCE			[nicht bekannt]
ktuelle Generierung: 21	.01.2006 20:45:57					Sicherheitsbetrieb.
as Sicherheitsprogramm ist konsistent Bausteine:	•					
F-Ablaufgruppe/F-Baustein	Symb. Name	Funktion im Sicherheitspro	Signatur	Know How S		Vergleichen
∃- 🤭 Sicherheitsprogramm						
⊡- ☐ F-Ablaufgruppe FC1						Berechtigung
🖃 🔂 Gesamt						
🖅 FC1	La companya da sana	F-CALL	9382			F-Ablaufgruppen
- FB1	FB_HAUPTP	F-Programmbaustein	980C			
🖅 FB186	F_TOF	F-Applikationsbaustein	14B4	<b>N</b>		Generieren
🚁 FB216	F_FDBACK	F-Applikationsbaustein	F521	<b>N</b>		Genelleien
27 FB217	F_SFDOOR	F-Applikationsbaustein	86DA	<b>N</b>		1
🚁 FB600	F_IO_CGP	F-Systembaustein	C554	<u> </u>		Laden
7 FB601	F_CTRL_1	F-Systembaustein	EF3F	V		
FB602	F_CTRL_2	F-Systembaustein	7A69	<b>N</b>		
FB603	FITOF	F-Systembaustein	69AF	V		
	F DIAG N	F-Systemhaustein	990A		-	Drucken

F	Preface	Notes	StartUp	Programming	
I A Training Document		Page 57 of 64	4		Module



23. The safety program is entered by calling FC1 "F-CALL" from a time interrupt OB. To this end, set up OB35 in the *SIMATIC Manager*. ( $\rightarrow$  Blocks  $\rightarrow$  Insert new object  $\rightarrow$  Organization block  $\rightarrow$  OB35  $\rightarrow$  OK)

SIMATIC Manager -	[CPU315F_PROFIsafe	- F:\0_57_Projekte\	CPU315F_]			_ 🗆 🗙
🞒 Datei Bearbeiten Ei	infügen Zielsystem Ansi	cht Extras Fenster	Hilfe			_ 8 ×
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🖃 🎒 CPU315F_PROFIs		Symbolisch	er Name	Erstellsprache	Größe im Arbeits	Тур 🔺
SIMATIC 300(1	o pullip p	en		576.0		SDB
🖻 – 🚺 CPU 315F-	(2)				38	Organisations
E S7-Pro		institute that the second	PROGRAMM	F-FUP	420	Funktionsbau
Ba		F TOF		F-AWL	294	Funktionsbau
Sed sala	Ausschneiden	Ctrl+X		F-FUP	332	Funktionsbau
	Kopieren	Ctrl+C		F-FUP	340	Funktionsbau
	Einfügen	Ctrl+V		F-AWL	15252	Funktionsbau
	Löschen	Del		F-AWL F-AWL	9574 5300	Funktionsbau Funktionsbau
	Neues Objekt einfüc	100	▶ Organisal	tionsbaustein	1092	Funktionsbau
	Zielsystem		<ul> <li>Organisa</li> <li>Funktions</li> </ul>		984	Funktionsbau
	21615950611		- Funktion	baascent	746	Funktionsbau
	Umverdrahten		Datenbau	Istein	738	Funktionsbau
	Bausteine vergleiche	en	Datentyp		532	Funktionsbau
	Referenzdaten		Variablen			Funktion
	Bausteinkonsistenz p	orüfen		F-DB	38	Instanzdatent
	Drucken		+ I	F-DB	70	Instanzdatent
		22		F-DB	42	Instanzdatent
	Umbenennen	F2		F-DB	266	Datenbaustei
	Objekteigenschafter Spezielle Objekteige					
Fügt Organisationsbaustein	ar	nochorcon -				11.
Eigenschaften - Organisa	tionsbaustein			×		
Allgemein - Teil1 Allgemei	in - Teil 2 Aufrufe Attribute	•				
Name:	OB35					
Symbolischer Name:	CYC_INT	_				
Symbolkommentar:		-				
Erstellsprache:	I FUP					
	200			3		
Projektpfad:	CPU315F_PROFIsafe\SIMA PN/DP\S7-Programm(2)\Ba					
Speicherort des Projekts:	F:\0_S7_Projekte\CPU315	F_				
	Code	Schnittstelle				
Erstellt am:	21.01.2006 20:51:40					
Zuletzt geändert am:	21.01.2006 20:51:40	21.01.2006 20:	51:40			
Kommentar:			*	8		
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		Abbrecher	n Hilfe	1		
		Abbiccher				

1

**Note**: Time interrupt OBs have the advantage that they interrupt cyclical program processing in OB1 of the standard user program at fixed time intervals; that is, in a time interrupt OB, the safety program is called and executed at fixed time intervals. After the safety program has been processed, the standard user program continues to be processed.

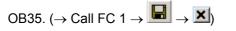
	Preface	Notes	StartUp	Programming	
TIA Training Documen	t	Page 5	58 of 64		Module



24. Open 'OB35' by double clicking in the SIMATIC Manager. ( $\rightarrow$  OB35)

Datei Bearbeiten Einfügen Zie	elsystem Ansicht Extras	Fenster Hilfe			_ 8
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CPU315F_PROFIsafe	Objektname	Symbolischer Name	Erstellsprache Grö	iße im Arbeits	Тур
SIMATIC 300(1)	📓 Systemdaten			<u></u>	SDB
🖻 - 🚺 CPU 315F-2 PN/DP	🕞 OB1			38	Organisationsba
🖻 🗊 S7-Programm(2)	🕮 OB35	CYC_INT	FUP	38	Organisationsba
🔤 Quellen	G FB1	FB_HAUPTPROGRAMM	F-FUP	420	Funktionsbauste
Bausteine	🗗 🚰 FB186	F_TOF	F-AWL	294	Funktionsbauste
	5 FB216	F_FDBACK	F-FUP	332	Funktionsbaust
	🔂 FB217	F_SFDOOR	F-FUP	340	Funktionsbaust
	55 FB600	F_IO_CGP	F-AWL	15252	Funktionsbaust
	5 FB601	F_CTRL_1	F-AWL	9574	Funktionsbaust
	58602	F_CTRL_2	F-AWL	5300	Funktionsbaust
	FB603	FITOF	F-AWL	1092	Funktionsbaust
	FB604	F_DIAG_N	F-AWL	984	Funktionsbaust
	FB605		F-AWL	746	Funktionsbaust
	5 FB606		F-AWL	738	Funktionsbaust
	58607		F-AWL	532	Funktionsbaust
	FC1		F-CALL	370	Funktion
	DB1		F-DB	38	Instanzdatenba
	DB216		F-DB	70	Instanzdatenba
	DB217		F-DB	42	Instanzdatenba
	II				•

25. Call FC1 "F-CALL" in the time interrupt OB35 as shown in the figure below. Save and close



KOP/AWL/FUP - [OB35 "CYC_INT" CPU315F_PROFIsafe\SIMATIC 300(1)\CPU 315F-2 PN/DP\\OB35]	×
	<u></u>
Inhalt von: 'Umgebung\Schnittstelle'  Schnittstelle  TEMP  TEMP  Generation  Fcl EN	TX TX
■ BLOCK FC ■ Market FC ■ Mar	/ergleich
Drücken Sie F1, um Hilfe zu erhalten.	Änd //

	Preface	Notes	StartUp	Programming	
TIA Training Document		Page 5	9 of 64		Module



26. Open 'OB1' by double clicking in the SIMATIC Manager and select 'FBD' as 'Programming language'. ( $\rightarrow$  OB1  $\rightarrow$  FBD  $\rightarrow$  OK)

) 🚅 🔡 😹 👗		10 <b>9</b> -	🖻 📴 🔠 🔳 < Kein Filt	er>	- 10 28 00 5	
B CPU315F_PROFI		Objektname	Symbolischer Name	Erstellsprache	Größe im Arbeits	Тур
🖻 📓 SIMATIC 300(		🚵 Systemdaten				SDB
🖻 - 🚺 CPU 315F		🕮 OB1			38	Organisationsba
🖻 🛐 S7-Pro	T-339 - 9-563920	🕀 0B35	CYC_INT	FUP	54	Organisationsba
Di Qu	austeine	🔁 FB1	FB_HAUPTPROGRAMM	F-FUP	420	Funktionsbauste
	austeine	5 FB186	F_TOF	F-AWL	294	Funktionsbauste
		5 FB216	F_FDBACK	F-FUP	332	Funktionsbauste
		5 FB217	F_SFDOOR	F-FUP	340	Funktionsbauste
		5 FB600	F_IO_CGP	F-AWL	15252	Funktionsbauste
		55 FB601	F_CTRL_1	F-AWL	9574	Funktionsbauste
		FB602	F_CTRL_2	F-AWL	5300	Funktionsbauste
		FB603	FITOF	F-AWL	1092	Funktionsbauste
		FB604	F_DIAG_N	F-AWL	984	Funktionsbauste
		FB605		F-AWL F-AWL	746 738	Funktionsbauste Funktionsbauste
		FB607		F-AWL	532	Funktionsbauste
		5 FC1		F-CALL	370	Funktion
		DB1		F-DB	38	Instanzdatenba
		DB216		F-DB	70	Instanzdatenba
				F-DB	42	Instanzdatenba
		B DBZI/		L-DD	42	Instanzoatenbat
		DB217		F-DD	42	Instanzdatenbat
-		1	PC Adap	iter(PROFIBUS)	38 Bytes	
icken Sie F1, um Hilfe zu enschaften - Organis Allgemein - Teil 1 Allgen Name: Symbolischer Name: Symbolkommentar: Erstellsprache: Projektpfad: Speicherort des Projekts Erstellt am:	ationsbauste nein - Teil 2   A   081 	ein uufrufe Attribute	PC Adap PC Adap	ter(PROFIBUS)		Instanzoate

	Preface	Notes	StartUp	Programming	
TIA Training Document		Page 6	60 of 64		Module
Issued: 02/2008		PROFIsafe and P	ROFINET with IO Cont	troller CPU 315F-2 PN/DP and IO	Device ET 200S



27. From the standard program, program the activation of flag M10.0 for switching on the press in

the operational mode. Save OB1 and close it. ( $\rightarrow$   $\blacksquare$   $\rightarrow$   $\blacktriangleright$ )

KOP/AWL/FUP - [OB1 CPU315F_PROFIsafe\SIMATIC 300(1)\CP	U 315F-2 PN/DP]	
🕞 Datei Bearbeiten Einfügen Zielsystem Test Ansicht Extras Fens	ter Hilfe	_ 8 ×
	r ister i 🖪 🖪 🗷 🖪	
Inhalt von: 'Umgebung\Schnittst    Schnittstelle  Schnittstelle  Schnittstelle  Name  OB1 : "Hain Program Sweep (Cycle)"  Netrwerk 1: Betriebsmässiges Binschalten der Presse a  "Schalten_Bin"  "HV01-S221"	÷	Keues Netzwerk     Bog Bitverknüpfung     Gog Unwandler     De Aufruf     Gog De Aufruf     Gog De Aufruf     Gog De Aufruf     Gog De Aufruf
X X X X X X X X X X X X X X	4: Operandeninfo λ 5: Steuer	Programmel E Aufrufstruk h λ 6: Diagnose λ 7: Vergleich
Drücken Sie F1, um Hilfe zu erhalten.	© offline Abs <	

	Preface	Notes	StartUp	Programming	
TIA Training Documen	t	Page 6	1 of 64		Module





Issued: 02/2008

28. Open the safety program again. ( $\rightarrow$  Blocks  $\rightarrow$  Options  $\rightarrow$  Edit safety program)

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0 😅 🔡 🐖 🗶 🖻 🖻 🚵	🙄 🖳 🖻 Einstellungen	. Ctrl+Alt+E	J 7/ 28 00 4	
	· OB1	zeigegeräte achig verwalten	Größe im Arbeits  42	Typ A SDB Organisationsba
	- OB35 Umverdrahten. - FB1 Ablaufeigensch		54 420	Organisationsba Funktionsbauste
	FB186 Bausteine verg FB216 Referenzdaten FB217 Globaldaten de FB600 Netz konfigurie	finieren 🕨	294 332 340 15252 9574	Funktionsbauste Funktionsbauste Funktionsbauste Funktionsbauste Funktionsbauste
	FB602 Baugruppen sir FB603 Prozeßdiagnose		5300 1092	Funktionsbauste Funktionsbauste
	FB600	gramm bearbeiten	984 746	Funktionsbauste Funktionsbauste
10	FB606 PG/PC-Schnitts FB607	telle einstellen F-AWL	738 532	Funktionsbauste Funktionsbauste
5	FC1	F-CALL	370	Funktion
5	DB1	F-DB	38	Instanzdatenbai
	DB216	F-DB	70	Instanzdatenbai
8	DB217	F-DB	42	Instanzdatenbal 💌

29. Click on the button 'Load'. ( $\rightarrow$  Laden)

augruppenträger: 0 9	Steckplatz: 2					Aktueller Modus:
esamtsignatur aller F-Bausteine mit F esamtsignatur des Sicherheitsprogra			E8F9CCE E8F9CCE			[nicht bekannt]
ktuelle Generierung: 2	1.01.2006 20:45:57					Sicherheitsbetrieb.
as Sicherheitsprogramm ist konsister	ıt.					
-Bausteine:					- 32	
F-Ablaufgruppe/F-Baustein	Symb. Name	Funktion im Sicherheitspro	Signatur	Know How S		Vergleichen
🖃 🗁 Sicherheitsprogramm						
						Berechtigung
🖃 – 🗁 Gesamt	2		8			
FC1		F-CALL	9382	V		F-Ablaufgruppen.
_ <mark>7</mark> 7 FB1	FB_HAUPTP	F-Programmbaustein	980C			
🚁 FB186	F_TOF	F-Applikationsbaustein	14B4	ম		Generieren
🚁 FB216	F_FDBACK	F-Applikationsbaustein	F521	<b>N</b>		Genelleren
🖅 FB217	F_SFDOOR	F-Applikationsbaustein	86DA	V		
🚁 FB600	F_IO_CGP	F-Systembaustein	C554	<b>V</b>		Laden
🖅 FB601	F_CTRL_1	F-Systembaustein	EF3F	Laden des	Sicherb	eitsprogramms in die F
<b>FB602</b>	F_CTRL_2	F-Systembaustein	7A69			oroprogramms in die i
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 Preface
 Notes
 StartUp
 Programming

 T I A Training Document
 Page 62 of 64
 Module

 E08
 Box
 Module





30. Confirm the inquiry whether the F-CPU is to be switched to the operating mode STOP with '**Yes**'.  $(\rightarrow$  Yes)



<<Consistent loading of failsafe blocks is possible only when the F-CPU is in STOP. Do you want to switch the F-CPU into the STOP mode?>>

31. Confirm the inquiry whether the standard blocks are also to be loaded with 'Yes'. ( $\rightarrow$  Yes)

Sollen bei diesem Ladevorgang die im Bausteinordner befindlichen Standard-Bausteine (ausgenommen Systemdatenbausteine) mitgeladen werden ?	befindlichen Standard-Bausteine (ausgenommen	s Sicherheitsprogramms (320	.12()
	T Diese Meldung in Zukunft nicht mehr anzeigen.	befindlichen Standard-Bausteine	(ausgenommen
🦳 Diese Meldung in Zukunft nicht mehr anzeigen.			

<<Are the standard blocks contained in the block folder (except for the system data blocks) to be loaded also during this loading procedure?>>

#### 32. Enter the password. ( $\rightarrow$ pw\_fcpu $\rightarrow$ OK)

Zugangsberecht	igung einrichten	×
Die Baugruppe/M mit einem Paßwor	femory Card CPU 315F rt geschützt.	-2 PN/DP ist
Paßwort:	*****	
	/orgabe für weitere ges Memory Cards verwend	
ОК	Abbrechen	Hilfe

33. Confirm the inquiry whether the F-CPU is to be started with 'Yes'. ( $\rightarrow$  Yes)

Laden de	s Sicherheitsprogramms (320:163)
	Die F-CPU befindet sich im Zustand STOP. Soll die F-CPU jetzt gestartet werden?
Ja	Nein

<<The F-CPU is in the STOP mode. Do you want to start the F-CPU now?>>



Issued: 02/2008

**Notes**: If you are loading only the F-blocks, the block from which the F-CALL block is called (in our example, the time interrupt OB35) is not loaded. You will have to load this OB separately, as in the standard case.

The complete safety program can only be loaded in the STOP mode.

	Preface	Notes	StartUp	Programming	
TIA Training Document	с с			Module	



34. In the dialog field 'Safety Program', activate successively the option buttons 'Offline' and 'Online', and check whether the overall signatures of all F-blocks with F-attribute of the block container match online and offline. If it is a match, loading was successful. If not, reload. (→ Online  $\rightarrow$  Offline  $\rightarrow$  Close)

Baugruppentra Zeigt die Online-Bausteine des Sicherheitsprogramms an					
	austeine mit F-Attribut des E				Aktiviert
ktuelle Generierung: as Sicherheitsprogram	21.01.2006 20			-	Sicherheitsbetrieb.
Bausteine: F-Baustein	Symb. Name	Funktion im Sicherheitsprogramm	Signatur		Vergleichen
FB1		F-Programmbaustein	980C		
🚁 FB186		F-Applikationsbaustein	14B4		Berechtigung
FB216	*	F-Applikationsbaustein	F521		
🗗 FB217		F-Applikationsbaustein	86DA		F-Ablaufgruppen
🖅 FB600		F-Systembaustein	C554		
🖅 - FB601		F-Systembaustein	EF3F		
🚁 FB602		F-Systembaustein	7A69		Generieren
FB603		F-Systembaustein	69AF		1
🖅 FB604		F-Systembaustein	99CA		Laden
₽ FB605		automatisch generierter F-Baustein	AC39		
🖅 FB606		automatisch generierter F-Baustein	293A		
🖅 FB607		automatisch generierter F-Baustein	4B0E		
最 FC1	6	F-CALL	9382	· ·	Drucken

35. To activate the safety mode, take the F-CPU from STOP to RUN.



Note: After you have generated the safety program, a complete function test corresponding to your automation task has to be performed.

	Preface	Notes	StartUp	Programming	
TIA Training Document		Page 64 of 64			Module
Issued: 02/2008		PROFIsafe and P	ROFINET with IO Cont	roller CPU 315F-2 PN/DP and IC	Device ET 200S