SIEMENS

SIMATIC S7 Distributed Safety

Getting Started

Edition 10/2004



Safety Guidelines

This manual contains notices that you should observe to ensure your own personal safety, as well as to protect the product and connected equipment from damage. These notices are highlighted in the manual by a warning triangle and are marked as follows according to the level of danger:



Danger

Indicates that death, severe physical injury, or substantial property damage **will** result if proper precautions are not taken.



Warning

Indicates that death, severe physical injury, or substantial property damage **can** result if proper precautions are not taken.



Caution

Indicates that minor physical injury or property damage can result if proper precautions are not taken.

Caution

Indicates that property damage can result if proper precautions are not taken.

Notice

Indicates important information relating to the product or draws special attention to part of the documentation.

Qualified Personnel

This device/system may only be set up and operated by **qualified personnel**. Qualified personnel are defined as persons who are authorized to commission, to ground, and to tag circuits, equipment, and systems in accordance with established safety practices and standards.

Proper Use

Note the following:



Warning

This device and its components may only be used for the applications described in the catalog or the technical description, and only in connection with devices or components from other manufacturers which have been approved or recommended by Siemens.

This product can only function correctly and safely if it is transported, stored, set up, and installed correctly, and operated and maintained as recommended.

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Disclaimer of Liability

We have checked the contents of this manual for agreement with the hardware and software described. Since deviations cannot be precluded entirely, we cannot guarantee full agreement. However, the specifications in this manual are revised regularly, and any necessary corrections are included in subsequent editions. Suggestions for improvement are welcomed.

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Introduction

These instructions will guide you step-by-step through the configuration and programming with *S7 Distributed Safety* based on a concrete example.

You will learn about basic functions and the special properties of S7 Distributed Safety.

It should take one or two hours to work through this example depending on your experience.

Requirements for the Example

The following requirements must be met:

- In order to understand these Getting Started instructions, you need general knowledge about automation technology and also need to be familiar with the base software, STEP 7.
- You need an S7-300 station consisting of:
- Power supply (PS) with 2 A
- CPU 315F-2 DP with an inserted MMC
- Distributed I/O system ET 200S with:
 - Interface module IM 151-1 HIGH FEATURE
 - Power module PM-E 24-48 V DC
 - Terminal modules such as TM-E30S44-01 and TM-E30C44-01
 - Fail-safe digital input module ET 200S 4/8 F-DI DC24V
 - Fail-safe digital output module ET 200S 4 F-DO DC24V / 2A
 - Power module PM-E 24 V DC
 - Digital electronic module 2DI 24 V DC ST
- SIGUARD laser scanner LS4-4/P1 with PROFIBUS interface
- The following software packages must be correctly installed on your programming device featuring an MPI interface:
- STEP 7 as of version 5.3, service pack 1
- S7 Distributed Safety as of version V5.3

- GSD file of the laser scanner (this is included in the product package of the laser scanner; the file is also available in the Internet at http://www.siemens.com/automation/service&support).

- If the hardware components are not available, you can also use the add-on package S7-PLCSIM (hardware simulation program) as of version 5.3. This add-on package will enable you to simulate the hardware components as described in these Getting Started instructions.
- The programming device must be connected to the F-CPU via the MPI/DP interface (187.5 Kbps baud rate).
- The hardware must be fully installed and wired. Relevant information for this is provided in the manual, *ET 200S Distributed I/O System, Fail-Safe Modules*
- A description of the installation and wiring of the CPU 315F-2 DP is provided in the *Getting Started Collection, Automation System S7-300, CPU 31x: Commissioning.*



Warning

As a component in plants and systems, the S7-300 is subject to special standards and regulations depending on the area of application. Please observe current regulation on safety and accident prevention such as IEC 60204-1 (Emergency Stop Equipment), EN 954-1 (Safety Related Parts of Control Systems) and IEC 61508 (Functional Safety).

The example in these Getting Started instructions serves as an introduction to configuring and programming with *S7 Distributed Safety*. It does not lead to effective operation in every case. Before you do this, we highly recommend that you refer to the latest version of the manual, *S7 Distributed Safety, Configuring and Programming*. The warnings and additional notes this manual contains must be heeded at all times even if they are not repeated in this document!

Serious injury and damage to machines and equipment may result if these regulations are neglected.



Design and Tasks in the Example

Production cell with access protection

The walk-in production area is monitored with a laser scanner. The service area is secured by a safety door.

Entering the production area or opening the safety door results in a stop or shutdown of the production cell similar to an emergency stop.

The system can only be started when the emergency stop is interlock deactivated, the safety door is closed and the laser scanner detects no one in the protected area. User acknowledgment is required on site to restart production after the emergency stop has been activated or the safety door has been opened.

Procedure

Configuration

Using *HW Config* you configure an ET 200S fail-safe digital input module to connect an emergency stop switch and the position switches for monitoring a safety door, an ET 200S fail-safe digital output module to connect a motor, an ET 200S digital standard electronic module for user acknowledgment and feedback loop, and a laser scanner.

The configuration is described in steps 1 to 8.

Programming

Once the configuration is successfully completed, you can program your safety program.

In our example, a fail-safe block is programmed with an emergency stop, a safety door function, a feedback loop (as restart protection when there is an incorrect load) and user acknowledgment for the reintegration. The block is then compiled to a safety program.

The programming is described in steps 9 to 19.

Acceptance test

Supporting measures for acceptance are described in the appendix.

Installation on the PROFIBUS DP



Wiring Overview for ET 200S





Warning

You may come into contact with live electrical wires connected to the power mains. Only wire the S7-300 and ET 200S when they are disconnected from the mains.

A description of the installation and wiring of the CPU 315F-2 DP is provided in the *Getting Started Collection, Automation System* S7-300, CPU 31x: Commissioning.

Configuration of the Hardware

Using HW Config, you configure:

- CPU 315F-2 DP
- Distributed I/O system ET 200S with:
 - Interface module IM 151-1 HIGH FEATURE

- Fail-safe digital input module ET 200S for connecting an emergency stop switch and the position switches for monitoring a safety door

- Fail-safe digital output module ET 200S for connecting a motor

- Digital standard electronic module ET 200S for user acknowledgment and feedback loop

· Laser scanner for area monitoring (fail-safe DP standard slave).

Step 2: Configuration of the CPU 315F-2 DP using HW Config

Sequence	Action	Result
1	Create a new project in the SIMATIC Manager (for example, "DS_Getting Started") and insert a SIMATIC 300 station.	The SIMATIC 300 station appears in the SIMATIC Manager.
2	Open <i>HW Config</i> by selecting the SIMATIC 300 station and open the object (for example, with Ctrl+Alt+O).	HW Config opens.
3	In the "Hardware Catalog" window, select the "Standard" hardware profile from the "Profile" pull-down list .	
4	Drag and drop a rail from the hardware catalog into the <i>HW Config</i> window, the power supply module (for example, PS307 2A) and the desired F-CPU (for example, CPU 315F-2 DP).	A dialog box opens for setting the PROFIBUS properties of the new subnet.
	Required path: 1.) Rail: \SIMATIC 300\RACK-300 2.) Power supply: \SIMATIC 300\PS-300 3.) CPU 315F: \SIMATIC 300\CPU-300\CPU 315F-2 DP (6ES7 315-6FF01-0AB0).	
5	Click on "New". The dialog box for setting the PROFIBUS properties of the new subnet shows the newly created PROFIBUS subnet. Close the dialog box with "OK."	The fail-safe module will be later connected to the F-CPU over the new PROFIBUS subnet.
6	Double-click on the CPU 315F-2 DP in the configuration window to set the properties of the F-CPU.	The dialog box "Properties - CPU 315F-2 DP" opens.

Sequence	Action Result	
7	Select the "Protection" tab. Make the following settings in the "Level of protection" field:	
	 Press the option button "1: Access protection for F-CPU" and select the option "Removable with password". Press the option button "3: Write/read protection" and enter a max. 8-digit password for the F-CPU, for example, "pw_fcpu". Type your password again in the field "Enter again". 	
	Mark the check box "CPU contains safety program".	
	The dialog box should now appear as follows:	
	Properties - CPU 315F-2 DP - (R0/52)	
	General Startup Cycle/Clock Memory Retentive Memory Interrupts Time-of-Day Interrupts Cyclic Interrupts Diagnostics/Clock Protection Communication F Parameters	
	Level of protection Mode • <u>1</u> : Access protect. for F CPU ▶ <u>Removable with password</u> • <u>Process mode</u> Permissible cycle increase via test functions: • <u>3</u> : Write-/read protection Password: • <u>Test mode</u> Enter again: <u>Stresses</u> • <u>CPU</u> contains safety program • <u>CPU</u> contains safety	
	OK Cancel Help	

Sequence	Action	Result	
8	Change to the "F-Parameters" tab.		
	Here, you can change the following parameters or accept the default settings:		
	- Basis for the PROFIsafe addresses		
	- Number range for F-data blocks		
	- Number range for F-function blocks		
	- Amount of local data used by the F-system.		
	Leave the default values for our example.		
	The dialog box appears as follows:		
	Properties - CPU 315F-2 DP - (R0/52)		
	General Startup Cycle/Clock Memory Rel	entive Memory Interrupts Time-of-Day Interrupts	
	Cyclic Interrupts Diagnostics/Clock	Protection Communication F Parameters	
	Parameter	Value	
	🖃 🔄 Parameter		
	Er 🔄 PROFIsafe		
	Limit Base for PROFIsafe addresses	2000	
	E Gata blocks		
	-E from (DB)	818	
	L to (DB)	1023	
	E-G F function blocks		
	-E from (FB)	1638	
	└──― to (FB)	2047	
	⊡-🔄 F local data		
	LE Size	792	
	OK		
	Note : F-blocks are automatically added during t it is runtime capable. You must reserve a range Use the default settings for our example. If the <i>c Distributed Safety</i> signals this with an error mest number band accordingly.	he compilation of the safety program to ensure that of numbers for the automatically added F-blocks. configured band of numbers is insufficient, <i>S7</i> sage. You must then increase the size of the	
9	Click "OK" to confirm.	The message window closes.	

Sequence	Action		Re	sult
10	Change to the "Cyclic Interrupts" tab and set the call time for the cyclic interrupt OB 35 to 50 r (The safety program is called and run at fixed time intervals in the cyclic interrupt OB.) The dialog box should now appear as follows:			c interrupt OB 35 to 50 ms. clic interrupt OB.)
	Properties - CPU 315	F-2 DP - (R0/52)		×
	General Startup Cyclic Interrupts	Cycle/Clock Memory	Retentive Memory Intern Protection Commu	upts Time-of-Day Interrupts nication F Parameters
	Priority	Execution (ms)	Phase offset (ms)	Process image partition
	0B3 <u>0</u> : 7	5000	0	OB1 PI 💌
	OB3 <u>1</u> : 8	2000	0	OB1 PI
	0B3 <u>2</u> ; 9	1000	0	OB1 PI 🔽
	OB3 <u>3</u> ; 10	500	0	OB1 PI
	OB3 <u>4</u> : 11	200	0	OB1 PI 🔽
	OB3 <u>5</u> : 12	50	0	OB1 PI 🔽
	OB3 <u>6</u> : 13	50	0	OB1 PI
	OB3 <u>7</u> : 14	20	0	OB1 PI
	OB3 <u>8</u> : 15	10	0	OB1 PI
	ОК			Cancel Help
11	Click "OK" to confirm.		Th CF	e dialog box "Properties - PU 315F-2 DP" closes.
			Th is r	e configuration of the F-CPU now completed.

Step 3: Configuration of an ET 200S Distributed I/O System Using HW Config

		<u> </u>	
Sequence	Action	Result	
1	In the "Hardware Catalog" window, select the "Standard" hardware profile from the "Profile" pull-down list.		
2	Drag and drop the IM 151-1 HIGH FEATURE interface module from the hardware catalog (PROFIBUS DP\ET 200S) onto the PROFIBUS subnet in the <i>HW Config</i> window.	A dialog box opens for setting the PROFIBUS interface properties.	
3	Enter "3" as the address.		
	The dialog box should now appear as follows:		
	Properties - PROFIBUS interface IM151-1 High Feature Image: Comparison of the seature General Parameters Address: Image: Comparison of the seature		
	Transmission rate: 1.5 Mbps		
	Subnet:		
	not networked	New	
	PROFIBUS(1) 1.5 Mbps	<u>N</u> EW	
		Properties	
		Dejete	
	ОК	Cancel Help	
	Close the dialog box with "OK"		
	You have now set up a DP station with the address 3 on PPOFIE	RUS subnet "(1)"	
4	Double-click on the IM 151-1 HIGH FEATURE in the configuration window to set the properties of the interface module.	The dialog box "Properties - DP slave" opens.	
5	Confirm your settings with "OK".	The dialog box "Properties - DP slave" closes.	
6	Drag and drop a PM-E 24-48 V DC power module from the hardware catalog to slot 1 of the IM 151-1 HIGH FEATURE interface module.	The configuration of the IM151- 1 HIGH FEATURE is now completed.	
	Required path: 1.) \PROFIBUS DP\ET200S\IM151-1 HIGH FEATURE\PM		

Step 4: Configuration of an F-DI Module for Connecting an Emergency Stop Switch and the Position Switches for Monitoring a Safety Door

Sequence	Action	Result
1	Drag and drop a 4/8 F-DI DC24V fail-safe digital input module from the hardware catalog to slot 2 of the ET 200S.	
	1.) \PROFIBUS DP\ET200S\IM151-1 HIGH FEATURE\DI (6ES7 138-4FA01-0AB0)	
2	Double-click on the 4/8 F-DI DC24V in the configuration window to set the properties of the input module.	The dialog box "Properties - 4/8 F-DI DC24V" opens.
3	Select the "Addresses" tab. Leave the default address "0" for our example. The dialog box appears as follows:	
	Properties - 4/8 F-DI DC24¥ - (R-/52)	×
	General Addresses Parameter	
	Start: I Process image:	
	End: 5 🔽	
	- Outputs	
	Start: 0 Process image:	
	End: 3 💌	
		Cancel Help
	Note : If you wish to change the values, you need to ensure that th and output data range are assigned identical values.	e start addresses of the input

Sequence	Action Result		
4	Change to the "Parameter" tab. Here, you can c default settings:	hange the following parameters or accept the	
	- F-parameters (PROFIsafe parameters)		
	- Module parameters (global module parameters)		
	 Channel-specific parameters. In our example, channels 0 and 4 should be connected to a two-channel emergency stop switch (emergency stop). Make the following settings (as highlighted in the figure): 		
	Properties - 4/8 F-DI DC24V - (R-/52) General Addresses Parameter		
	Parameter	Value	
	Module parameters		
		3 (ms)	
	Short-circuit test	cyclic	
	Activated		
	- Evaluation of the sensors	1002 evaluation	
	- Type of sensor interconn	2 channel equivalent	
	- Behavior at discrepancy	0 - Supply value	
	LE Discrepancy time (ms)	10	
	Channel 1, 5		
	ОК	Cancel Help	
	Note about "F-Parameters" : The PROFIsafe addresses must be unique throughout the and for all stations. The addresses are assigned automatically to prevent incorrect assig parameters. The PROFIsafe destination address must be set per DIL switch on the F-more PROFIsafe source address is assigned by the F-CPU ("Base for PROFIsafe addresses" parameter).		
	A valid current safety message frame must be received by the F-CPU within the fail-safe monitoring time. Otherwise, the fail-safe module goes to the safe state.		
	The fail-safe monitoring time must be set high enough for the message frame delay to be tolerate on the one hand, and low enough for the process to react as fast as possible and without impairment when an error occurs on the other. The calculation table 'S7cotia.xls' can aid you in determining the optimal time. This file is available on the Internet: http://www4.ad.siemens.de/ww/view/de/ under the contribution ID 19138505.		
	Leave the default settings for the F-parameters	unchanged for our example.	
	Note about "Module parameters" : For a cyclic sensor supplies for all sensors connected to the Otherwise, errors will be detected on these char	s short-circuit test, you have to use the internal F-module and deactivate any unused channels. nnels.	
	Leave the default settings for the module param	eters unchanged for our example.	
	 Note about "Channel x, y" parameters: The "evaluation of the sensors" and "type of sensor interconnection" should be configured according to the sensor wiring. The sensor wiring and the safety quality of the sensor are decisive for the safety class that can be achieved. Deactivate the channels that are not used. Note about "1002 evaluation", "Behavior at discrepancy" and "Discrepancy time" (see highlight in figure): The "Discrepancy time" configure here starts when different levels (or same levels with nonequivalence testing) are detected for two associated input signals ("1002 evaluation" of the sensor). When discrepancy time expires within the module and depending on the configuration of the discrepancy response, the "last, valid value" or "0" from the affected input channel is made available to the F-CPU. 		

Sequence	Action		Result
5	In our example, channels 1 and 5 should be co two-channel safety door. Make the following se	nnected to the pos ttings (as highligh	sition switches for monitoring a ted in the figure):
	Properties - 4/8 F-DI DC24V - (R-/52) General Addresses Parameter		
	Parameter	Value	
	Parameters F parameters		
		3 (ms)	
	_≝ Short-circuit test	cyclic	
	🕂 🧰 Channel 0, 4		
	Channel 1, 5		
	→≝ Activated		
	Evaluation of the sensors	1 chappel	III
	→ = Type of sensor interconn		
	Discrepancy time (ms)		
	⊕ 💼 Channel 2, 6		
	🕀 🧰 Channel 3, 7		
	,		
	ОК		Cancel Help
6	Deactivate the unused channels 2, 6 and 3, 7 t "Activated" check boxes and confirm your char	by unmarking the ges with "OK".	A message window opens informing you that the safety program must be compiled again due to your change.
7	Click "Close" to confirm.		The message window closes.
8	Confirm your settings with "OK".		The dialog box "Properties - 4/8 F-DI DC24V" closes.
			The configuration of the F-input module is now completed.

Step 5: Configuration of an F-DO Module for Connecting a Motor

Sequence	Action	Result	
1	Drag and drop a 4 F-DO DC24V / 2A fail-safe digital input module from the hardware catalog to slot 3 of the ET 200S. Required path: 1.) \PROFIBUS DP\ET200S\IM151-1 HIGH FEATURE\D (6ES7 138-4FB01-0AB0)	0	
2	Double-click on the 4 F-DO DC24V / 2A in the configuration window to set the properties of the output module.	The dialog box "Properties - 4 F-DO DC24V / 2A" opens.	
3	Select the "Addresses" tab (See F-DI Configuration above). Leave the default address "6" for our example. Note : If you wish to change the values, you need to ensure that the start addresses of the input and output data range are assigned identical values.	at	
4	Change to the "Parameter" tab. Here, you can change the following parameters or accept the default settings: - F-parameters (PROFIsafe parameters) - Channel-specific parameters. In our example, a motor should be indirectly switched on channel 0 through two contactors. Make the following settings (as highlighted in the figure): Properties - 4 F-D0 DC24V/2A - (R-/53)		
	Parameter Value □ Parameters □ F parameters □ DO channel 0 □ Image: Constraint of the second se		
	ОК	Cancel Help	
	Note about "F-Parameters": See Step 4.		
	Leave the default settings for the F-parameters unchanged for	our example.	
	Note about "DO channel x" parameters : Each output channel time. This time specifies the maximum duration of the shutdow and it therefore also specifies the readback time for the shutdow You use a wire break test for monitoring the connection of the	el has its own configurable readback in test for the corresponding channel wn cycle of the channel. output to the load.	

Sequence	Action	Result
5	Deactivate the unused DO channels 1, 2 and 3 and confirm your changes with "OK".	A message window opens informing you that the safety program must be compiled again due to your change.
6	Click "Close" to confirm.	The message window closes.
7	Confirm your settings with "OK".	The dialog box "Properties - 4 F-DO DC24V / 2A" closes.
		The configuration of the F- output module is now completed.

Step 6: Configuration of a Standard DI Module for User Acknowledgment and the Feedback Loop

Sequence	Action	Result
1	Drag and drop a PM-E 24 V DC power module from the hardware catalog to slot 4 of the standard DI module.	
	Note : The power module has to be configured because a combination of F-DI / F-DO modules and standard DI / DO / FM modules is not allowed within a voltage group for AK6/SIL3/Cat.4 applications. A new voltage group must always begin with a power module.	
2	Drag and drop a 2DI 24 V DC ST digital electronic module from the hardware catalog to slot 5 of the ET 200S for non-safe signals (user acknowledgment and feedback loop) and set the start address to "11" for our example (same procedure as for the standard program).	The configuration of the electronic module 2DI 24 V DC ST is now completed.
	Required path: 1.) \PROFIBUS DP\ET200S\IM151-1 HIGH FEATURE\DI	

Step 7: Configuration of a SIGUARD LS4-4/P1 Laser Scanner (fail-safe DP standard slave)

Sequence	Action	Result
1	In the "Hardware Catalog" window, select the "Standard" hardware profile from the "Profile" pull-down list .	
2	Drag and drop a laser scanner (for example, "SIGUARD Laser Scanner LS4-4/P1") from the hardware catalog (PROFIBUS DP\Additional Field Devices\General) into the window of <i>HW</i> <i>Config</i> .	A dialog box opens for setting the PROFIBUS interface properties.
	Note : The GSD file for the laser scanner must be already installed on the PG/PC.	
3	Enter "4" as the address and confirm with "OK". You have now configured a DP station with address 4 on the PROFIBUS subnet "(1)" (See Step 3, IM 151-1 Configuration).	The dialog box "Properties - PROFIBUS Interface" closes.
4	Select the laser scanner in the configuration window and double-click in the line of the laser scanner below in the detail view to set its properties.	The dialog box "Properties - DP slave" opens.

Sequence	Action	Result				
5	Select the "Address/ID" tab.					
	Leave the default address "12" for our example.					
	Note : If you wish to change the values, you need to ensure that the start addresses of the input and output data range are					
	assigned identical values.					
6	Change to the "PROFIsafe" tab and make the following settings:	revelue" button and onter (EQO +				
	DP address =) "504". Close the dialog box with "OK".	ge value bullon and enter (500 +				
	 Select the "F_WD_Time" parameter, click on the "Changing time in the fail-safe DP stand. 	ge value" button and enter a value ard slaves, for example, "150"				
	The dialog box should now appear as follows:					
	Properties - DP slave	×				
	Address / ID Parameter Assignment PROFIsafe					
	Parameter name Value	Change value				
	F_Check_SeqNr No Check					
	F_SIL SIL2					
	F Par Version 0					
	F_Source_Add 2002					
	F_Dest_Add 504					
	F_WD_Time 150					
	Current F parameter CRC (CRC1) hexadecimal:					
	1E51					
	UK Lancel Help					
	Note about F_WD_Time: A valid current safety message frame	must be received by the F-CPU				
	within the fail-safe monitoring time.	ssage frame delay to be tolerated				
	on the one hand, and low enough for the process to react as fast	as possible and without				
	impairment when an error occurs on the other.	e range of the "F_WD_Time"				
	parameter is specified by the device database file (*.GSD file).					
7	Confirm your change with "OK".	A message window opens				
		program must be compiled				
		again due to your change.				
8	Click "Close" to confirm.	The message window closes.				
9	Confirm your settings with "OK".	The dialog box "Properties - DP slave" closes.				
		The configuration of the SIGUARD LS4-4/P1 laser				
		scanner is now completed.				

Sequence	Action	Result
1	Close the hardware configuration by calling the menu command Station > Save and Compile .	Your project is compiled.
2	Transfer the configuration when the F-CPU is in STOP with the menu command PLC > Download to Module .	The "Select Station Address" dialog box opens.
3	Select the F-CPU and confirm with "OK".	The data are transferred from the PG to the F-CPU.
		You have now finished configuration of the hardware for the tasks involved in the example.

Step 8: Save, Compile and Download the Hardware Configuration

Summary: Configuration of the Hardware

Up until now, you have used HW Config to configure:

- CPU 315F-2 DP
- Distributed I/O system ET 200S with:
 - Interface module IM 151-1 HIGH FEATURE

- Fail-safe digital input module ET 200S for connecting an emergency stop switch and the position switches for monitoring a safety door

- Start addresses of the output and input data ranges: both 0
- Channels 0 and 4 for emergency stop
- Channels 1 and 5 for safety door position switches
- Fail-safe digital output module ET 200S for connecting a motor
 - Start address of the output and input data ranges: both 6
 - Channel 0 for indirect switching of a motor through two contactors

- Digital standard electronic module ET 200S for user acknowledgment and feedback loop

- Start address: 11
- Laser scanner for area monitoring (fail-safe DP standard slave)

- Start address of the output and input data ranges: both 12.

Now you are ready to program the safety program.

Programming the Safety Program

F-I/O Data Blocks

For each compilation in HW Config, an "F-I/O DB" is automatically created for each F-I/O and a symbolic name is entered for it in the symbol table. You can view the F-I/O DBs generated for the example I/O in the block container. These are the F-data blocks DB 819, DB 820 and DB 821.



The symbolic name of the F-I/O DB is made up of the fixed prefix "F," the start address of the F-I/O, and the names (maximum 17 characters) entered in the F-I/O object properties in HW Config.

Symbolic name in our example:

- "F00000 4 8 F DI_DC24V": fail-safe digital input module 4/8 F-DI DC24V (= DB 819)
- "F00006 4 F DO DC24V_2A": fail-safe digital output module 4 F-DO DC24V / 2A (= DB 820)
- "F00012 196": SIGUARD LS4-4/P1 laser scanner (= DB 821).

You can access the variables of the F-I/O DB with "fully gualified DB access" (that is, by specifying the symbolic name of the F-I/O DB and by specifying the name of the variable).

F-Shared DB

The "DB 818" in the block container of our example is "F-Shared-DB". The F-shared data block is a fail-safe block that is automatically inserted and contains all of the shared data of the safety program and additional information needed by the F-system.

Procedure

In our example, a fail-safe block should be programmed with a safety door function, an emergency stop function (safety circuit for shutdown when an emergency stop occurs, when the safety door is open or when someone enters the protected area monitored by the laser scanner), a feedback loop (as restart protection when there is an incorrect load) and user acknowledgment for the reintegration. The block should then compiled to a safety program.

Inputs and outputs in the safety program

Following the configuration of the hard as described in steps 1 to 8, the following fail-safe I/O DBs are available for programming the example safety program:

Configured Hardware	Start add.	Symbolic name	F-I/O DB
Fail-safe digital input module 4/8 F-DI DC24V (6ES7 138-4FA01-0AB0)	0	F00000_4_8_F_DI_DC24V	DB 819
Fail-safe digital output module 4 F-DO DC24V / 2A (6ES7 138-4FB01-0AB0)	6	F00006_4_F_DO_DC24V_2A	DB 820
Digital electronic module 2DI 24 V DC ST	11	-	-
SIGUARD LS4-4/P1 laser scanner	12	F00012_196	DB 821

Specify symbolic names for the fail-safe input and outputs (as you do in the standard program). In our example, these are:

Inputs and outputs in the safety program	Symbolic name
I0.0 for emergency stop	Emergency stop
I0.1 for safety door position switch	Safety door contact 1
I0.5 for safety door position switch	Safety door contact 2
Q6.0 for motor starter	Load
I11.0 for acknowledgment	Ack. button
I11.1 for feedback loop	Feedback loop
Q12.0 for protected area control	LS4_Protected_field_bit_0
Q12.1 for protected area control	LS4_Protected_field_bit_1
Q12.2 for protected area control	LS4_Protected_field_bit_2
I12.7 for safe shutdown	LS4_OSSD

Note: Adhere to the rules for creating the program structure as described in the chapter "Defining the Program Structure" of the *S7 Distributed Safety, Configuring and Programming* manual.

Step 9: Creating an F-FB with the F-FBD Programming Language

Sequence	Action		Result				
1	Insert a F-FB. Open the bloc SIMATIC Manager and sele Block > Function Block. Yo Object" shortcut menu.	The dialog box "Properties - Function Block" opens.					
2	In the "General - Part 1" tab, enter a name for the F-FB (for example, "FB100"). Select "F-FBD" as the programming language. The dialog box should now appear as follows:						
	General - Part 1 General	- Part 2 Calls Attributes					
	<u>N</u> ame:	FB100 F	✓ <u>M</u> ultiple Instance Capability				
	<u>S</u> ymbolic Name:						
	Symbol <u>C</u> omment:						
	Created in <u>L</u> anguage:	F-FBD					
	Project path: Storage location of project: C:\Program Files\Siemens\Step7\s7proj\DS_Getti						
		Code la	nterface				
	Date created: Last modified:	25/10/2004 2:23:32 PM 25/10/2004 2:23:32 PM 2	25/10/2004 2:23:32 PM				
	C <u>o</u> mment:		<u>^</u>				
	ОК		Cancel Help				
3	Close the dialog box with "O	К".	The F-FB is generated in the block container and highlighted with a yellow background.				

Sequence	Action	Result	
1	Double-click on the F-FB in SIMATIC Manager.	The dialog box for assigning a password for the safety program opens.	
2	Enter (2x) a max. 8-digit password for the safety program, for example, "pw_fprog".	The <i>FBD/LAD Editor</i> opens, see figure below.	
3	Image: Started _en\SIMATIC 300(1)\CPU 315F-2 I File Edit Insert PLC Debug View Options Window Help Image: Started _en\SIMATIC 300(1)\CPU 315F-2 I Image: Started _en\SIMATIC 300(1)\CPU 315F-3 I Image: Started 300(1)\CPU 315F-3 I <	Image: Second state sta	
		Program eleme	
	 Press F1 to get Help. Note: The F-FBD and F-LAD programming languages correspond FBD/LAD languages. The standard <i>FBD/LAD editor</i> in <i>STEP</i> 7 is The primary differences between the F-FBD and F-LAD program standard counterparts are limitations in the operation set and the that can be used (see <i>ST Distributed Safety, Configuring and Proc</i> The following are displayed in the F-Program Elements Catalog: Supported operations F-FBs and F-FCs from the block container of your S7 program F-blocks from F-libraries, e.g., F-application blocks of <i>Distributed Safety</i> door monitoring etc. Multiple instances. 	Abo < 5.2 NW 1 Insert Ind in principle to the standard a used for programming. Insert a used for programming. Insert a used for programming. Insert a used for programming. Insert a used for programming. Insert	

Step 10: Edit and Save the F-FB in the FBD Editor

Sequence	Action	Result				
4	Assign special colors for non-safe data in the F-block.					
	To do this, select the menu command Options > Customize , open the "View" tab, press the "Select" button and select a "Background Color"; In our example, this is 'light blue' (as highlighted in the figure below).					
	Customize X General View STL LAD/FBD Block Sources Source Text					
	View after Block Open ✓ Symbolic representation Symbol information With text color: Selegt ✓ Automatic symbol selection (for LAD/FBD) §orting of selection list by: Symbol ✓ Block/getwork comments ✓ Address identification ✓ Permanently forced addresses (EORCE) ✓ Process diagnostic addresses (EDIAG) With background color:					
	View for Block Types Logic Blocks: Data Blocks: Created in Language Data View					
	Program element overview Libraries: Project Type and number					
	OK Cancel Help					
5	Confirm your change with "OK".	The "Customize" dialog box closes. Now non-safe data will be highlighted in light blue in the safety program.				

Step 11: Programming the Safety Door Function



Sequence	Action	Result
	Note : If you require Boolean constants "0" and "1" in your safety during block calls, you can access the "RLO0" and "RLO1" variab qualified DB access. In our example, the F-shared DB in the block "DB 818" ("F_GLOBDB".VKE1). Note : In fail-safe programming, you cannot interconnect, supply v input EN or the enable output ENO.	orogram to assign parameters les in the F-shared DB using fully < container has the number vith "0" or evaluate the enable
3	Save the F-FB and confirm the message with "Yes".	The F-block is subjected to a consistency test and saved once it completes the test successfully.
		The programming of the safety door function is now completed.

Step 12: Programming the Emergency Stop Function

Sequence	Action	Result				
1	Insert the following statical variables for the F-FB: - "EN_Safety_circuit" (enable safety circuit) and - the a uxiliary m emory b its "AMB01" and "AMB02".					
2	Insert a new network.					
3	Insert the required operations from the program element catalog ("Bit Logic") and supply the inputs and outputs as illustrated in the figure. Image: Stated_en\SIMATIC 300(1)\CPU 315F-2 DP\\FB100] File Edit Insert PLC Debug View Options Window Help Image: Stated_en\SIMATIC 300(1)\CPU 315F-2 DP\\FB100]					
	EN_Safety_door Name Data Type Rddress Initial Val EN_Safety_circuit EN_Safety_circuit Bool 0.1 FALSE AHB01 Bool 0.2 FALSE MB02 Bool 0.3 FALSE	Exc1 ▲ Bit logic Bit logic Bit logic Bit logic Bit logic				
	#AMBO1 #AMBO1 #AMBO2 III.0 @"Ack_button" \$SR "Emergency_stop" #EM_Safety_door #EM_Safety_door II2.7 Safe shutdown "IS4_0SSD" R 0 # Press F1 to get Help.	AUR				
	background.	ogram has a light blue				
4	Save the F-FB.	The F-block is subjected to a consistency test and saved once it completes the test successfully. The programming of the emergency stop function (shutdown at emergency stop, open safety door, violation of the laser scanner's protected				

Step 13: Programming the Feedback Loop Monitoring



Sequence	Action	Result		
	Note : If you require Boolean constants "0" and "1" in your safety p during block calls, you can access the "RLO0" and "RLO1" variab qualified DB access. In our example, the F-shared DB in the block "DB 818" ("F_GLOBDB".VKE1). Note : In fail-safe programming, you cannot interconnect, supply w input EN or the enable output ENO.	f you require Boolean constants "0" and "1" in your safety program to assign parameters block calls, you can access the "RLOO" and "RLO1" variables in the F-shared DB using fully ed DB access. In our example, the F-shared DB in the block container has the number 18" ("F_GLOBDB".VKE1). In fail-safe programming, you cannot interconnect, supply with "0" or evaluate the enable EN or the enable output ENO.		
4	Save the F-FB.	The F-block is subjected to a consistency test and saved once it completes the test successfully. The programming of the feedback loop monitoring is now completed.		

Step 14: Programming the Selection of the Laser Scanner Protection Area



Step 15: Programming the User Acknowledgment for Reintegration of the F-I/O

Sequence	Action	Result						
1	Insert the following statical variable for the E EB:							
•	auxiliant memory bit "AMPO2"							
2	Insert a new network.							
3	reintegration through the ACK_REI variable of the respective F-I/O DB as shown in the figure below.							
	KLAD/STL/FBD - [FB100 "Safety_program" DS_Getting_Started_en\SIMATIC 300(1)\CPU 315F-2 DP\\FB100]							
	Contents Of: 'Environment\Interface\STAT'							
	MADO2 Neume Madress Initial Val KKC/A MAD03 Madress Initial Val KKC/A							
		▶ Bit logic						
	Network 5: Reintegration of the F-I/0							
	DB819.DEXO.2							
	FACTOR OF DEPOSITION	······································						
	P DI_DC24V". ACK_REI	[#] [#]						
	All.0							
	DB820.DEX0.2							
	1=ACKNOWLEDGEMENT REINTEGRATION							
	"F00006_4_F_D0_ DC24V_2A".ACK_REI							
		ting Comparator						
	DB821.DEX0.2	te-leng Converter						
	1-ACKNOWLEDCEMENT REINTEGRATION	Jumps						
	"F00012_196". ACK REI							
	Press F1 to get Help.							
	The non-safe "Acknowledgment button" signal in the standard program has a light blue background.							
	Symbolic name in our example:							
	- "F00000 4 8 F DI DC24V" fail-safe digital input module 4/8 F	-DI DC24V (= DB 819)						
	- "F00006_4_F_DO_DC24V_2A": fail-safe digital input module 4/8 F-Di DC24V (= DB 819) - "F00006_4_F_DO_DC24V_2A": fail-safe digital output module 4 F-DO 24 V DC / 2A (= DB 820) - "F00012_196": SIGUARD LS4-4/P1 laser scanner (= DB 821).							
	Note: A user acknowledgment with a positive edge at the ACK_R	El variable of the E-I/O DB is						
	required for the reintegration of the F-I/O (i.e. for switching from fa	ail-safe values (0) to process						
	data) after an error is corrected:							
	- After every communication error							
	- After F-I/O errors or channel errors when the parameter ACK_N	EC = 1.						
4	Save the F-FB and ensure that no errors have occurred by	The F-block is subjected to a						
	checking the "Error" output window of the FBD/LAD Editor.	consistency test and saved						
		once it completes the test						
		I he programming of the user						
		completed.						
5	Close the F-FB and the FBD/I AD Editor	You have programmed the						
0		functionality for the task						
		involved in the example and can						
		now specify the F-runtime						
		ցւսսի.						

Step 16: Specify the F-Runtime Group

Sequence	Action				Result		
1	In the SIMATIC Manager, se "Safety Program" dialog box	lect the Op appears.	tions > Edit Safet	ty Progr	ram menu cor	mmand. The	
	Safety program - DS_Getting_Started_en\SIMATIC 300(1)\CPU 315F-2 DP\S7-Programm(1)						
	O Diffine O O Diffine C O Diffine C O Directive signature of all F-blocks with F-i Collective signature of the safety program: Oursept compilation: Oursept compilation:	Rack: attributes for the b	0 S lock container: A C	6lot: \9778D06)	2	Current mode: unknown	
	The safety program has been changed sir Blocks:	nce it was last con	npiled.			Safety mode	
	F-run-time/F-block	Symb. name	Function in safety program	Signature	Know-how p	Compare	
	□-/ Safety program □-/ All Objects					Permission	
	- ∏ FB100	Safety program	F-FB	13D5			
	FB216	F_FDBACK	F application block	F521	v	Run-time groups	
	FB217	F_SFDOOR	F application block	86DA	<u> </u>		
	Epicoo	F_IU_BUI	F-system block	FAFA		Compile	
		F_UIRL_I	F-system block	403B			
		r_unt_z	P-system block	56E7		Download	
			I-DB for E application block	7656	▼		
	27 DB818	F GLOBDB	F shared DB	3DF3		1	
		- F00000_4_8	F I/O DB	D634			
	- DB820	E00006 4 E	F I/O DB	B097		<u>Print</u>	
	Close					Help	
2	Click on the "Runtime Group	s" button.			The dialog bo	ox "Edit F-Runtime	
	Note : F-blocks must not be of must be inserted into one (or	called direct two) F-run	ly in an OB; rather time groups.	r, they	Groups" oper	ns.	

Sequence	Action	Result					
3	Click on the "New" button to open the "Define New F-Runtime Group" dialog box.						
	Make the following settings for the F-runtime group:						
	• Enter "FC100" as the F-CALL call block for the new F-runtime group. This FC is automatically						
	created as soon as you exit the "Edit F-Runtime Groups" dialog with "OK."						
	• Define the F-program block of the F-runtime group by selecting the previously programmed F-						
	FB from the drop-down list that you want to define as the F-program block for the F-runtime						
	group, "FB100" In our example.						
	• Since the F-program block is a function block in our example, assign all fistance DB to it (10) example. "DB 100"). This I-DB is automatically created as soon as you exit the "Edit E-						
	Runtime Groups" dialog with "OK."	··· , · · · · · · · · · · · · · · · · ·					
	• Set the maximum cycle time of the F-runt	ime group to "100 ms".					
	The dialog box should now appear as follows.						
	A Define new E-run-time group	X					
	F-CALL block:	FC100 💌					
	-						
	<u>F</u> -program block:	FB100 🔽					
	I-DB for F-program block:	DB100					
	May, cucle time of the E-rup time in ms:	[sho					
	Max. Cycle time of the Pstantine in his.	סטרן					
	DB for F-run-time group communication:						
	OK Cancel	Help					
	Note: The F-CALL is the F-block for calling the	e F-runtime group from the standard user program.					
	The F-CALL includes the call for the F-program	n block and the calls for the automatically added F-					
	blocks of the F-runtime group.						
	Note: The E program block is an E EC or E EE	P (with instance DR) that becomes the E program					
	Note: The F-program block is an F-FC or F-FB (with instance DB) that becomes the F-program block when assigned to the E-CALL. You can do the following in the E-program block:						
	 Program the safety program with F-FBD or F-I AD 						
	 Call other created F-FBs/F-FCs for struct 	uring the safety program					
	Insert F-blocks from the F-Application Blo	cks block container from the Distributed Safety F-					
	library (V1)						
	Insert F-blocks from "custom F-libraries"						
	The user defines the call sequence of the F-bl	ocks within the F-program block.					
	Close the dialog box with "OK"						

Sequence	Action			I	Result		
4	You return to the "Edit F-Ru	ntime Group	os" dialog which no	w appea	rs as follow	vs:	
	Edit F run-time groups						×
	F-run-time group/parameter	V	(alue				
	Erup time group EC	F	B100 - 100mo	- No r	call found		
					> FC100	- 140 (
		F-CALL block			10100		
	F-program block			-	FB100		_
	🗐 Symbolic name	F-program block	<	S	afety program		
	🗐 I-DB for F-progra	am block		1	PDB100		
	🗐 Symbolic name	I-DB for F-progr	am block				
	📋 Max. cycle time	of the F-run-tim	e in ms	1	00		
	📋 Call F-run-time ir	1		N	o call found		
	Data block for F	-run-time group	s communication				<u> </u>
	Symbolic name	DB for F-run-tim	e groups communication	า			
	New Delete]					
					-		
	UK				Cano	:el	Help
	Close the dialog box with "C)K".					
0	A message window opens asking if you wish to create any other blocks that are still needed. In our example, these are the F- CALL ("FC100") and the I-DB for the F-program block ("DB 100").						ved. The w then closes.
0	Confirm by clicking on Yes	Daram" diala	a which now anne	are as fo	llowe:		
0		Jyrann ulaic	g which now appe	ais as 10	10003.		
	Safety program - DS_Getting_St	arted_en\SIMA	TIC 300(1)\CPU 315F-2	DP\57-Prog	ramm(1)		×
	Offline C Online	Rack:	0 9	Slot:	2	Γ	Current mode:
	Collective signature of all F-blocks with F Collective signature of the safety program	-attributes for the b n:	lock container: S	99C6BA4A))		unknown
	Current compilation: 09.1	09.2004 14:18:19		\smile			Cofotu modo
	The safety program has been changed s	ince it was last cor	npiled.				Jarcy mode
	Blocks:		1		,	_	
	F-run-time/F-block	Symb. name	Function in safety program	Signature	Know-how p	4	Compare
							Permission
	E-C All Objects		5000				
		Safety program	F-CALL E-program block	SAA 33BE			Run-time groups
		F_TOF	F application block	14B4	<u> </u>		Canala
	FB216	F_FDBACK	F application block	F521	V		
	FB217	F_SFDOOR	F application block	86DA Fafa	<u> </u>		Download
	3 FB1639	F_CTRL_1	F-system block	403B	<u>지</u>		
	🚁 FB1640	F_CTRL_2	F-system block	C2	V		
	FB1641	FITOF	F-system block	69AF 3DB9		•	Print
							Heb
	The eafably program has not	whoon organ	ad but has not ust	hoon	mailed Th	0.00	
	of all F-blocks with the F-att program differ (as highlighte	ribute in the	block container ar re).	nd the col	llective sig	atur	e of the safety
	The safety program has nov	v been creat	ted but has not yet	been co	mpiled. Th	e col	lective signature
	program differ (as highlighte	d in the figu	re).				

Step 17: Compile the Safety Program

Sequence	Action	Result					
1	Click on the "Compile" button in the "Safety Program" dialog. A consistency test is performed on the F-blocks involved in the runtime when the safety program is compiled, in other words the safety program is checked for errors. Any error messages are output in an error window. Once the consistency test is successfully completed, the additionally required F-system blocks are generated automatically and inserted into the runtime group to create an executable safety program						
2	Safety program - D5_Getting_St	arted_en\SIMA	TIC 300(1)\CPU 315F-2	DP\S7-Pr	ogramm(1)		×
	Offline Online Collective signature of all F-blocks with F Collective signature of the safety program Current compilation: 25: The safety program is consistent. Blocks:	Rack: -attributes for the b n: 10.2004 17:28:49	0 lock container:	Slot: B 7C080D D B 7C080D D	2		Current mode: unknown Safety mode
	F-run-time/F-block	Symb. name	Function in safety program	Signature	Know-how p		Compare
	🖃 🦳 🗁 Safety program						
							Permission
	🖃 – 🗁 All Objects						
	🚁 FC100		F-CALL	5AA	N N		Run-time groups
	16 FB100	Safety_program	F-program block	33BE			
	- ₽ FB186	F_TOF	F application block	14B4	N		Compile
	FB216	F_FDBACK	F application block	F521	N		
	₩ FB217	F_SFDOOR	F application block	86DA	N		Download
	₩ FB1638	F_IO_BOI	F-system block	FAFA	<u> </u>		
	2 FB1639	F_CTRL_1	F-system block	EF3F	N		
	FB1640	F_CTRL_2	F-system block	BAE4			
	FB1641	FITOF	F-system block	69AF	N		Print
	J 367 ER1642	1	Automatically denerated	13450			
	Close The collective signature of a signature of the safety progr consistent and executable s Click "Close" to confirm. The	III F-blocks v ram must ma afety progra e "Safety Pro	with the F-attribute atch (as highlighte im has been gene ogram" dialog box	of the d in the rated. closes	block conta figure); in	iner a other	Help and the collective words, a

Step 18: Call the Safety Program in the Cyclic Program

Sequence	Action	Result								
1	The safety program is accessed by calling F-CALL from the standard user program. Call the CALL in the cyclic interrupt OB 35 as shown in the figure. Note : You need to insert the cyclic interrupt OB 35 beforehand in the <i>SIMATIC Manager</i> .									
	LAD/STL/FBD - [OB35 "CYC_INTS" D5_Getting_Started_en\SIMATIC 300(1)\CPU 315F-2 DP\\0 File Fdt Insert PIC Debug View Options Window Help	B35] _□×								
	Contents Of: 'Environment\Interface' Contents Of: 'Environment\Interface' Name TEMP OB35 : "Cyclic Interrupt" Comment: Network 1: Safety program Comment:	Kew network Fe blocks Fc blocks Fc blocks SFE blocks SFC blocks Multiple instances F Libraries								
	CALL FC 100	F30064 / FCLB0064								
	Press F1 to get Help.	Abs < 5.2 Nw 1 Ln 2 Insert Chg								
	Note : Cyclic interrupt OBs have the advantage of interrupting the of the standard user program at fixed time intervals; that is, a safe executed at fixed time intervals in a cyclic interrupt OB.	e cyclic program execution in OB1 ety program is called and								
	Once the safety program is executed, the standard user program	n resumes.								
2	Save and close OB 35.	The block is saved.								

Step 19: Download the Complete Safety Program to the F-CPU and Activate the Safety Mode

Seguence	Action	Popult
Sequence	Action	Result
1	In the SIMATIC Manager, select the Options > Edit Safety Program menu command.	The "Safety Program" dialog box appears.
2	Activate the "Download" button.	All F-blocks with the F-attribute belonging to the safety program are identified and downloaded to the F-CPU.
3	A note is displayed offering you the option of downloading the state the safety program.	andard user program in addition to
	Safety program download (320:127) Image: Do you want to include the standard blocks located in the block folder (with the exception of system data blocks) in this download? Image: Do not display this message again. Image: Yes No Cancel Confirm by clicking on "Yes". Note: If you are downloading F-blocks only, the block in which the interrupt OB35 in our example) is not downloaded. You then hav way as for a standard program.	The F-CALL block is called (cyclic te to download this OB the same
4	Note: To download the entire safety program, the F-CPU has to In the "Safety Program" dialog box, select the "Offline" and	be in STOP mode. If they match, downloading was
	"Online" option buttons in turn to check whether the collective signatures of all F-blocks with F-attribute in the block container match offline and online.	successful. If not, repeat the download operation.
5	To activate safety mode, switch the F-CPU from STOP to RUN mode. Note : Once a safety program has been created, you need to perform a full function test for your automation tasks (see S7)	You have now finished creating the safety program for the tasks involved in the example.
	Distributed Safety, Configuring and Programming manual).	

Appendix 1: Modifying the Safety Program



3 In the SMATIC Manager, select the Options > Edit Safety Program menu command. The "Safety Program" dialog box appears. Image: Safety Program 05 Cetting, Stated emolitication (SMATIC 500()) CU 2131:2 019 S2-Program (D) Image: Safety Program 0: Safety emolity in the Safety Program (D) Image: Safety program 0: Sofety program 0: Stated emolity in the Safety program 0: Safety emolity in the Safety emolity is indicated as the Safety emolity in the Safety emolity in the Safety emolity is indicated as the Safety emolity is indicated as the "Current mode". If it is activate the Safety mode" is indicated as the "Current mode". If it is activate the Safety mode" is indicated as the "Current mode". If it is activate the Safety mode" is indicated as the "Current mode". If it is activate the "Safety mode" is indicated as the "Current mode". If it is activate the "Safety mode" is inter-OPU. In the E-FB is loaded in	Sequence	Action			F	Result		
The "Safety Program" dialog box appears. ^C Safety program - DS-Cattug-Safetd - mSVATIC 500(1)/CIUJ157-DP-S7-Program(1) ^C Online - Back: 0	3	In the SIMATIC Manager, select the Options > Edit Safety Program menu command.						
Image: Stately program: DS_Cetting: Stated_entStMATIC 300(1)/CPU3157-20P ST-Programm(1) Image: Stately program and the state program is the state complete. Collective signature of all Factors with Faithbales for the block contains: Image: State program is the state program is the complete. Detective signature of all Factors with Faithbales for the block contains: Image: State program is block in the state program is the complete. Block: Image: State program is block in the state complete. Image: State program is block in the state program is the complete program is the state program is block in the state program. Image: State program is block in the state program is block in the state program is the s	-	The "Safety Program" dialog	box appea	rs.				
• Office		Safety program - D5 Getting Sta	arted en\SIMA	TIC 300(1)\CPU 315F-2	DP\S7-Proc	iramm(1)		×
** Ultre ** Ultre <t< th=""><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th></t<>								
Clebete ignoluse of lar Bob (or with F-athbules to the block contains: Clebete ignoluse of the addy progen: Durent compilion: 25.10.2004 17.28.49 The addy progen has been charged inne it was last compiled. Block: Functioner/Holds Synth, name Functioner/Holds Functioner/Holds Synth, name Functioner/Holds Permission Functioner/Holds Synth, name Functioner/Holds Permission File File File File File File File File File File File File File File		• Uthine • O Unline	Hack:	0 5	olot:	2	[Current mode:
Calculate signature of the safety program. 0 Safety model Carrent completion: 2010 17/22 43 Safety model Block: Function in safety program far boom changed ince it was last completed. Safety model Safety model Block: Function in safety program far boom changed ince it was last completed. Safety model Function in safety program for gaps. Safety model Function and program. Function in safety program. Function in the safety program. Function in safety program. Function in safety program. Function in safety program. Function in safety program. Note: You have changed and saved an F-block of the safety program and therefore created an inconsistent safety program. In other words, the collective signature of all F-blocks with the F-attribute in the block container and the collective signature of the safety program. Function in RUN mode. 4 Note: You have changed and saved an F-block of the safety program in RUN model. Another prompt will appear. This inconsistent safety program. In Other words, the collective signature of all F-blocks with the F-attribute in the block container and the collective signature of all F-slocks with the F-attribute in the slock program. Another prompt will appear. This in collective safety program in RUN mode. 5		Collective signature of all F-blocks with F-	attributes for the b	lock container: 🖉 🛛 🛛	37C080DD			unknown
Content complaints: 2510.0001/1228.43 The safety program has been changed inno it was list complet. Blocks: Image: Second Secon		Collective signature of the safety program		, c)			
The stelp program has been changed since it was list compiled. Image: Compiler Comp		Current compilation: 25.1	0.2004 17:28:49					Safetrumode
Block: Function is addy program Compare Image: Signature Function Flock Signature Know-how prime Image: Function Signature Function is addy program Function is addy program Function is addy program Image: Function Signature Function is addy program Function is addy program Function is addy program Function is addy program Image: Function Signature Function is addy program Function is		The safety program has been changed si	nce it was last con	npiled.				
Image: Second		Blocks:					_	
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7 Test the changes to the system or view the "Program status online". Once the test is successfully completed, continue by compiling the safety program	C	Download the modified E EB	from the E	DB/LAD Editor to t	he F		1.4.2	
7 Test the changes to the system or view the "Program status online". Once the test is successfully completed, continue by compiling the safety program	0	CPU (same procedure as for	r the standa	rd program).		וופ ד-דא is יסו ו	ioa	bed in the F-
online".	7	Test the changes to the syst		the "Program state		noo tha ta	ot ic	auaaaafullu
the safety program	1	online".		and a rogram statt		ompleted	SL IS CONt	successfully
The sale volucio and					ti	he safetv n	roar	am.

Sequence	Action				Result			
8	To apply the changes to the	To apply the changes to the safety program and get a consistent safety program again, press the						
	"Complie" button.	annaar aa fa	llowo					
	The dialog box should how appear as follows.							
	Safety program - DS_Getting_St	arted_en\SIMA	TIC 300(1)\CPU 315F-2	DP\S7-Pro	ogramm(1)	×		
	Offline C Online	Rack:	0 9	Slot:	2	Current and a		
	Collective signature of all F-blocks with F-	attributes for the b	lock container: (C75EFD27		Lurrent mode:		
	Collective signature of the safety program	Ľ	(α	C75EFD27		GIRHOWIT		
	Current compilation: 25.1	0.2004 17:48:37						
	The safety program is consistent.					Safety mode		
	Blocks:							
	F-run-time/F-block	Symb. name	Function in safety program	Signature	Know-how p 🔺	Compare		
	□- ² Safety program							
	⊕-					Permission		
			E CALL	EAA				
		Safetu program	F-CALL E-program block	6285		Run-time groups		
		F TOF	F application block	14B4				
		F FDBACK	F application block	F521		Compile		
	7 FB217	F_SFDOOR	F application block	86DA	<u> </u>			
	🖅 FB1638	F_IO_BOI	F-system block	FAFA	V	Download		
	FB1639	F_CTRL_1	F-system block	EF3F				
	₩ FB1640	F_CTRL_2	F-system block	BAE4	V			
	FB1641	FITOF	F-system block	69AF		Print		
	J 367 FR1642		Automatically denerated	LSDBS				
	Close					Help		
	The collective signature of a	II F-blocks v	vith the F-attribute	of the b	olock container	and the collective		
	signature of the safety progr	am must ma	atch; in other word	ls, a cor	nsistent and ex	ecutable safety		
	program has been generated	d (as highlig	hted in the figure)	•				
9	Click on the "Download" but	ton to down	load the modified s	safety	All F-blocks wi	th the F-attribute		
	program to the F-CPU.				belonging to th	e safety program		
					the E CPU	ind downloaded to		
10	In the "Cafety Drearem" diel	ag bay agle	at the "Offline" and	4	liter-CFU.	downloading was		
10	"Online" option buttons in tu	n to check	whether the collec	tivo	successful If n	ot repeat the		
	signatures of all E-blocks wit	th F-attribute	in the block cont	ainer	download oper	ation		
	match offline and online.			anner				
11	To activate safety mode sw	RUN	You have now	finished adapted				
	mode.				the safety proc	ram for the		
	Note: After creating a safety	nrogram v	ou must perform a	full	modified task (see Sequence 1		
	function test for your automa	ation tasks.			above).	•		
	After modifying a safety proc	gram that ha	as already be fully					
	tested, it is sufficient to only	test the mo	difications (see S7	,				
	Distributed Safety, Configuri	ing and Pro	gramming manual)).				

Appendix 2: Acceptance Support for the Safety Program

Sequence	Action	Result
1	 Note: The documentation of the safety program is part of the acceptance documents in accordance with machine guidelines or IEC 61508 for the process industry and correspondingly applied standards. Print out the safety program for the acceptance. Proceed as follows: Activate the "Offline" button in the "Safety Program" dialog in order for the signature of the symbols to be included in the footer of the offline safety program printout. Click on the "Print" button in the "Safety Program" dialog. Activate all four check boxes in the "Print Safety Program" dialog. Activate all four check boxes in the "Print Safety Program" dialog. Activate all four check boxes in the "Print Safety Program" dialog. Print safety program Create printout of: Function Block Diagram/Ladder Logic Safety program Hardware configuration Symbol table 4.) Click "OK" to confirm. 5.) Select "All" for the print range of the "Hardware Configuration" and mark the option "With parameter description.	The "Print Safety Program" dialog box opens.
	Confirm with "OK". Note : You need to archive all four printouts and logs of the function tests.	The safety program is printed.
2	Check the printout. The collective signatures in the footer of the printout (each with the collective signature of all F-blocks with an F-attribute in the block container and signature of the symbols) must match in all	
3	four printouts. Activate the "Online" option to run a check in the "Safety Program" dialog (the safety program must be loaded): The online collective signature of all F-blocks with F-attribute in the block container must match those in the accepted offline printout and no unused F-CALL may be present in the online safety program. Note: Additional important notes and instructions about acceptance of the safety program are available in the S7 Distributed Safety, Configuring and Programming manual.	If these checks reveal any deviations or errors, recompile the safety program and perform the acceptance procedure again.

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Δn	nendix	3.1	[vnical	Config	uration	and	Proo	iramming	Mistakes	and the	Causes
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Туре	Error	Possible Cause / Remedy
Configuration error	F-blocks cannot be downloaded to the F-CPU.	F-CPU parameter "CPU contains safety program" in the "Protection" tab is not activated.
Configuration error	SF LED on the F-module lights when the safety program is not loaded.	ET 200M: System property ET 200S: The PROFIsafe address set on the DIL switch does not match the one set in <i>HW Config</i> .
Configuration error	 SF-LED on the F-module lights and TIMEOUT error in the DIAG byte of the F-I/O DB 	Monitoring time of the F-module \leq cycle time of the F-CALL.
Configuration error	 SF-LED on the F-module lights and CRC error in the DIAG byte of the F-I/O DB 	- Loaded safety program does not match the one loaded in <i>HW</i> <i>Config</i> .
		 Safety program is inconsistent. PIQ/PII of the F-module was overwritten by the standard user program.
Configuration error	 SF-LED on the F-DI module lights and module reports short-circuit 	Sensor connection does not match configuration, for example:
		 Only one switching contact is connected to a channel with 1002 evaluation
		 A sensor with non-equivalence contacts is connected to a channel configure for "two- channel equivalence".
		- Two switching contacts of a single-channel or two-channel non-equivalence sensor are supplied via VS1 and VS2
Programming error	After an F-block is edited and saved, the block cannot be closed and the message "The block was not saved" appears.	Check for any programming or syntax errors in the "Error" detail tab of the FBD/LAD Editor.
Programming error	F-PIQ/PII has not been updated.	F-CALL is not called in the cyclic OB3x.
		F-module has been passivated. Evaluate the QBAD and DIAG byte parameters in the respective F-I/O DB.
Programming error	F-CPU goes to STOP due to data corruption in the safety program.	 F-CALL is called more than once in the cyclic program. The standard user program is writing to F-DB addresses. Undeclared TEMP variables are being used in the safety program. Memory bits are being read in the safety program that are changing during the processing of the F-CALL, for example, clock memory bits. Overflow during INT operations has not been checked

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Your Feedback as regards the S7 Distributed Safety (Version 10/2004)

Dear SIMATIC user,

Our goal is to provide you information with a high degree of quality and usability, and to continuously improve the SIMATIC documentation for you. To achieve this goal, we require your feedback and suggestions. Please take a few minutes to fill out this questionnaire and return it to me by Fax, e-mail or by post.

We are giving out three presents every month in a raffle among the senders. Which present would you like to have?

SIMATIC Manual Collection

Automation Value Card

Laser pointer

Dr. Thomas Rubach,

Head of Information & Documentation

	General	Questions	
1.	Are you familiar with the SIMATIC Manual Collection?	3. Do you use Getting Starteds?	
	yes no	yes no if yes, which:	
2.	Have you ever downloaded manuals from the internet?	4. How much experience do you have with the S7 Distributed Safety?	
	yes no	Expert	
		Advanced user	
		Beginner	

Please specify the documents, for which you want to answer the questions below:					
	A: Manual S7 Distributed Safety, Configuring and Programming			D: Manual ET 200eco, Distributed I/O Fail-Safe I/O Module	
	B: Manual S7-300, Fail-Safe Signal Modules		E: System Description Safety Engineering in SIMATIC S7		
	C: Manual ET 200S, Distributed I/O System Fail-Safe Modules			F: Getting Started S7 Distributed Safety	
1.	In which project phase do you use this document frequently?		•	Were able to find the required information?	
	Information	Assembly		yes no	
	Planning	Commissioning		which was not:	
	Configuration	Maintenance & Service	4.	What is the scope of the information?	
	Programming	others:		Just right	
				Not enough - which topic:	
2.	Finding the required information in the document:			—	
•	How quickly can you find the desired information in the document?			l oo detailed – which topic:	
	immediately	not at all	5.	Is the information easy to understand (texts, figures, tables)?	
	after a brief search	after a long search		yes no	
				if no, which was not:	
	Which search method do you prefer?				
	Table of contents	Index			
	Full-text search	others:	6.	Are examples important to you?	
				no, of less importance	
•	Which supplements/improvements would you like in order to help you find the required information quickly?			yes, important -were the examples enough?	
				yes no	
				if no, on which topic:	
3.	Your judgement of the document as regards content.				
•	How satisfied are you with this document		7.	What are your suggestions as regards the	
	Totally satisfied	not very satisfied		contents of the document?	
	Very satisfied	not satisfied			
	Satisfied				

Thank you for your cooperation