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

### MODULE A8

### **Test and online functions**

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#### PAGE:

1.	Forward	4
2.	Test and online functions	6

The following symbols stand for the specified modules:



Programming



Notes



#### 1. FORWARD

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The module A7 is assigned content wise to the **Basics of STEP 7- Programming**.

#### Learning goal:

In this module, the reader will learn the tools which are helpful for error searching.

- Debug functions
- Online- functions

#### **Requirements:**

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

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

Debug- and ONLINE- Functions

#### Required hardware and software

- 1 PC, Operating system Windows 95/98/2000/ME/NT4.0 with
  - Minimal: 133MHz and 64MB RAM, approx. 65 MB free hard disk space
  - Optimal: 500MHz and 128MB RAM, approx. 65MB free hard disk space
- 2 Software STEP 7 V 5.x
- 3 MPI- Interface for the PC (e.g. PC- Adapter)
- 4 PLC SIMATIC S7-300

Example configuration:

- Power supply: PS 307 2A
- CPU: CPU 314
- Digital inputs: DI 16x DC24V
- Digital outputs: DO 16x DC24V / 0.5 A



#### Forward

Debug- and ONLINE- Functions

#### 2. TEST AND ONLINE FUNCTIONS

In the following section, the debug and on-line functions are introduced and can be tested e.g. with the STEP 7 project 'Startup' from module A3 – 'Startup' PLC- Programming with STEP 7.

In STEP 7, many different debug and diagnostic functions are available. In order to use the functions, the following steps must be implemented:

1. First open the LAD,STL,FBD Program blocks tool. ( $\rightarrow$  Start  $\rightarrow$  Simatic  $\rightarrow$  STEP 7  $\rightarrow$  LAD, STL, FBD Program blocks).



2. **Open** a block to observe it. ( $\rightarrow$  File  $\rightarrow$  Open).



**Debug- and ONLINE- Functions** 

3. Open a block from the CPU **Online** or **Available nodes** ( $\rightarrow$  Entry point: Project  $\rightarrow$  Name  $\rightarrow$  Online  $\rightarrow$  Choose block  $\rightarrow$  OK).

Open				×
Entry point: Project Name:	View: Component vie Storage path	w <b>T</b>	⊙ Online ⊂ Offline	8
startup	C:\Siemens\Ste	ep7\S7proj\STARTUP	<u>B</u> rowse	
Startup	<ul> <li>OB1</li> <li>SFB1</li> <li>SFB4</li> <li>SFB41</li> <li>SFB44</li> <li>SFB48</li> <li>SFB61</li> </ul>	<ul> <li>FC1</li> <li>SFB2</li> <li>SFB5</li> <li>SFB42</li> <li>SFB46</li> <li>SFB49</li> <li>SFB62</li> </ul>	<ul> <li>SFB0</li> <li>SFB3</li> <li>SFB32</li> <li>SFB43</li> <li>SFB47</li> <li>SFB60</li> <li>SFB63</li> </ul>	4
	<u>O</u> bject name: Object <u>t</u> ype:	FC1 All that can be proce	ssed	T
ОК			Cancel	Help



Note:

Since STEP 7 V5.x can also access a project from **Offline**, make sure to access a block from the Online functions!!!

Forward

4. Now the variables can be monitored and modified from the PC under the menu option → PLC with → Monitor/Modify Variables and accessed on the diagnostic functions → Module Information and → Operating Mode. From here one can also request → Clear/Reset and → Set Time of Day adjustments.



- If the function → Variable Monitor/Modify was selected, several operations can be monitored and modified.
- 5.1. In addition, the necessary operands must be registered in a table and their format must be selected.



Forward Debug- and ONLINE- Functions		
Forward Debug- and ONLINE- Functions		
	Forward	Debug- and ONLINE- Functions

5.2. Now the times (  $\rightarrow$  Trigger ) for monitoring and modifying need to be accessed.



Trigger	×
Trigger Point for Monitoring © <u>B</u> eginning of Scan Cycle © End of Scan Cycle © Transition to <u>S</u> TDP	Trigger Condition for Monitoring © <u>O</u> nce © E <u>v</u> ery Cycle
Trigger Point for Modifying Beginning of Scan Cycle End of Scan Cycle Transition to STOP	Trigger Condition for Modifying
OK	Cancel Help

5.3. The operands can now be monitored (  $\rightarrow$  Variable  $\rightarrow$  Monitor).



Forward

**Debug- and ONLINE- Functions** 

5.4. In order to modify, the modification value must be given beforehand (  $\rightarrow$  Variable  $\rightarrow$  Modify).

Office         Organization         Mode         CMP2         Modely value         Applies
Additional Direction     Update     Upd
AN TOT SHALTE MARKINGSOME TO 2 CAN'T STOTEDOWS AN MW TOD BOX MMW TOD HEDE Danke Frank Values: 44x72
er He 10 HEz Daule Frank Value - 48-72
Danie Form Video Ab-72
1.2019.47
Multi-Yoke as Exmed #1

 Another possibility for the monitoring of operands and the debugging of an executed program is with the function → Debug → Monitor.



6.1. In STL, the logic operation result **RLO**, the value of the operand **STA**, and the contents from the ACCU1 **STANDARD** are indicated behind each operand. With a right mouse click on the area under **STANDARD**, the display type can be changed to the desired format.



Forward

**Debug- and ONLINE- Functions** 

6.2. The signal chart can be monitored in a LAD.

Network 1: Pulse press A pulse should be applied for 10 seconds when the start-b sensor IO.O for the protection grid are activiated. Τ1 "B0" "S1" S\_IMPULS 1 1 11 s Q 55T**#10**s DUAL TW -... S5T#10S S5T#0ms DEZ – R

6.3. The signal chart and signal state can be monitored in a FBD.

Network 1: Pulse press A pulse should be applied for 10 seconds when the start-button IO sensor IO.O for the protection grid are activiated. 8. 1 Τ1 "B0" S\_IMPULS 1 "S1" s DUAL S5T**#10s** S5T#Oms S5T#10S -TW DEZ -... ... — R Q --

Forward

7. The diagnostic function **Module Information** makes an exact diagnosis possible of the system states regarding memory efficiency, communication, as well as cycle loading and offers detailed information about the selected CPU (→Module Information ).

The **Diagnostic buffer**, which logs the last 100 operating state modifications and error messages on the CPU as a ring buffer, is important for finding errors. Thus programming and hardware errors can be located fast and effectively ( $\rightarrow$  Diagnostic Buffer).

Moc	📆 Module Information - CPU 314C-2 PtP ONLINE				
Path: Status:	startup\S7 Program(1)		Operating mode of the CPU: 📀 STOP		
Jiaius.					
	Time System	Performanc	nce Data Communication Stacks		
	General	Diagnostic Buf	uffer Memory Scan Cycle Time		
<u>E</u> ve	nts:	🗖 Ei	Elter settings active		
No	<ol> <li>Time of day</li> </ol>	Date	Event 🔺		
1	08:32:19:813 pm	04/10/94	STOP: inconsistency in the configuration data		
2	08:32:19:767 pm	04/10/94	Mode transition from STOP to STARTUP		
3	08:32:12:292 pm	04/10/94	Formating of a MMC executed		
4	08:32:07:267 pm	04/10/94	STOP caused by PG stop operation or by SFB 20 "STO		
5	07:01:02:677 pm	04/10/94	Mode transition from STARTUP to RUN		
6	07:01:02:676 pm	04/10/94	Hequest for automatic warm restart		
	07:01:02:366 pm 07:00:50:304	04/10/94	Mode transition from STUP to STARTUP		
10	07:00:03:364 pm	04/10/34	Power on backed up		
<u>D</u> eta	Details on Event: 1 of 66 Event ID: 16# 49A4				
ST oc N Er Pr Re	STOP: inconsistency in the configuration data occurred when checking Parameters for internal consistency No consistency entries assignable Error type: Parameter field incomplete Previous operating mode: STARTUP (warm restart) Requested operating mode: STOP (internal)				
	Save <u>A</u> s <u>S</u> ettings <u>Open Block</u> <u>Help on Event</u>				
C	lose <u>U</u> pdate	<u>P</u> rin	int Help		

8. With the diagnosis function **Operating Mode**, these errors can be understood and affected.
 (→ Operating Mode)

Operating Mode		×
Path: startup\S7 Program(1)		
Current Operating Mode:	STOP	[
		<u>C</u> old Restart
		<u>H</u> ot Restart
		STOP
Current Keyswitch Setting:	RUN-P	
Last Operating Mode:	STARTUP	
<u>U</u> pdate	Clos	se Help

Forward Debug- and ONLINE- Functions

9. With the function  $\rightarrow$  Clear/Reset, one can request a reset of the program equipment.



10. The time of day and date can be actuated with the **Set Time of Day** or accepted from the program equipment. (→ Set Time of Day)

Set Time of Day				
Path: startup\S7	7 Program(1)			
	<u>D</u> ate:	Time of Day:		
PG/PC time:	09 / 05 / 02	11:45:44 am		
Module time:	04 /10 /94	09 :28 :21 pm		
▼ Take from P <u>G</u> /PC				
		Extended >>		
	Close	Help		

Forward