Training document for the company-wide automation solution
Totally Integrated Automation (TIA)

MODULE A8
Test and online functions
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1. Forward

2. Test and online functions

The following symbols stand for the specified modules:

- Programming
- Notes
1. FORWARD

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

- **Basics of STEP 7- Programming**
  - 2 - 3 days  
  - A modules

- **Additional functions of STEP 7- Programming**
  - 2 - 3 days  
  - B modules

- **Industrial field bus systems**
  - 2 - 3 days  
  - D modules

- **Sequencer programming**
  - 2 - 3 days  
  - C modules

- **Process visualization**
  - 2 - 3 days  
  - F modules

- **IT- Communication with SIMATIC S7**
  - 1 - 2 days  
  - E modules

**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)
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
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. (→ Start → Simatic → STEP 7 → LAD, STL, FBD Program blocks).

2. **Open a block to observe it.** (→ File → Open).
3. Open a block from the CPU **Online** or **Available nodes** (→ Entry point: Project → Name → Online → Choose block → OK).

![Open dialog box](image)

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

5. 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.
5.2. Now the times (→ Trigger) for monitoring and modifying need to be accessed.

5.3. The operands can now be monitored (→ Variable → Monitor).
5.4. In order to modify, the modification value must be given beforehand (→ Variable → Modify).

6. 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.
6.2. The signal chart can be monitored in a LAD.

6.3. The signal chart and signal state can be monitored in a FBD.
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 (→ Diagnostic Buffer).

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