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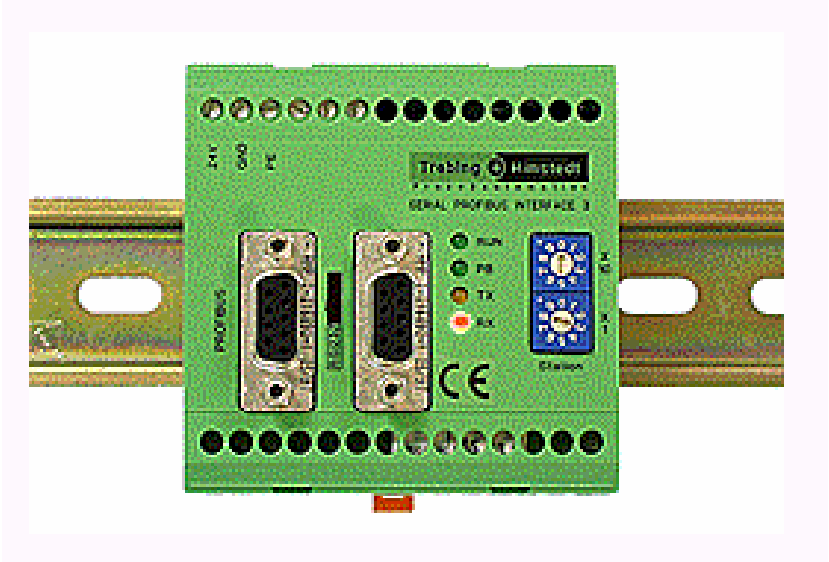
Configuration of the SPI3 PROFIBUS DP Slave for Datalogic Barcode Readers



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1 Important information

1.1 General instructions

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Should you encounter any problems with the device, please consult the technical manual first of all. If you are still anable to solve the problems after studying the above information carefully you can contact the following places:

If you need to contact the support hotline, please make sure you have the Technical manual handy!

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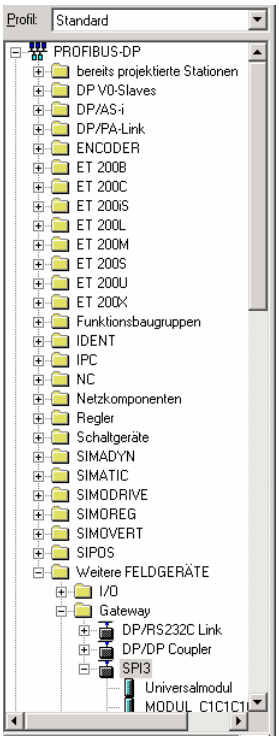
2 Software

The following files and sample projects are included in the scope of supply of the software for the SPI3 module:

2.1 Device master file THDP0091.GSD

Used to integrate the SPI3 PROFIBUS slave in the SIEMENS S7 PROFIBUS-DP network.



The device master file **THPD0091.GSD** supplied by P+F contains configuration data for the SPI3 serial interface. It must be copied to the following folder

`\Siemens\Step7\S7data\Gsd`

in order to tell STEP7, the Siemens Simatic software, that a new external field device (in this case the SPI3 module) is to be added to the Hardware Catalog.

Finally, `Tools/Update Catalog` must be selected in the STEP7 *HW Config* program. The Hardware Catalog now contains the entry SPI3 under

`PROFIBUS DP/Other field devices/Gateway`

You can use this device as a PROFIBUS-DP slave.

File name	Size	Changed	Version	HW Rel.	SW Rel.
thdp0091.gsd	49,493 bytes	06.05.2002	2.2	1.0	1.3

2.2 Demo project *scanner2*

After integrating the device master file `THDP0091.GSD` as described in section 2.1 above, you can load the demo project *scanner2* into the Simatic Manager.

This project demonstrates a typical connection of a Datalogic barcode reader to an S7-315-2 via the SPI3 (this connection can normally be customized comparatively easily to other S7 models).

In our example the serial field device SPI3 has the PROFIBUS slave address 03. The same address must also be set on the device itself (refer to section 3.1).

2.2.1 Parameterizing the SPI3

The `Datalogic_DPD_20i/8o` communication module was used with the following parameters in the sample project (refer to Fig. 1).

- `Baud rate:` **`9600`**
  Transmission rate to the scanner
- `Flags:` **`Disable diagnostic interrupts`**
  This setting disables a diagnostic interrupt in case of an error (e.g. parity) in transmissions to or from the scanner.
  If you set `Enable diagnostic interrupts` instead, the error is handled using OB82.
- `Handshake:` **`No`**
  The data flow between the SPI3 and the scanner is not controlled.
- `Xon / Xoff character:` **`17 / 19`**
  (means decimal 17 (XON/DC1) and decimal 19 (XOFF/DC3))
- `Parity:` **`Even`**
  Parity bit transmitted to the scanner
- `Character frame:` **`8 bit`**
  Data bits transmitted to the scanner
- `Delay time [*10 ms]:` **`10`**
  Timeout time after which a scanned character string is transferred to the PLC. The delay time (ZVZ) serves to identify the end of the telegram (only if you selected `ASCII driver ZVZ` as the transmission mode)
- `Transmission mode:` **`ASCII driver ZVZ`**
  (ZVZ = character delay time)
- `Priority:` **`Low`**
- `Start / stop character:` **`2 / 3`**
  (means decimal 2 (STX) and decimal 3 (ETX))
  The start and stop characters are only relevant if you selected `ASCII driver start/stop character` as the transmission mode.
- `Telegram length:` `1`
  The telegram length is only relevant if you selected `ASCII driver fixed length` as the transmission mode.

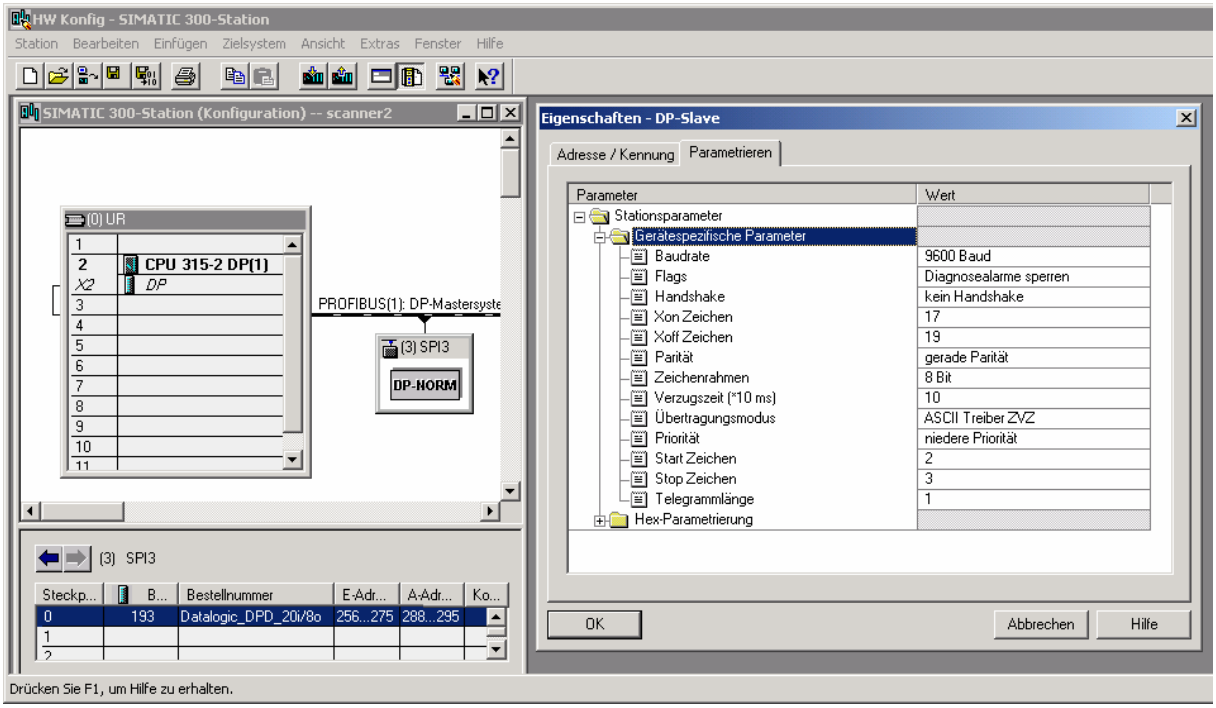


Fig. 1: Hardware configuration of the SPI3

The barcode reader should be parameterized as described in section 3.2 to ensure that the sample project functions correctly.

2.2.2 Changing the I/O area

The `Datalogic_DPD_20i/8o` communication module with 20 input bytes, 8 output bytes, and the following address areas was used for the SPI3:

- Input address: 256-275
- Output address: 288-295

You can also select modules with larger or smaller address areas. In this case, OB1 may need to be customized accordingly.

- Customizing in network 1 (input address)
  The start address of the input area is specified in the first line (in hexadecimal notation) and the size of the address area in the last line:

```
Network 1:
   CALL  "DPRD_DAT"                    // SFC 14
      LADDR  :=W#16#100                // 100h = 256d
      RET_VAL:=MW50
      RECORD :=P#M 10.0 BYTE 20        // 20 characters
   NOP   0                             // starting at MB10
```

- Customizing in network 3 (output address)
  The start address of the output area is specified in the first line (in hexadecimal notation) and the size of the address area in the last line:

```
Network 3:
   CALL  "DPWR_DAT"                  // SFC 15
      LADDR  :=W#16#120              // 120h = 288d
      RECORD :=P#M 43.0 BYTE 8       //     8     characters
starting at MB43
      RET_VAL:=MW52
```

2.2.3 Transmission mode

The transmission mode determines how a character string is detected and identified as valid. `ASCII driver ZVZ` was selected in our example (ZVZ stands for character delay time): a character string is assumed to have ended if no more characters are received within the time specified by the "Delay time" parameter (in this case: 10*10 ms = 100 ms).

The following detection criteria are also possible:

1. `ASCII driver fixed length`
2. `ASCII driver start/stop character`

2.2.4 The variable table

Communication between the PLC and the SPI3 can be visualized with the help of the variable table `VAT_1`.

`MW50` and `MW52` contain the status and return values of the `SFC14` (read consistent data to DP standard slave) and `SFC15` (write consistent data to DP standard slave) system blocks. If these values are zero, no communication errors have occurred.

`MW10` is followed by the 20-byte input area, in which the first four bytes (`MW10` and `MW12`) contain defined status information rather than user data (refer to Table 1).

Byte	MW	Field	Description
0	10	Control Field	Data flow contol, fragmentation, resynchronization
1		Station Address Field	SPI3 PROFIBUS address (here: 03)
2	12	Service Access Point Field	(Not to be confused with PROFIBUS SAP)
3		Length Field	Length of the transferred character strin; corresponds to the total length – 4.
4	14	Data0	1st data byte
5		Data1	2nd data byte
...		...	…
19	28	Data15	16th data byte

Table 1: Assignment of the input area

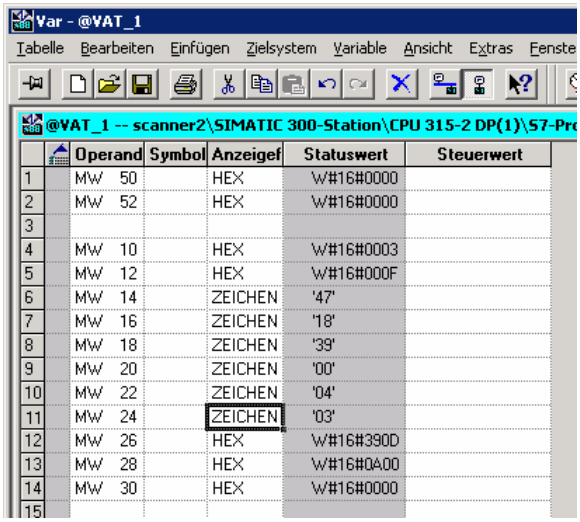


Fig. 2: Variable table VAT_1

The scanned 13-digit barcode (in this example: 4 7 1 8 3 9 0 0 0 4 0 3 9) and the postfix characters 0Dh (CR) and 0Ah (LF) appended by the barcode reader start at MW14. The remaining 20-character digit is not overwritten (in this example: right byte in MW28).
(4 + 13 + 2 = 19 digits are required; 20 characters are available in the above example.)

2.2.5 Diagnostic interrupt OB82

As mentioned above in section 2.2.1, no transmission errors between the SPI3 and the scanner are handled in the sample configuration (refer to section 2.2.1, `Flags: Disable diagnostic interrupts`). Transmission errors are especially likely if the scanner is connected or disconnected to or from the SPI3 when energized.

We recommend using **OB82** to handle the event and responding to the error on the PLC side. To do this, simply set the flag to **`Enable diagnostic interrupts`** when you parameterize the SPI3.

2.2.6 Acknowledging a character string

A character string that is scanned by the PLC from the SPI3 is acknowledged in network 2 of OB1. No more data is sent to the PLC until this acknowledgment is received by the SPI3, even if a new character string is scanned.
The acknowledgment principle is as follows:
Bit 0 of the first byte in the input area (in this example: `MB10`) is a so-called toggle bit, in other words it is inverted each time a new character string is transferred.
The toggle bit is returned to the SPI3 as an acknowledgment (in this example it is copied to `MB43`). The remaining seven bits are first masked out:

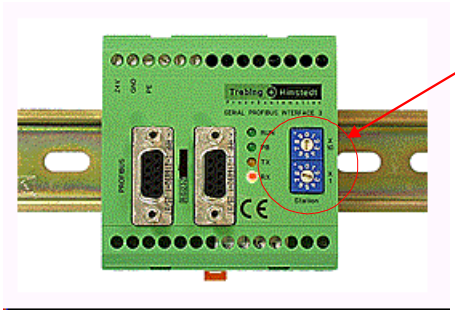
```
Network 2:
      L     MB    10
      L     B#16#1
      UW
      T     MB    43
```

3 Configuration

Various hardware settings are required in order for the S7 PLC to communicate with the Datalogic barcode reader via the serial field device SPI3. Software adaptations may also be necessary to code and data blocks.

3.1 SPI3 PROFIBUS address

The PROFIBUS-DP address must be set with two rotary switches on the SPI module. We selected the address 03 for our sample project *scanner2*.



Note: The SPI3 only updates the PROFIBUS address after a cold restart. Either set the PROFIBUS address when the SPI3 is deenergized or interrupt the power supply briefly after setting it.

Important: PROFIBUS addresses 00 to 02 are reserved. Please only set addresses between 03 and 99.

Note: The RS232 side of the SPI3 module (baud rate, parity, etc.) must be configured using the STEP7 software. The data is loaded into the SPI3 via the MPI cable, the S7, and the PROFIBUS!

3.2 Datalogic barcode reader

We recommend the following settings for the Datalogic barcode reader:

- Baud rate: 9600
- Parity: Even
- Stop bits: 1
- Handshake: No