SIEMENS

Open User Communication with TCON

S7-1500 CPU

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Caution

The functions and solutions described in this article confine themselves predominantly to the realization of the automation task. Furthermore, please take into account that corresponding protective measures have to be taken in the context of Industrial Security when connecting your equipment to other parts of the plant, the enterprise network or the internet. Further information can be found in Entry ID 50203404.

http://support.automation.siemens.com/WW/view/en/50203404

Contents

1 Introduction

You can use Open User Communication over Industrial Ethernet, for example, for data exchange through the integrated PROFINET and Ethernet interface of the S7-1500 CPU. The protocols below are supported for this:

- TCP
- ISO-on-TCP
- UDP

The following communication instructions are available for Open User Communication over Industrial Ethernet.

- TCON for establishing a connection
- TDISCON for ending a connection
- TSEND for sending data
- TRCV for receiving data

In STEP 7 Professional V12 (TIA Portal), you will find the above-mentioned communication instructions in the "Instructions" task card in the "Communication > Open User Communication > Other" palette.

This example shows how to program the TCON communication instruction to establish a connection for the Open User Communication between two S7-1500 CPUs over the integrated PROFINET interface.

TCON in the S7-1500 CPU

In the S7-1500 CPU which actively establishes the connection, the TCON communication instruction returns a message (ERROR=1) to the user if the remote connection partner cannot be reached or the port addressed there is not available. In this case there must follow another attempt to establish a connection with a positive edge at the REQ input.

For this reason, in the S7-1500 CPU that actively establishes the connection, the REQ input of the TCON communication instruction must remain toggled until the TCON communication instruction has been completed successfully with DONE=1 and the connection is established.

2 Programming Establishment of the Connection and Data Exchange in the Active S7-1500 CPU

Marker byte 10 is configured as clock marker in the active S7-1500 CPU. The clock marker is for the following:

- The REQ input of the TCON communication instruction is toggled until the TCON communication instruction has been completed successfully with DONE=1.
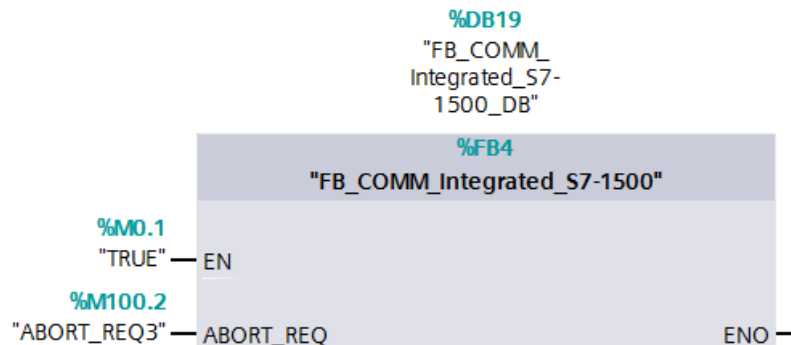
- The Send job is triggered.

2.1 OB1

OB1 is called cyclically.

The FB4 "FB_COMM_Integrated_S7-1500" is called in OB1 with the instance data block DB19 "FB_COMM_Integrated_S7-1500_DB".

You can disconnect the connection manually through the ABORT_REQ input. Set the ABORT_REQ input to the value 1 to disconnect the connection.

As soon as you set the ABORT_REQ input back to the value 0 the connection is established again automatically.
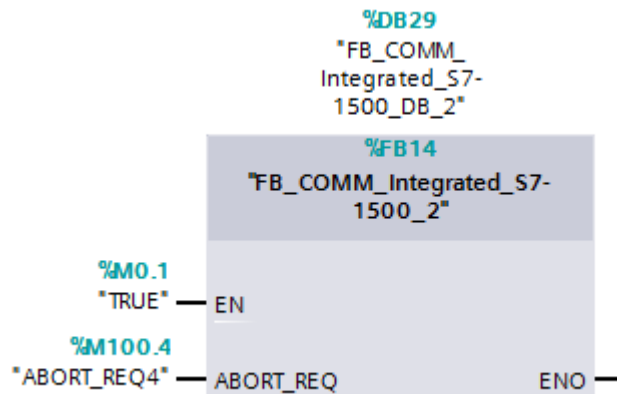
Figure 2-1

The FB14 "FB_COMM_Integrated_S7-1500" is called in OB1 with the instance data block DB29 "FB_COMM_Integrated_S7-1500_DB_2".

You can disconnect the connection manually through the ABORT_REQ input. Set the ABORT_REQ input to the value 1 to disconnect the connection. As soon as you set the ABORT_REQ input back to the value 0 the connection is established again automatically.

Figure 2-2

```
                              %DB29
                           "FB_COMM_
                          Integrated_S7-
                            1500_DB_2"
                              %FB14
                       "FB_COMM_Integrated_S7-
                              1500_2"
        %M0.1
        "TRUE" ——— EN
        %M100.4
   "ABORT_REQ4" ——— ABORT_REQ                    ENO ———
```

2.2 FB4 "FB_COMM_Integrated_S7-1500"

FB4 is called cyclically in OB1. The following communication instructions are called in FB4.

- TCON
- TSEND
- TRECV
- TDISCON

2.2.1 Connection Setup

The TCON instruction is for configuring and setting up a communication connection. Once the connection has been configured and set up, it is maintained and monitored automatically by the CPU. TCON is executed asynchronously.

Input and output parameters of the TCON instruction

Table 2-1 shows the input parameters of the TCON instruction.

Table 2-1

Parameter	Data type	Description
REQ	BOOLEAN	Starts the job to set up the connection specified in the ID at a rising edge.
ID	CONN_OUC (WORD)	Reference to the assigned connection. Range of values: W#16#0001 to W#16#0FFF
CONNECT	VARIANT	Pointer to the data area that contains the connection parameters.

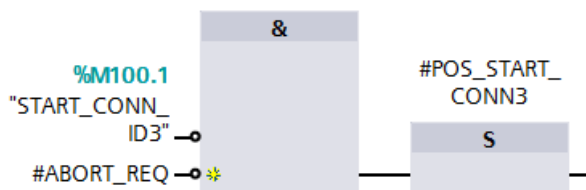Table 2-2 shows the output parameters of the TCON instruction.

Table 2-2

Parameter	Data type	Description
DONE	BOOLEAN	Status parameter with the values below: • 0: Job not yet started or still being executed. • 1: Job executed error-free.
BUSY	BOOLEAN	Status parameter with the values below: • 0: Job not yet started or already terminated. • 1: Job has not yet terminated. A new job cannot be started.
ERROR	BOOLEAN	Status parameter with the values below: • 0: No error • 1: Error occurred.
STATUS	WORD	Status of the instruction

Automatic connection setup

The connection is setup automatically as soon as the S7-1500 CPU starts up. Automatic connection setup is controlled by the static variable POS_START_CONN3 of the BOOL data type and the clock marker 10.7.

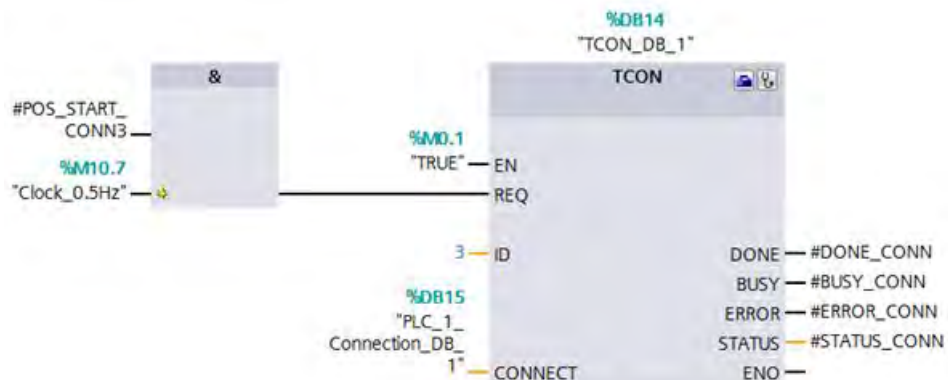The variable POS_START_CONN3 is set to value 1 as soon as the S7-1500 starts up.

Figure 2-3

The REQ input of the TCON is toggled by means of clock marker M10.7 for as long as the variable POS_START_CONN3 has the value 1.

You specify the connection number at the ID input of the TCON. The connection number is a reference to the assigned connection.

At the CONNECT input of the TCON you specify the data area in which the connection parameters are stored. You set the connection parameters and connection of the CONNECT input in the block properties. The connection parameters are stored in DB15 "PLC_1_Connection_DB_1", for example (see section 2.2.2).
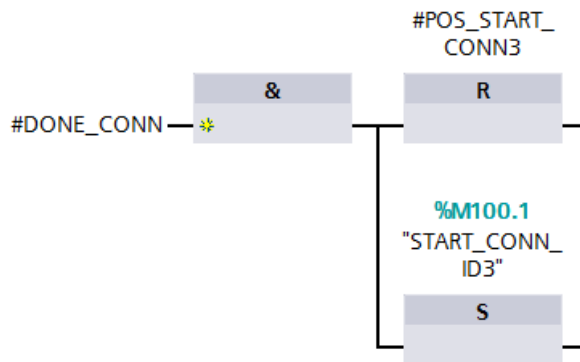
Figure 2-4

When the TCON has been completed successfully with DONE=1 and the connection established,

- the variable POS_START_CONN3 is reset to the value 0 and
- the marker M100.1 is set to the value 1, which indicates that the connection is set up.

Figure 2-5

2.2.2 Set Connection Parameters

You have the following options for setting the connection parameters and storing them in the data block.

- Set connection parameters using the wizard.
- Create connection data DB.

Set connection parameters using the wizard

Proceed as described below to set the connection parameters and store them in the data block.

In the TCON communication instruction you click the "Start Configuration" icon to have the block properties where you can find the connection parameters displayed in the inspector window of the program editor.

Figure 2-6
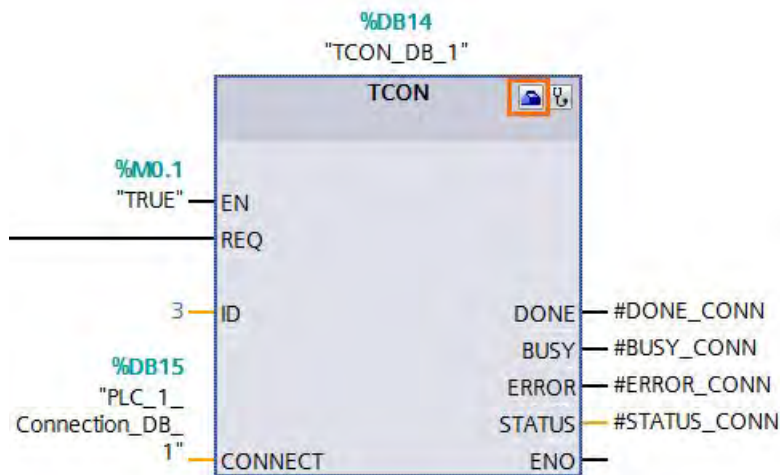
Enter the desired connection parameters in the "Configuration" tab. The "Connection Parameters" group is in the "Configuration" tab in the area navigation. This group includes the connection parameters. Here, with the support of the system, you enter the following parameters for the connections and address details:

- Communication partners

- Interface

- Connection ID

- Connection type

- Local TSAP and partner TSAP for ISO-on-TCP

- Port for TCP and UDP

- Using the "Active connection establishment" option field you specify the active partner of the Open User Communication (only for TCP and ISO-on-TCP). The "Active connection establishment" option field is enabled with the active partner.

In the "Connection Parameters" group you also connect the CONNECT input of the TCON communication instruction.

The name of the data block in which the connection description is stored is displayed in the "Connection Data" drop-down list. Using the drop-down list you can generate a new data block or select an existing data block. This is then automatically filled with the values from the connection parameterization. The name of the selected data block is entered automatically at the CONNECT input of the TCON.
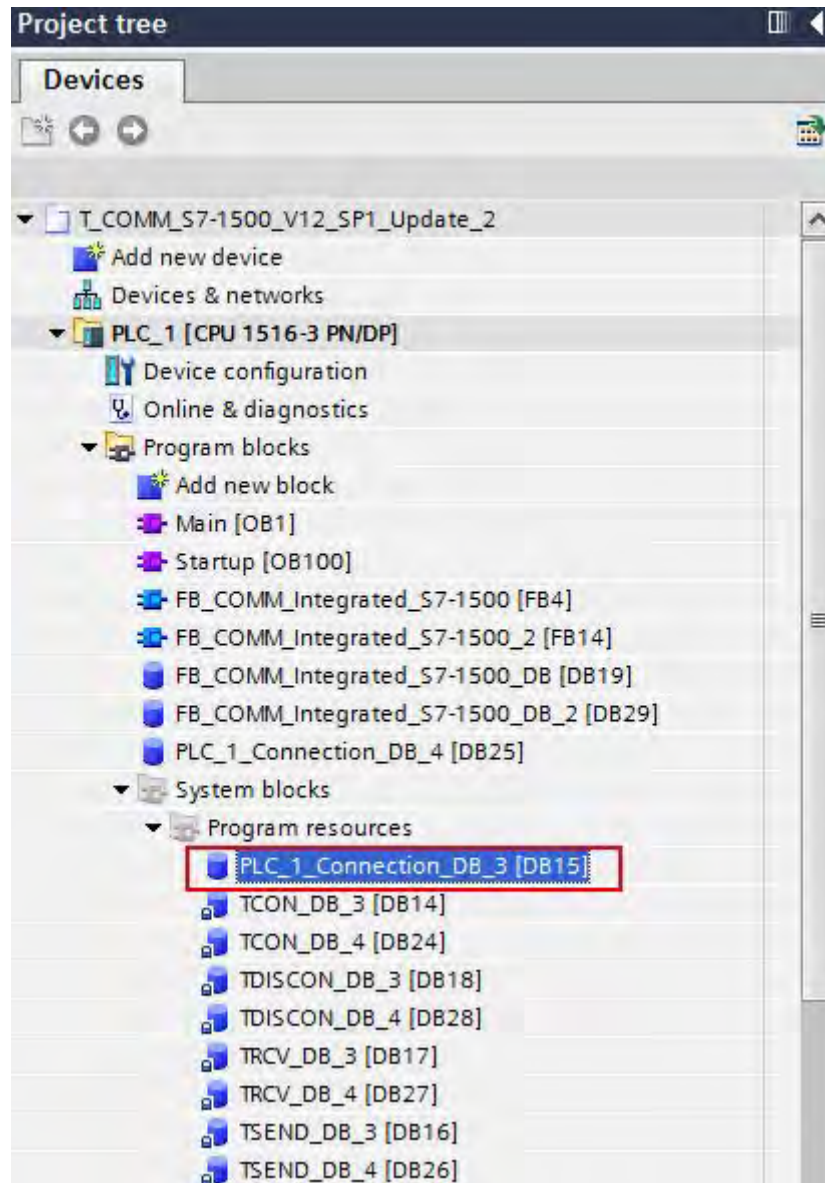
When all the required parameters are present, a check mark is set in front of the "Connection Parameters" group in the area navigation.

Figure 2-7
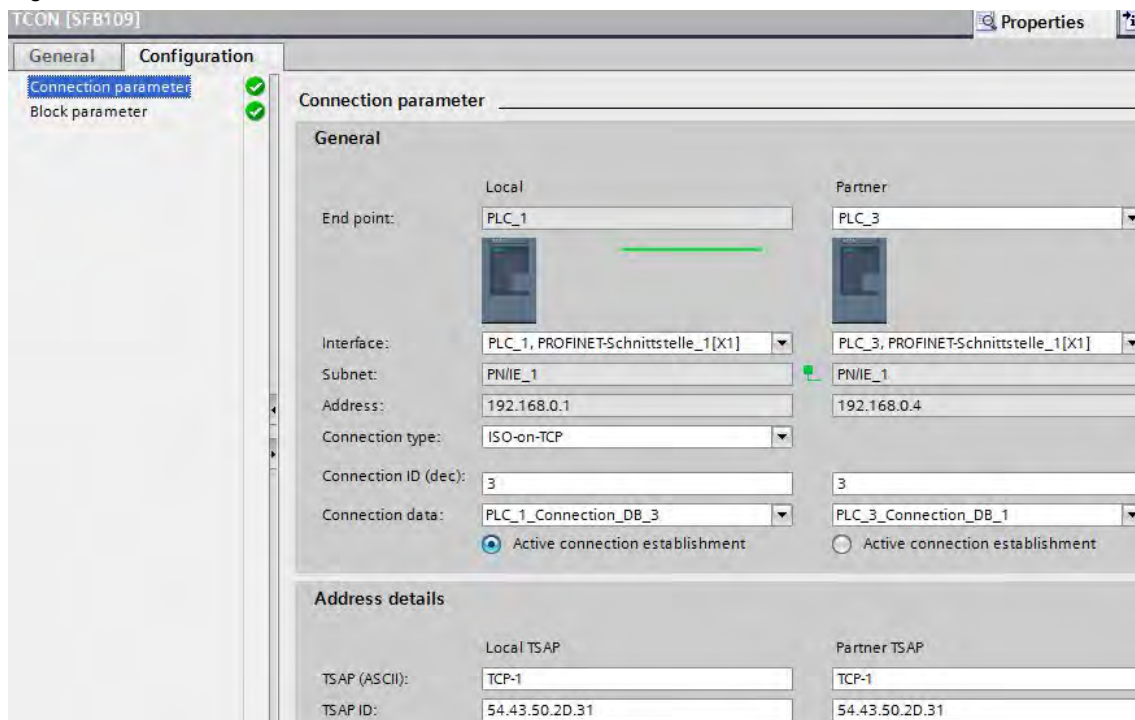
The data block in which the connection description is stored is located in the project navigation in the device folder under "Program blocks > System blocks > Program resources".

Figure 2-8

2.2.3 Send Data

With the TSEND instruction you send data over the established communication connection. TSEND is executed asynchronously.

Input and output parameters of the TSEND instruction

Table 2-3 shows the input parameters of the TSEND instruction.

Table 2-3

Parameter	Data type	Description
REQ	BOOLEAN	Starts the send job at a rising edge.
ID	CONN_OUC (WORD)	Reference to the connection established with TCON. Range of values: W#16#0001 to W#16#0FFF
DATA	VARIANT	Pointer to the send area that contains the address and length of the data to be sent. In this example the address refers to a data block. Alternatively the address can refer to the following: • The process input image • The process output image • A marker

Table 2-4 shows the output parameters of the TSEND instruction.

Table 2-4

Parameter	Data type	Description
DONE	BOOLEAN	Status parameter with the values below: • 0: Job not yet started or still being executed. • 1: Job executed error-free.
BUSY	BOOLEAN	Status parameter with the values below: • 0: Job not yet started or already terminated. • 1: Job has not yet terminated. A new job cannot be started.
ERROR	BOOLEAN	Status parameter with the values below: • 0: No error • 1: Error occurred.
STATUS	WORD	Status of the instruction

Trigger send job

The send job is triggered by a positive edge on the REQ input of the TSEND. The send job trigger is controlled by clock marker M10.7 and the BUSY_SEND static variable. BUSY_SEND is set when the send job is running. Triggering a new send job is not then possible.
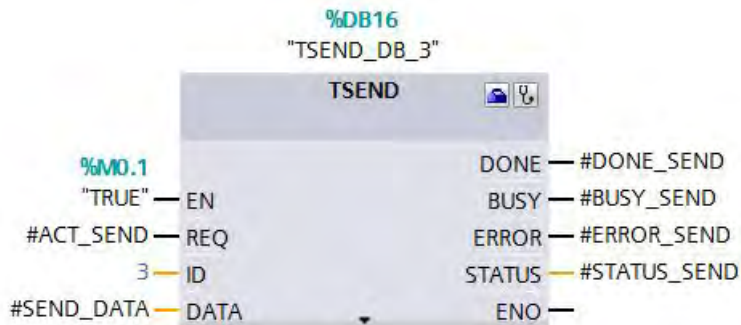
You specify the same connection number at the ID input of the TSEND as at the ID input of the TCON.

The DONE output is for showing that new data has been sent.

Figure 2-9

Figure 2-10

2.2.4 Receive Data

With the TRCV instruction you receive data over the established communication connection. TRCV is executed asynchronously.

Inputs and outputs of the TRCV instruction

Table 2-5 shows the input parameters of the TRCV instruction.

Table 2-5

Parameter	Data type	Description
EN_R	BOOLEAN	Enable receive
ID	CONN_OUC (WORD)	Reference to the connection established with TCON. Range of values: W#16#0001 to W#16#0FFF
DATA	VARIANT	Pointer to the receive area

Table 2-6 shows the output parameters of the TRCV instruction.

Table 2-6

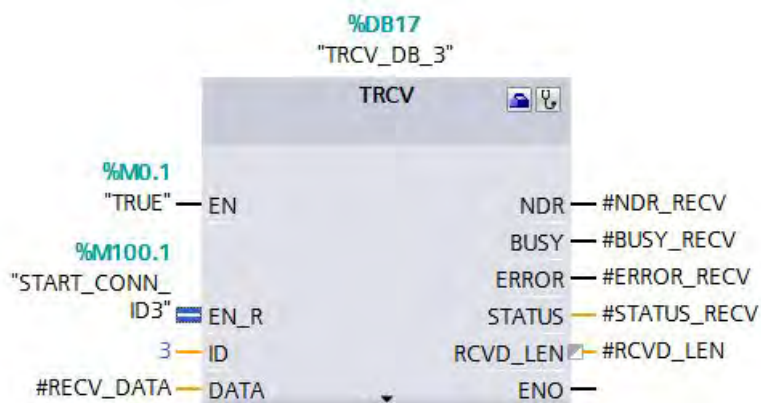| Parameter	Data type	Description
NDR	BOOLEAN	Status parameter with the values below: • 0: Job not yet started or still being executed. • 1: Job executed error-free.
BUSY	BOOLEAN	Status parameter with the values below: • 0: Job not yet started or already terminated. • 1: Job has not yet terminated. A new job cannot be started.
ERROR	BOOLEAN	Status parameter with the values below: • 0: No error • 1: Error occurred.
STATUS	WORD	Status of the instruction
RCVD_LEN	UINT	Volume of data actually received data in bytes.

Receive data

The data can be received as soon as the connection is established.

You specify the same connection number at the ID input of the TRCV as at the ID input of the TCON.

With the DATA input you specify the address and length of the data area where the received data is saved.

The NDR output is for showing that new data has been received.

Figure 2-11

2.2.5 Disconnect Connection

The TDISCON instruction disconnects the communication connection of the CPU to a communication partner.

Input and output parameters of the TDISCON instruction

Table 2-7 shows the input parameters of the TDISCON instruction.

Table 2-7

Parameter	Data type	Description
REQ	BOOLEAN	Starts the job to disconnect the connection specified in the ID at a rising edge.
ID	CONN_OUC (WORD)	Reference to the connection to be disconnected to the remote partner or between user program and communication layer of the operating system. ID must be identical to the associated ID parameter in the local connection description. Range of values: W#16#0001 to W#16#0FFF

Table 2-8 shows the output parameters of the TDISCON instruction.

Table 2-8

Parameter	Data type	Description
DONE	BOOLEAN	Status parameter with the values below: • 0: Job not yet started or not yet executed. • 1: Job executed error-free.
BUSY	BOOLEAN	Status parameter with the values below: • 0: Job not yet started or already terminated. • 1: Job has not yet terminated.
ERROR	BOOLEAN	Status parameter with the values below: • 0: No error • 1: Error occurred.
STATUS	WORD	Status of the instruction

Disconnect connection

At the REQ input of the TDISCON you specify the ABORT_REQ input of FB4.

When you set the ABORT_REQ input of FB4 to the value 1,

• The marker M100.1 and the static variable POS_START_CONN3 are reset to the value 0. As soon as the value of the ABORT_REQ input is reset to the value 0 the connection is established again automatically.

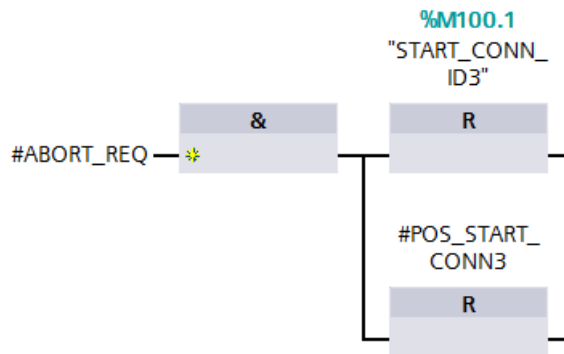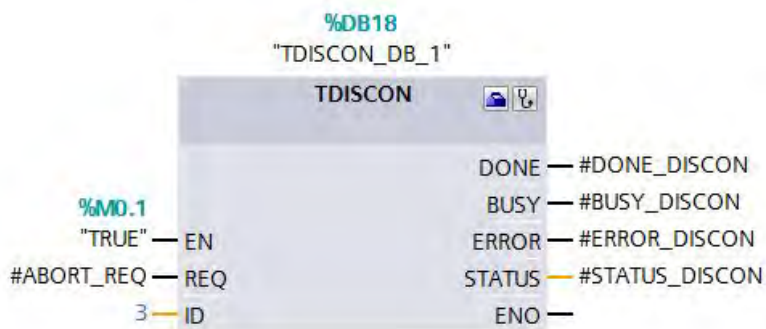• The job to disconnect the connection is started.

Figure 2-12

Figure 2-13

2.3 FB14 "FB_COMM_Integrated_S7-1500_2"

FB14 is called cyclically in OB1. The following communication instructions are called in FB14.

- TCON
- TSEND
- TRECV
- TDISCON

2.3.1 Connection Setup

The TCON instruction is for configuring and setting up a communication connection. Once the connection has been configured and set up, it is maintained and monitored automatically by the CPU. TCON is executed asynchronously.

Input and output parameters of the TCON instruction

Table 2-9 shows the input parameters of the TCON instruction.

Table 2-9

Parameter	Data type	Description
REQ	BOOLEAN	Starts the job to set up the connection specified in the ID at a rising edge.
ID	CONN_OUC (WORD)	Reference to the assigned connection. Range of values: W#16#0001 to W#16#0FFF
CONNECT	VARIANT	Pointer to the data area that contains the connection parameters.

Table 2-10 shows the output parameters of the TCON instruction.

Table 2-10

| Parameter	Data type	Description
DONE	BOOLEAN	Status parameter with the values below: • 0: Job not yet started or still being executed. • 1: Job executed error-free.
BUSY	BOOLEAN	Status parameter with the values below: • 0: Job not yet started or already terminated. • 1: Job has not yet terminated. A new job cannot be started.
ERROR	BOOLEAN	Status parameter with the values below: • 0: No error • 1: Error occurred.
STATUS	WORD	Status of the instruction

Automatic connection setup

The connection is setup automatically as soon as the S7-1500 CPU starts up. Automatic connection setup is controlled by the static variable POS_START_CONN4 of the BOOL data type and the clock marker 10.7.

The variable POS_START_CONN4 is set to value 1 as soon as the S7-1500 starts up.
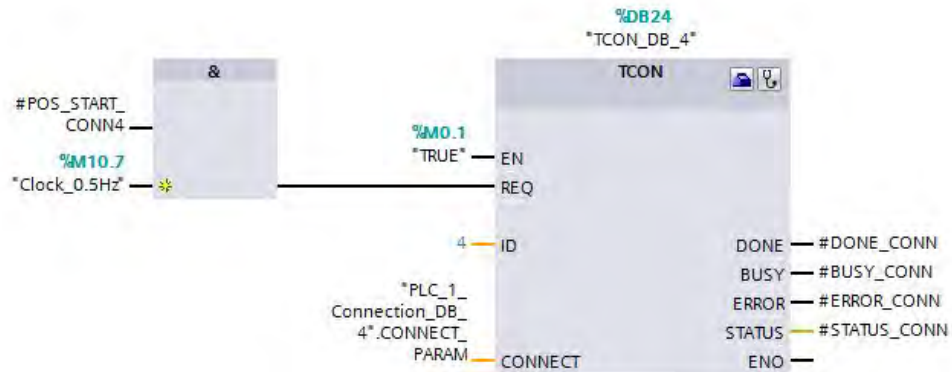
Figure 2-14
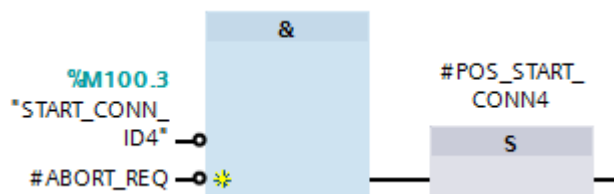
The REQ input of the TCON is toggled by means of clock marker M10.7 for as long as the variable POS_START_CONN4 has the value 1.

You specify the connection number at the ID input of the TCON. The connection number is a reference to the assigned connection.

At the CONNECT input of the TCON you specify the data area in which the connection parameters are stored. The connection data is stored in DB25 "PLC_1_Connection_DB_4"t. 2.3.2 describes how to create a connection DB.
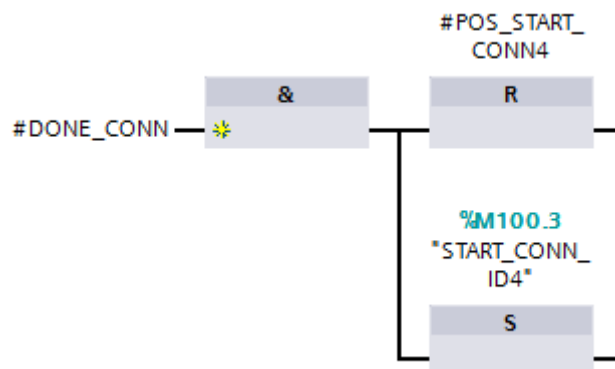
Figure 2-15

When the TCON has been completed successfully with DONE=1 and the connection established,

- the variable POS_START_CONN4 is reset to the value 0 and

- the marker M100.3 is set to the value 1, which indicates that the connection is set up.

Figure 2-16

2.3.2 Set Connection Parameters

You have the following options for setting the connection parameters and storing them in the data block.

- Set connection parameters using the wizard.

- Create connection data DB.

Create connection data DB

Proceed as follows to create a connection data DB for an ISO-on-TCP connection.

You need a data block of the "TCON_Param" type to store the connection parameters for the TCON communication instruction. Below is a description of how to create a data block of the "TCON_Param" type.

In the project navigation you go to the device folder and open the "Program blocks" folder.

Double-click the "Add new block" command. The "Add new block" dialog opens.

Figure 2-17
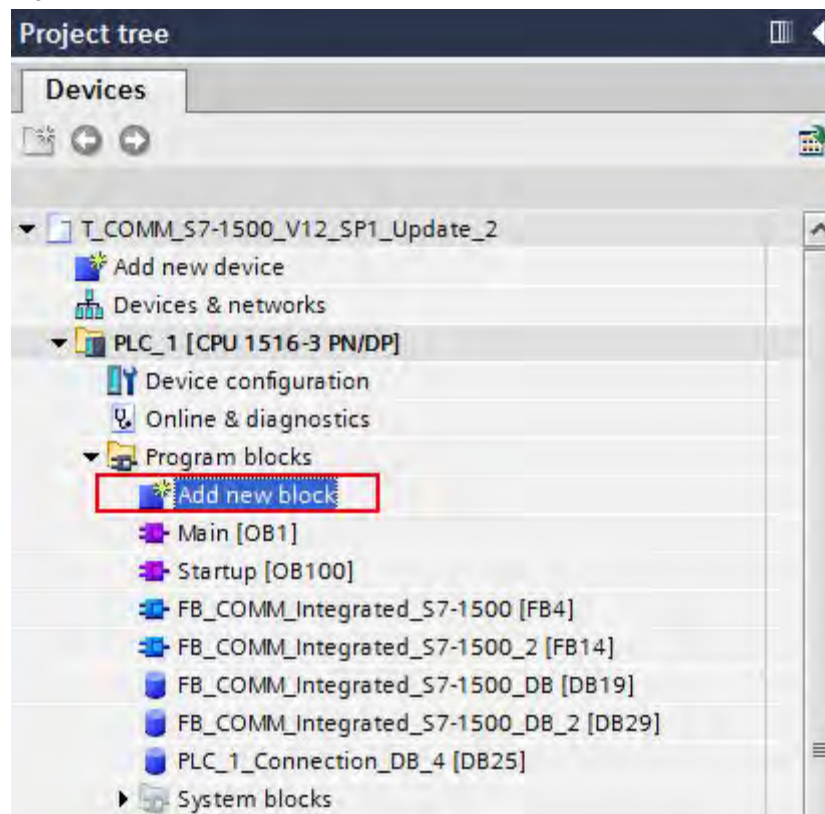
Click the "DB Data block" button.

Assign the "TCON_Param" type to the data block.

Name the new data block "PLC_1_Connection_DB_4", for example.

Let the number of the DB be generated automatically or designate a special number manually, 25, for example.
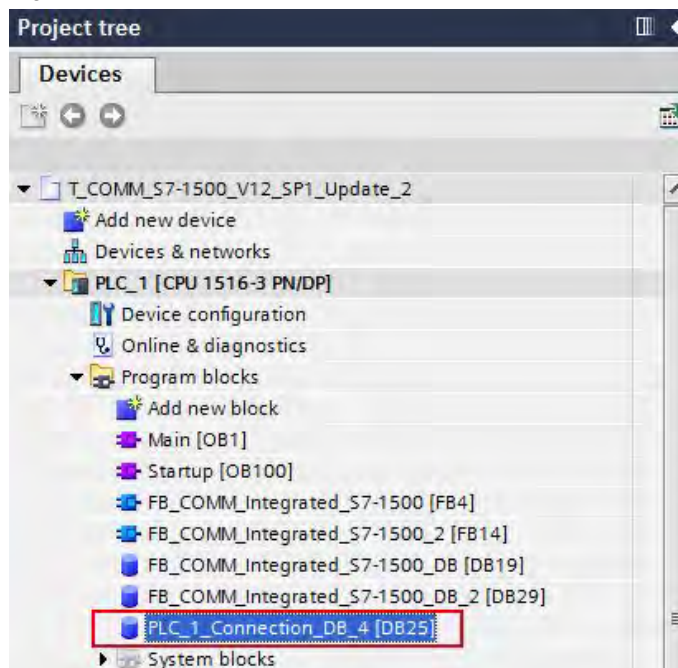
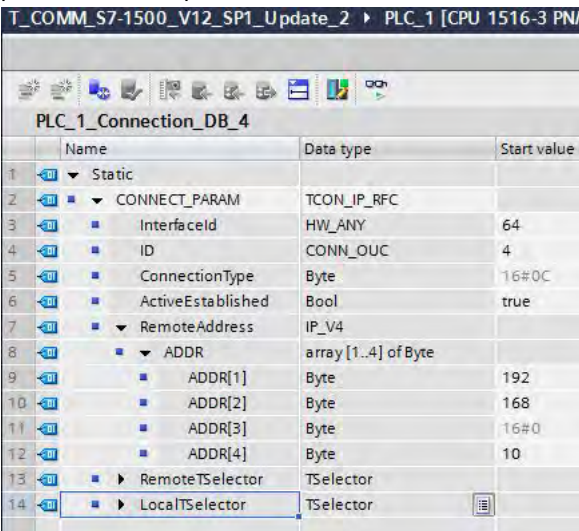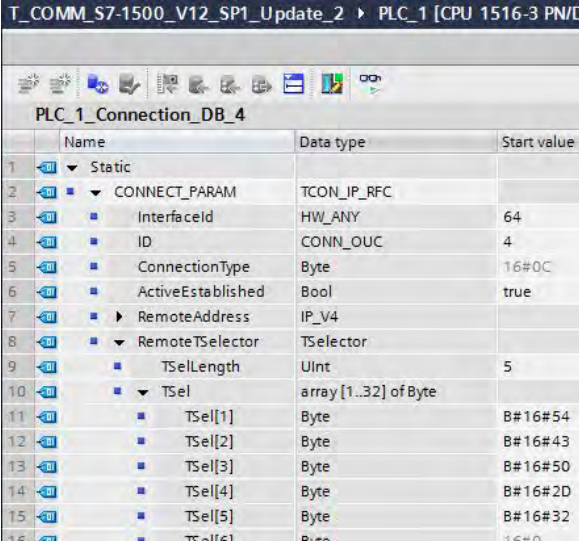Confirm your entries with "OK".

Figure 2-18
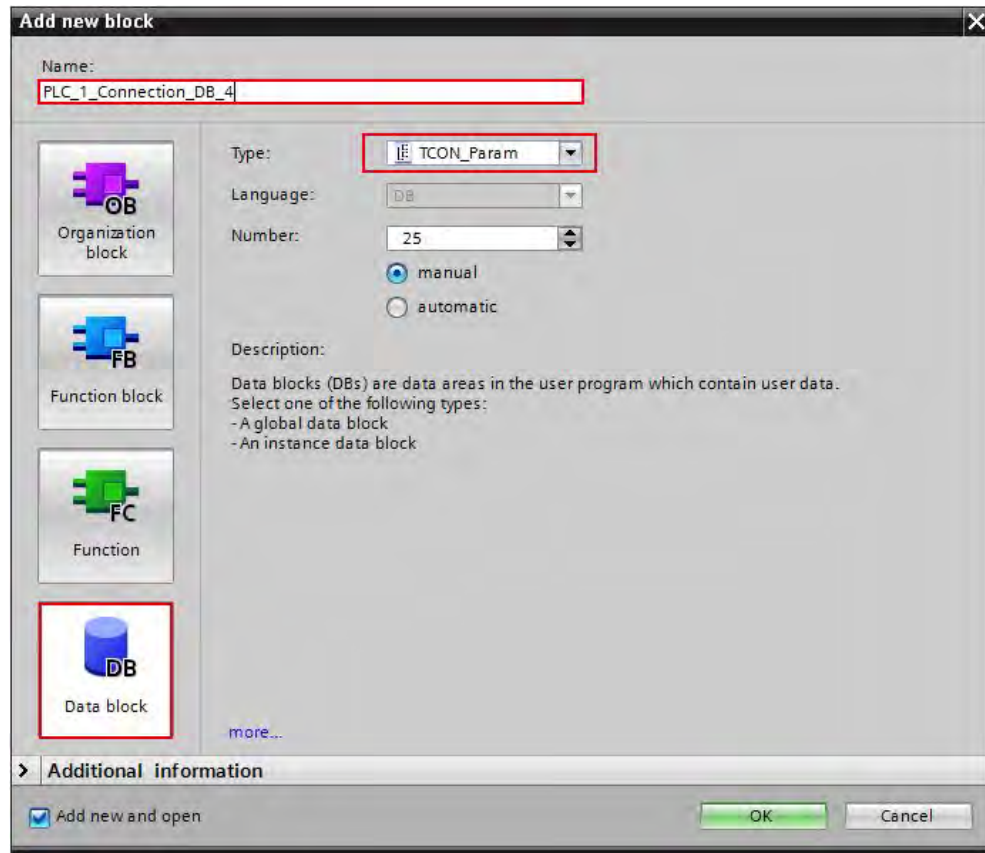
In the project tree, double-click the newly created connection data DB. The data block opens in the working area.
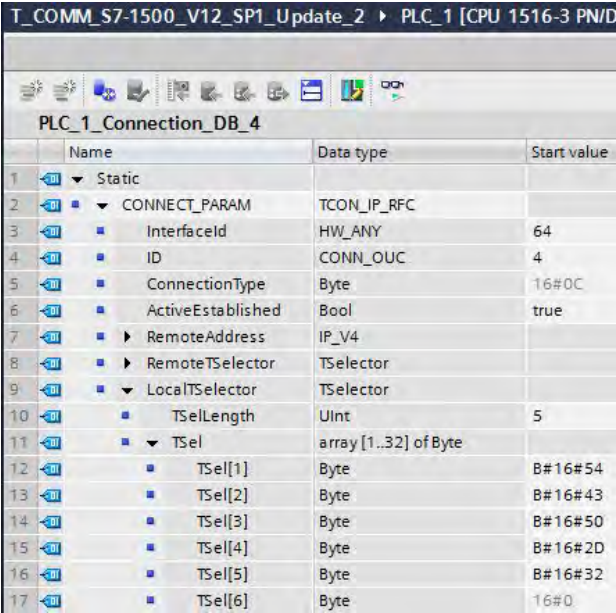
Figure 2-19

The connection data for an ISO-on-TCP connection are stored in the "TCON_IP_RFC" data structure. Enter the corresponding values for the parameters of the "TCON_IP_RFC" data structure.

Table 2-11

No.	Description
1.	For the "ID" parameter you enter the connection number which you specified at the "ID" input of the TCON communication instruction. The "ConnectionType" parameter is preset with the start value of 0C (hex) = 12 (dec). This corresponds to an ISO-on-TCP connection. Since the S7-1500 CPU establishes the connection actively, you set the "ActiveEstablished" parameter to "true". In the "RemoteAddress" data structure you enter the IP address of the communication partner, for example: 192.168.0.10.
2.	In the "RemoteTSelector" data structure you enter the partner TSAP and the length of the partner TSAP. The "TSelLength" parameter in the "RemoteTSelector" data structure defines the length of the partner TSAP. The "TSel" parameter in the "RemoteTSelector" data structure defines the partner TSAP.

No.	Description
3.	In the "LocalTSelector" data structure you enter the local TSAP and the length of the local TSAP. The "TSelLength" parameter in the "LocalTSelector" data structure defines the length of the TSAP. The "TSel" parameter in the "LocalTSelector" data structure defines the local TSAP. T_COMM_S7-1500_V12_SP1_Update_2 ▸ PLC_1 [CPU 1516-3 PN/D PLC_1_Connection_DB_4 |		Name	Data type	Start value
---	---	---	---	---
1		▼ Static		
2	■	▼ CONNECT_PARAM	TCON_IP_RFC	
3	■	Interfaceld	HW_ANY	64
4	■	ID	CONN_OUC	4
5	■	ConnectionType	Byte	16#0C
6	■	ActiveEstablished	Bool	true
7	■	▶ RemoteAddress	IP_V4	
8	■	▶ RemoteTSelector	TSelector	
9	■	▼ LocalTSelector	TSelector	
10	■	TSelLength	UInt	5
11		▼ TSel	array [1..32] of Byte	
12	■	TSel[1]	Byte	B#16#54
13	■	TSel[2]	Byte	B#16#43
14	■	TSel[3]	Byte	B#16#50
15	■	TSel[4]	Byte	B#16#2D
16	■	TSel[5]	Byte	B#16#32
17	■	TSel[6]	Byte	16#0	

NOTE	At the CONNECT parameter you specify the symbolic name of the "TCON_IP_RFC" data structure that contains the connection data of the ISO-on-TCP connection.

2.3.3 Send Data

With the TSEND instruction you send data over the established communication connection. TSEND is executed asynchronously.

Input and output parameters of the TSEND instruction

Table 2-12 shows the input parameters of the TSEND instruction.

Table 2-12

Parameter	Data type	Description
REQ	BOOLEAN	Starts the send job at a rising edge.
ID	CONN_OUC (WORD)	Reference to the connection established with TCON. Range of values: W#16#0001 to W#16#0FFF
DATA	VARIANT	Pointer to the send area that contains the address and length of the data to be sent. In this example the address refers to a data block. Alternatively the address can refer to the following: • The process input image • The process output image • A marker

Table 2-13 shows the output parameters of the TSEND instruction.

Table 2-13

Parameter	Data type	Description
DONE	BOOLEAN	Status parameter with the values below: • 0: Job not yet started or still being executed. • 1: Job executed error-free.
BUSY	BOOLEAN	Status parameter with the values below: • 0: Job not yet started or already terminated. • 1: Job has not yet terminated. A new job cannot be started.
ERROR	BOOLEAN	Status parameter with the values below: • 0: No error • 1: Error occurred.
STATUS	WORD	Status of the instruction

Trigger send job

The send job is triggered by a positive edge on the REQ input of the TSEND. The send job trigger is controlled by clock marker M10.7 and the BUSY_SEND static variable. BUSY_SEND is set when the send job is running. Triggering a new send job is not then possible.

You specify the same connection number at the ID input of the TSEND as at the ID input of the TCON.

The DONE output is for showing that new data has been sent.

Figure 2-20

Figure 2-21
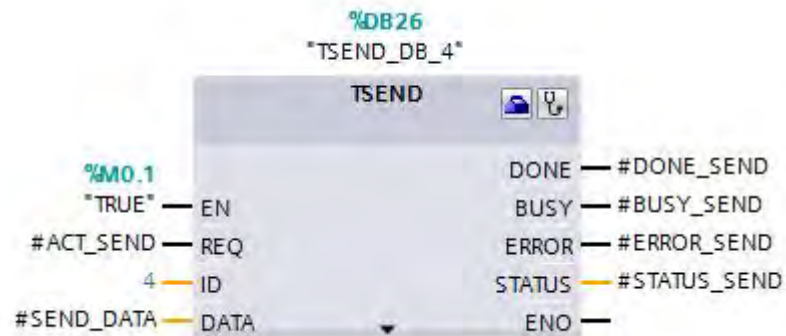
2.3.4 Receive Data

With the TRCV instruction you receive data over the established communication connection. TRCV is executed asynchronously.

Inputs and outputs of the TRCV instruction

Table 2-14 shows the input parameters of the TRCV instruction.

Table 2-14

Parameter	Data type	Description
EN_R	BOOLEAN	Enable receive
ID	CONN_OUC (WORD)	Reference to the connection established with TCON. Range of values: W#16#0001 to W#16#0FFF
DATA	VARIANT	Pointer to the receive area

Table 2-15 shows the output parameters of the TRCV instruction.

Table 2-15

Parameter	Data type	Description
NDR	BOOLEAN	Status parameter with the values below: • 0: Job not yet started or still being executed. • 1: Job executed error-free.
BUSY	BOOLEAN	Status parameter with the values below: • 0: Job not yet started or already terminated. • 1: Job has not yet terminated. A new job cannot be started.
ERROR	BOOLEAN	Status parameter with the values below: • 0: No error • 1: Error occurred.
STATUS	WORD	Status of the instruction
RCVD_LEN	UINT	Volume of data actually received data in bytes.

Receive data

The data can be received as soon as the connection is established.

You specify the same connection number at the ID input of the TRCV as at the ID input of the TCON.

With the DATA input you specify the address and length of the data area where the received data is saved.

The NDR output is for showing that new data has been received.

Figure 2-22

2.3.5 Disconnect Connection

The TDISCON instruction disconnects the communication connection of the CPU to a communication partner.

Input and output parameters of the TDISCON instruction

Table 2-16 shows the input parameters of the TDISCON instruction.

Table 2-16

Parameter	Data type	Description
REQ	BOOLEAN	Starts the job to disconnect the connection specified in the ID at a rising edge.
ID	CONN_OUC (WORD)	Reference to the connection to be disconnected to the remote partner or between user program and communication layer of the operating system. ID must be identical to the associated ID parameter in the local connection description. Range of values: W#16#0001 to W#16#0FFF

Table 2-17 shows the output parameters of the TDISCON instruction.

Table 2-17

Parameter	Data type	Description
DONE	BOOLEAN	Status parameter with the values below: • 0: Job not yet started or not yet executed. • 1: Job executed error-free.
BUSY	BOOLEAN	Status parameter with the values below: • 0: Job not yet started or already terminated. • 1: Job has not yet terminated.
ERROR	BOOLEAN	Status parameter with the values below: • 0: No error • 1: Error occurred.
STATUS	WORD	Status of the instruction

Disconnect connection

At the REQ input of the TDISCON you specify the ABORT_REQ input of FB14.

When you set the ABORT_REQ input of FB14 to the value 1,

- the marker M100.3 and the static variable POS_START_CONN4 are reset to the value 0. As soon as the value of the ABORT_REQ input is reset to the value 0, the connection is established again automatically.

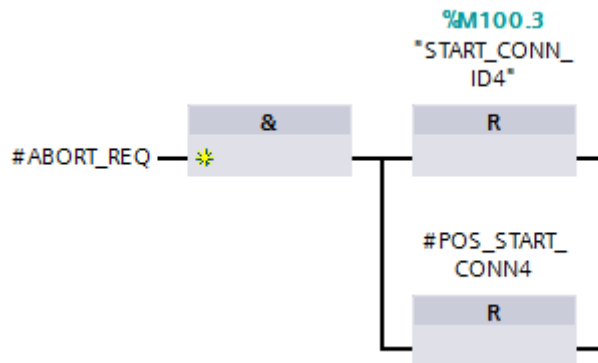- The job to disconnect the connection is started.

Figure 2-23

Figure 2-24

3 Programming Establishment of the Connection and Data Exchange in the Passive S7-1500 CPU

Marker byte 10 is configured as clock marker in the passive S7-1500. The send job is triggered by this clock marker.

3.1 OB1

OB1 is called cyclically. The FB2 "FB_COMM_Integrated_S7-1500" is called in OB1 with the instance data block DB4 "COMM_Integrated_S7-1500_DB".

You can disconnect the connection manually through the ABORT_REQ input. Set the ABORT_REQ input to the value 1 to disconnect the connection. As soon as you set the ABORT_REQ input back to the value 0, the connection is established again automatically.

Figure 3-1
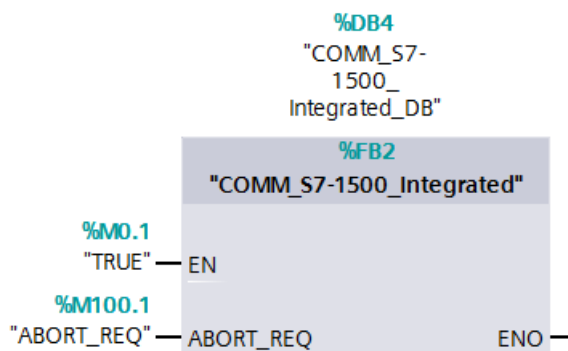
3.2 FB2 "COMM_Integrated_S7-1500"

FB2 is called cyclically in OB1. The following communication instructions are called in FB2.

- TCON
- TSEND
- TRECV
- TDISCON

3.2.1 Connection Setup

The TCON instruction is for configuring and setting up a communication connection. Once the connection has been configured and set up, it is maintained and monitored automatically by the CPU. TCON is executed asynchronously.

Input and output parameters of the TCON instruction

Table 3-1 shows the input parameters of the TCON instruction.

Table 3-1

Parameter	Data type	Description
REQ	BOOLEAN	Starts the job to set up the connection specified in the ID at a rising edge.
ID	CONN_OUC (WORD)	Reference to the assigned connection. Range of values: W#16#0001 to W#16#0FFF
CONNECT	VARIANT	

Table 3-2 shows the output parameters of the TCON instruction.

Table 3-2

Parameter	Data type	Description
DONE	BOOLEAN	Status parameter with the values below: • 0: Job not yet started or still being executed. • 1: Job executed error-free.
BUSY	BOOLEAN	Status parameter with the values below: • 0: Job not yet started or already terminated. • 1: Job has not yet terminated. A new job cannot be started.
ERROR	BOOLEAN	Status parameter with the values below: • 0: No error • 1: Error occurred.
STATUS	WORD	Status of the instruction

Automatic connection setup

The connection is setup automatically as soon as the S7-1500 CPU starts up. Automatic connection setup is controlled by the static variable POS_START_CONN3 of the BOOL data type.

The variable POS_START_CONN3 is set to value 1 as soon as the S7-1500 starts up. This generates a positive edge at the REQ input of the TCON. This starts the connection setup when the active partner CPU sends a connection setup request.
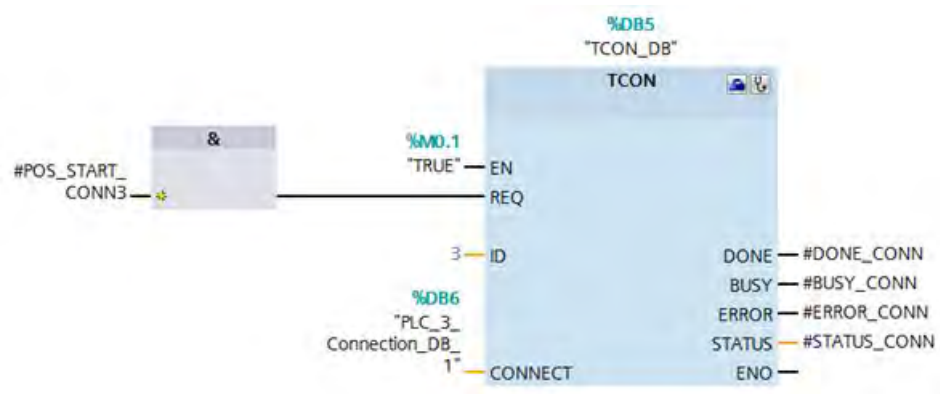
Figure 3-2
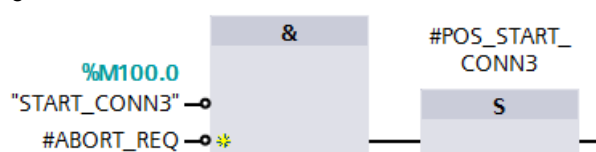
You specify the connection number at the ID input of the TCON. The connection number is a reference to the assigned connection.

At the CONNECT input of the TCON you specify the data area in which the connection parameters are stored. You set the connection parameters and connection of the CONNECT input in the block properties. The connection parameters are stored in DB6 "PLC_3_Connection_DB_1", for example (see section 3.2.2).

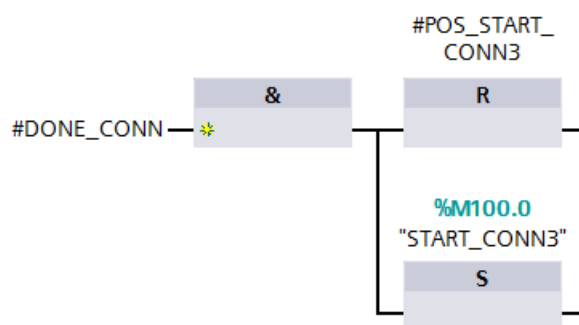Alternatively users can create their own connection data DB (see section 3.2.2).

Figure 3-3

When the TCON has been completed successfully with DONE=1 and the connection established,

- the variable POS_START_CONN3 is reset to the value 0 and

- the marker M100.0 is set to the value 1, which indicates that the connection is set up.

Figure 3-4

3.2.2 Parameterize Connection

You have the following options for setting the connection parameters and storing them in the data block.

- Set connection parameters using the wizard.

- Create connection data DB

Set connection parameters using the wizard.

Proceed as described below to set the connection parameters and store them in the data block.

In the TCON communication instruction you click the "Start Configuration" icon to have the block properties where you can find the connection parameters displayed in the inspector window of the program editor.

Figure 3-5
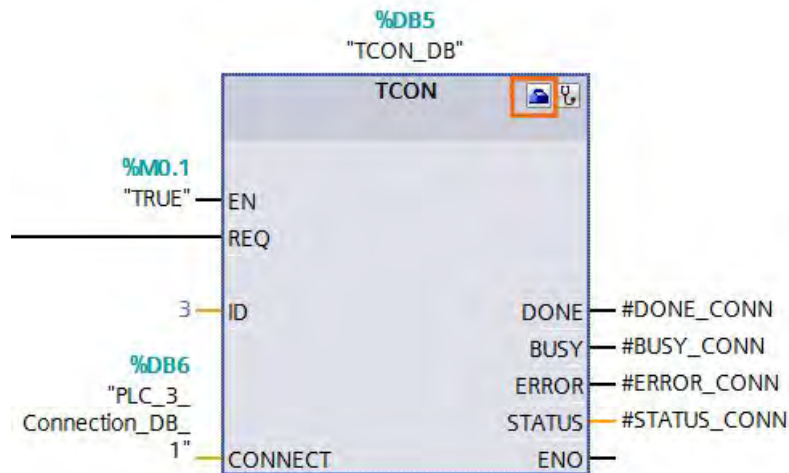
Enter the desired connection parameters in the "Configuration" tab. The "Connection Parameters" group is in the "Configuration" tab in the area navigation. This group includes the connection parameters. Here, with the support of the system, you enter the following parameters for the connections and address details:

- Communication partners

- Interface

- Connection ID

- Connection type

- Local TSAP and partner TSAP for ISO-on-TCP

- Port for TCP and UDP

- Using the "Active connection establishment" option field you specify the active partner of the Open User Communication (only for TCP and ISO-on-TCP). The "Active connection establishment" option field is disabled with the passive partner.

In the "Connection Parameters" group you also connect the CONNECT input of the TCON communication instruction.
The name of the data block in which the connection description is stored is displayed in the "Connection Data" drop-down list. Using the drop-down list you can generate a new data block or select an existing data block. This is then automatically filled with the values from the connection parameterization. The name of the selected data block is entered automatically at the CONNECT input of the TCON.
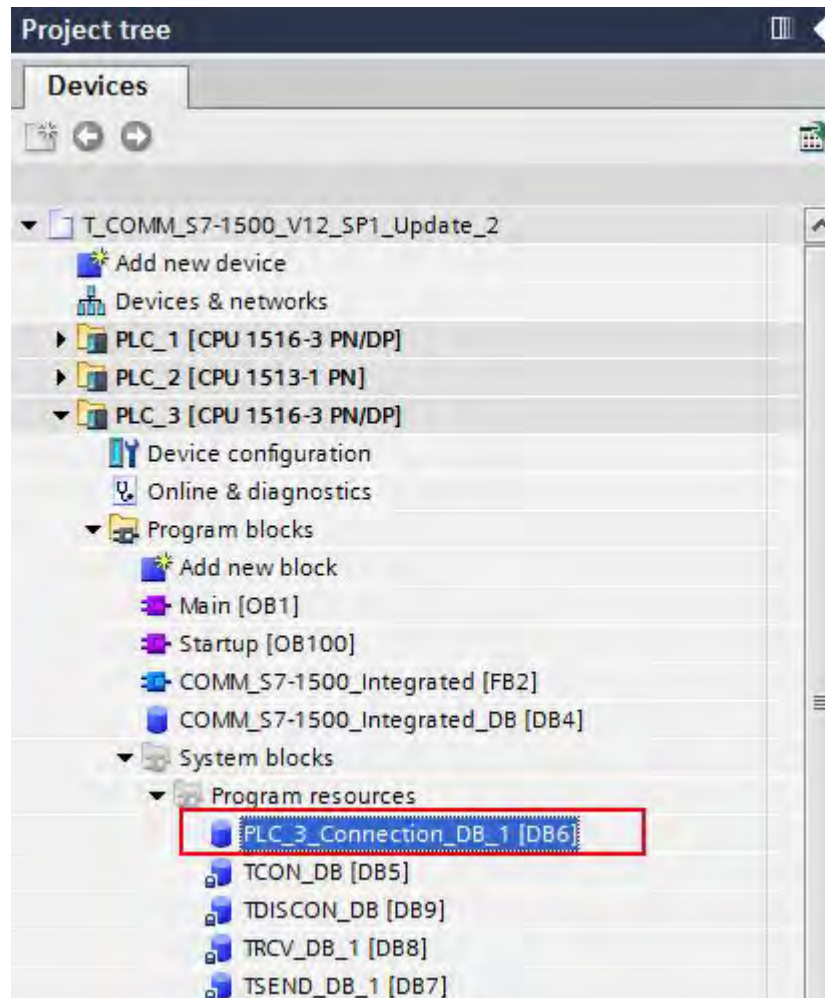
When all the required parameters are present, a check mark is set in front of the "Connection Parameters" group in the area navigation.

Figure 3-6
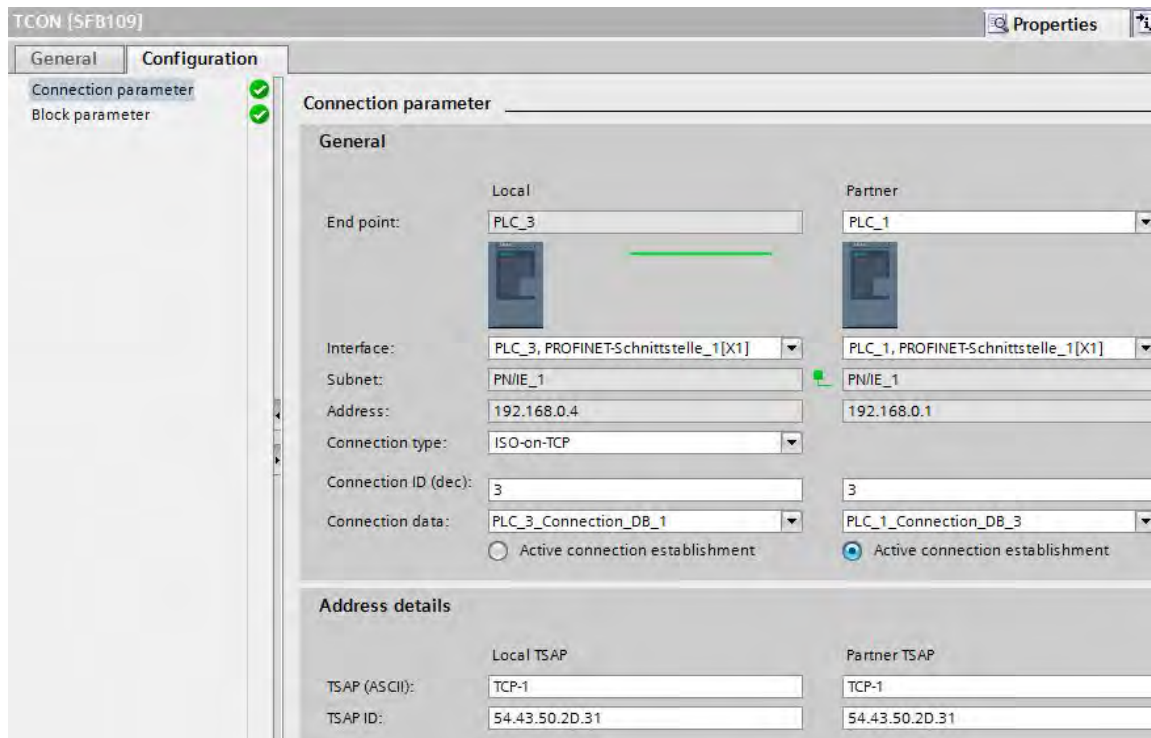
The data block in which the connection description is stored is located in the project navigation in the device folder under "Program blocks > System blocks > Program resources".

Figure 3-7

Create connection data DB

Proceed as follows to create a connection data DB for an ISO-on-TCP connection.

You need a data block of the "TCON_Param" type to store the connection parameters for the TCON communication instruction. Below is a description of how to create a data block of the "TCON_Param" type.

In the project navigation you got to the device folder and open the "Program blocks" folder.

Double-click the "Add new block" command. The "Add new block" dialog opens.

Figure 3-8
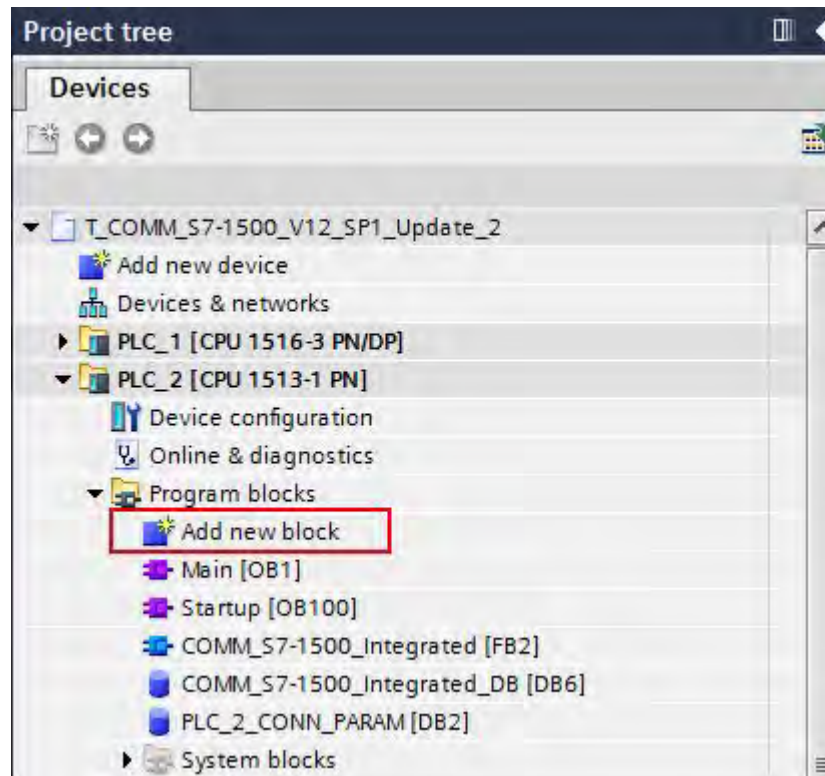
Click the "DB Data block" button.
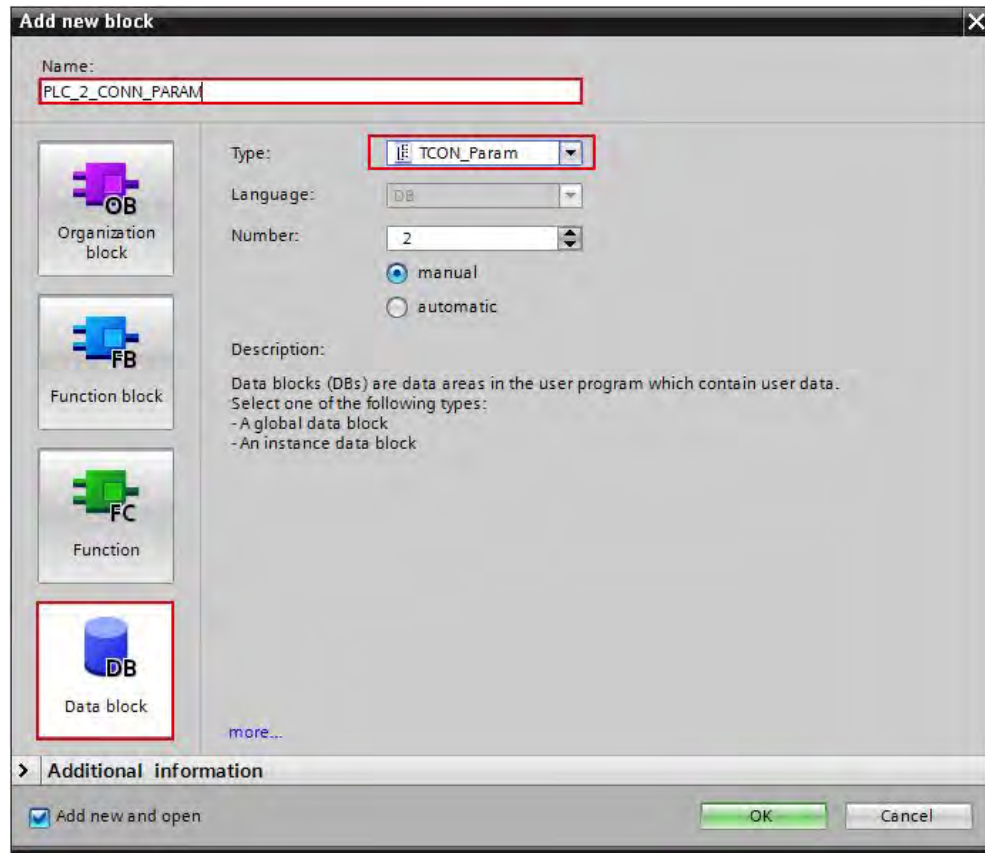
Assign the "TCON_Param" type to the data block.

Name the new data block "PLC_2_CONN_PARAM", for example.

Let the number of the DB be generated automatically or designate a special number manually, 2, for example.
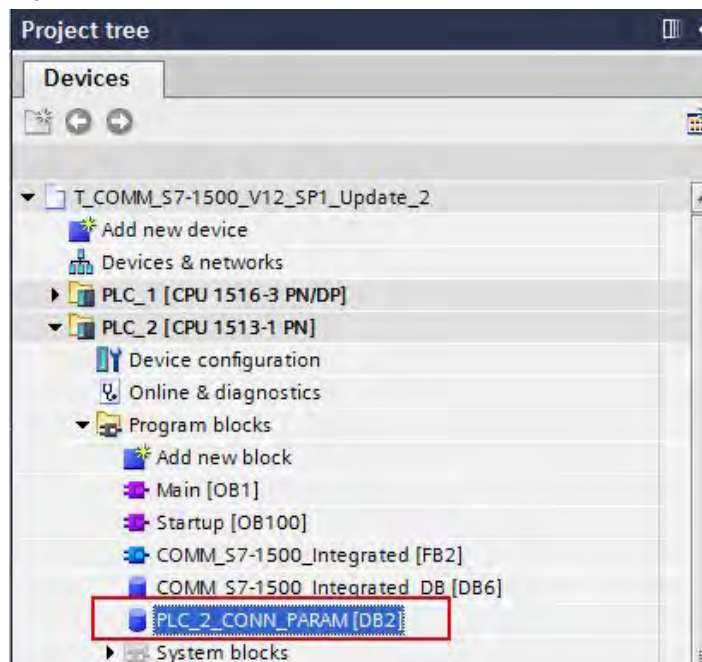
Confirm your entries with "OK".
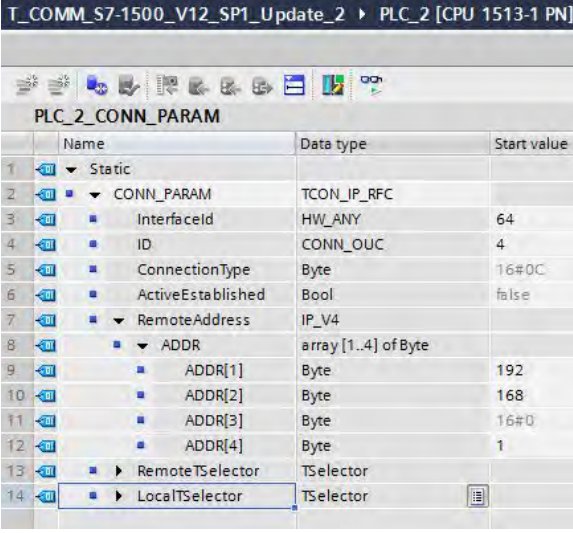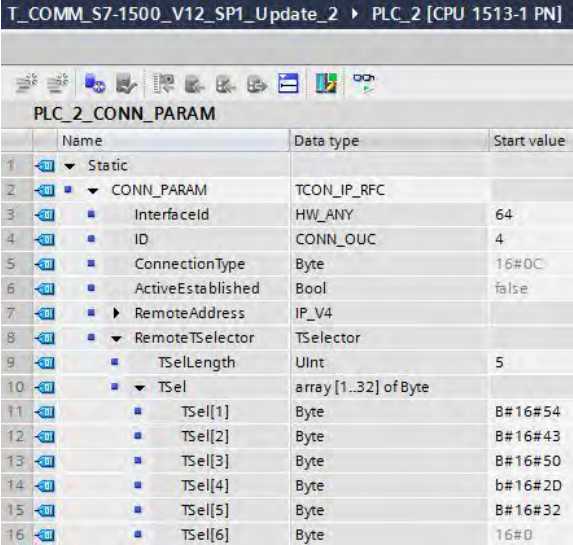
Figure 3-9

In the project tree, double-click the newly created connection data DB. The data block opens in the working area.
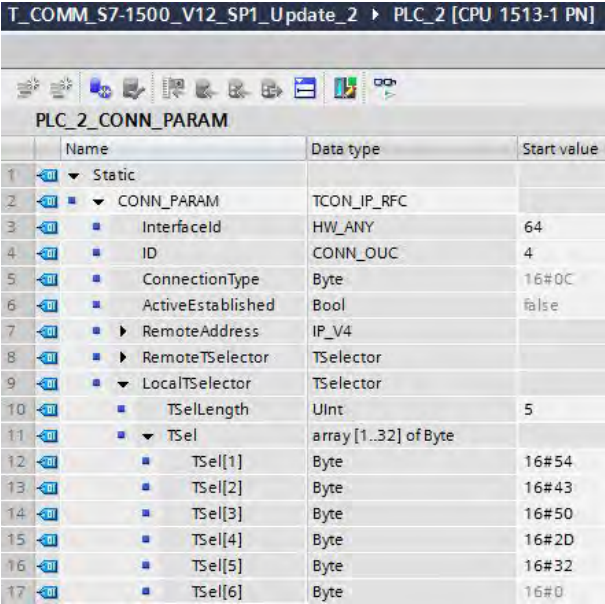
Figure 3-10

The connection data for an ISO-on-TCP connection are stored in the "TCON_IP_RFC" data structure. Enter the corresponding values for the parameters of the "TCON_IP_RFC" data structure.

Table 3-3

No.	Description
1.	For the "ID" parameter you enter the connection number which you specified at the "ID" input of the TCON communication instruction. The "ConnectionType" parameter is preset with the start value of 0C (hex) = 12 (dec). This corresponds to an ISO-on-TCP connection. Since the S7-1500 CPU is passive in the establishment of the connection, you set the "ActiveEstablished" parameter to "false". In the "RemoteAddress" data structure you enter the IP address of the communication partner, for example: 192.168.0.1.
2.	In the "RemoteTSelector" data structure you enter the partner TSAP and the length of the partner TSAP. The "TSelLength" parameter in the "RemoteTSelector" data structure defines the length of the partner TSAP. The "TSel" parameter in the "RemoteTSelector" data structure defines the partner TSAP.

No.	Description
3.	In the "LocalTSelector" data structure you enter the local TSAP and the length of the local TSAP. The "TSelLength" parameter in the "LocalTSelector" data structure defines the length of the TSAP. The "TSel" parameter in the "LocalTSelector" data structure defines the local TSAP.

NOTE   At the CONNECT parameter you specify the symbolic name of the "TCON_IP_RFC" data structure that contains the connection data of the ISO-on-TCP connection.

3.2.3   Send Data

With the TSEND instruction you send data over the established communication connection. TSEND is executed asynchronously.

Input and output parameters of the TSEND instruction

Table 3-4 shows the input parameters of the TSEND instruction.

Table 3-4

Parameter	Data type	Description
REQ	BOOLEAN	Starts the send job at a rising edge.
ID	CONN_OUC (WORD)	Reference to the connection established with TCON. Range of values: W#16#0001 to W#16#0FFF

Parameter	Data type	Description
DATA	VARIANT	Pointer to the send area that contains the address and length of the data to be sent. In this example the address refers to a data block. Alternatively the address can refer to the following: • The process input image • The process output image • A marker

Table 3-5 shows the output parameters of the TSEND instruction.

Table 3-5

Parameter	Data type	Description
DONE	BOOLEAN	Status parameter with the values below: • 0: Job not yet started or still being executed. • 1: Job executed error-free.
BUSY	BOOLEAN	Status parameter with the values below: • 0: Job not yet started or already terminated. • 1: Job has not yet terminated. A new job cannot be started.
ERROR	BOOLEAN	Status parameter with the values below: • 0: No error • 1: Error occurred.
STATUS	WORD	Status of the instruction

Trigger send job

As long as the connection is established the send job is triggered by a positive edge on the REQ input of the TSEND. The send job trigger is controlled by clock marker M10.7 and the BUSY_SEND static variable. BUSY_SEND is set when the send job is running. Triggering a new send job is not then possible.

You specify the same connection number at the ID input of the TSEND as at the ID input of the TCON.

The DONE output is for showing that new data has been sent.

Figure 3-11

Figure 3-12

3.2.4 Receive Data

With the TRCV instruction you receive data over the established communication connection. TRCV is executed asynchronously.

Inputs and outputs of the TRCV instruction

Table 3-6 shows the input parameters of the TRCV instruction.

Table 3-6

Parameter	Data type	Description
EN_R	BOOLEAN	Enable receive
ID	CONN_OUC (WORD)	Reference to the connection established with TCON. Range of values: W#16#0001 to W#16#0FFF
DATA	VARIANT	Pointer to the receive area

Table 3-7 shows the output parameters of the TRCV instruction.

Table 3-7

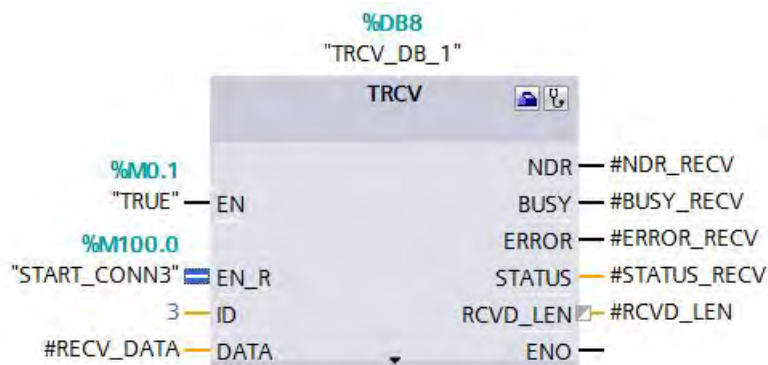| Parameter	Data type	Description
NDR	BOOLEAN	Status parameter with the values below: • 0: Job not yet started or still being executed. • 1: Job executed error-free.
BUSY	BOOLEAN	Status parameter with the values below: • 0: Job not yet started or already terminated. • 1: Job has not yet terminated. A new job cannot be started.
ERROR	BOOLEAN	Status parameter with the values below: • 0: No error • 1: Error occurred.
STATUS	WORD	Status of the instruction
RCVD_LEN	UINT	Volume of data actually received data in bytes.

Receive data

The data can be received as soon as the connection is established.

You specify the same connection number at the ID input of the TRCV as at the ID input of the TCON.

With the DATA input you specify the address and length of the data area where the received data is saved.

The NDR output is for showing that new data has been received.

Figure 3-13

3.2.5 Disconnect Connection

The TDISCON instruction disconnects the communication connection of the CPU to a communication partner.

Input and output parameters of the TDISCON instruction

Table 3-8 shows the input parameters of the TDISCON instruction.

Table 3-8

Parameter	Data type	Description
REQ	BOOLEAN	Starts the job to disconnect the connection specified in the ID at a rising edge.
ID	CONN_OUC (WORD)	Reference to the connection to be disconnected to the remote partner or between user program and communication layer of the operating system. ID must be identical to the associated ID parameter in the local connection description. Range of values: W#16#0001 to W#16#0FFF

Table 3-9 shows the output parameters of the TDISCON instruction.

Table 3-9

Parameter	Data type	Description
DONE	BOOLEAN	Status parameter with the values below: • 0: Job not yet started or not yet executed. • 1: Job executed error-free.
BUSY	BBOL	Status parameter with the values below: • 0: Job not yet started or already terminated. • 1: Job has not yet terminated.
ERROR	BOOLEAN	Status parameter with the values below: • 0: No error • 1: Error occurred.
STATUS	WORD	Status of the instruction

Disconnect connection

At the REQ input of the TDISCON you specify the ABORT_REQ input of FB2.

When you set the ABORT_REQ input of FB2 to the value 1,

• The marker M100.1 and the static variable POS_START_CONN3 are reset to the value 0. As soon as the value of the ABORT_REQ input is reset to the value 0, the connection is established again automatically.

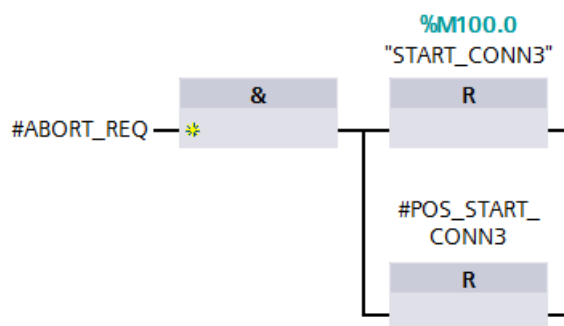• The job to disconnect the connection is started.

Figure 3-14

Figure 3-15