Communication between SIMATIC S5 and SIMATIC S7 over PROFIBUS

FDL Protocol with Free Layer 2 Access

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Question

How do you exchange data between SIMATIC S5 and SIMATIC S7 over PROFIBUS using the SDA service (Send Data with Acknowledge) and the free layer 2 access of the FDL protocol?

Answer

The instructions and notes listed in this document provide a detailed answer to this question.

Table of Contents

1 Introduction

This document provides information about examples of PROFIBUS communication between S7 stations and SIMATIC S5 stations using the SDA (Send Data with Acknowledge) service and the free layer 2 based on the FDL protocol.

Chapter 2 gives an overview of the sample program.

Chapter 4 gives information about the function mechanisms of the sample program.

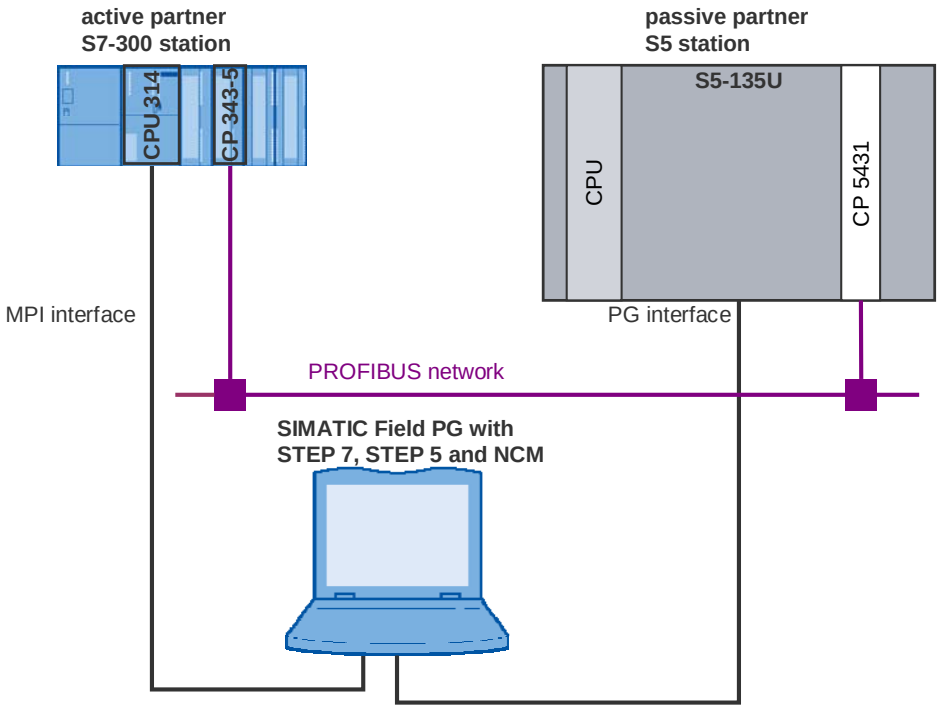
This document contains

- An overview of the plant configuration.
- An introduction to the blocks required and their communication structure.
- Details of the user programs of the S7-300 station and the S5 station.
- Information on how to use the sample programs.
- Other Notes, Tips and Tricks, etc.

2 Overview of the Sample Program

Plant Configuration

Figure 2-1



Checking the function of the sample program

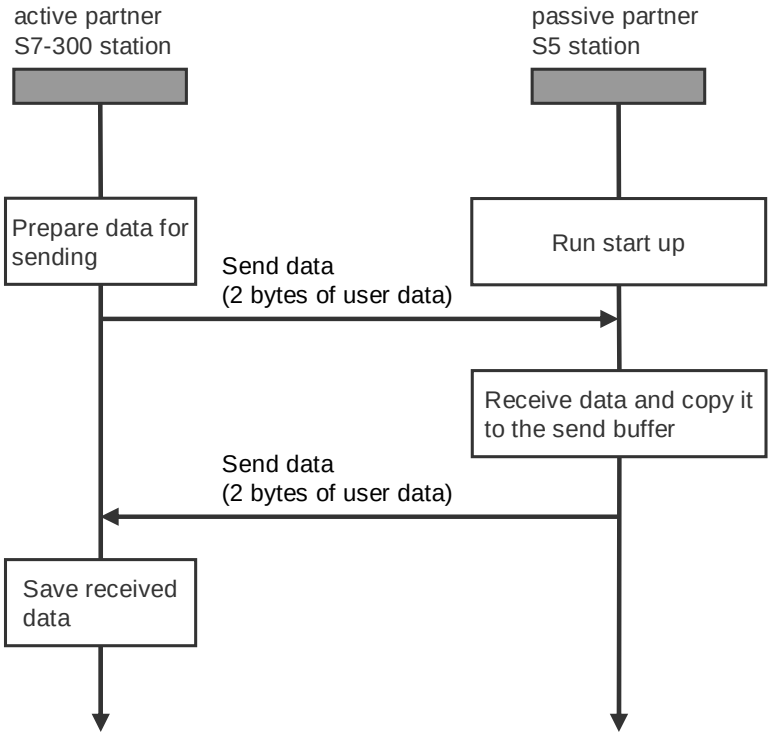
You can see whether the sample program is functioning correctly from variable table of the active S7-300 station. The variable table is included in the block folder of the STEP 7 project.

The data sent and received changes its value constantly (see chapter 5).

Overview of functions

The overview of functions shows the principal working method of the sample program.

Figure 2-2



Data Communication

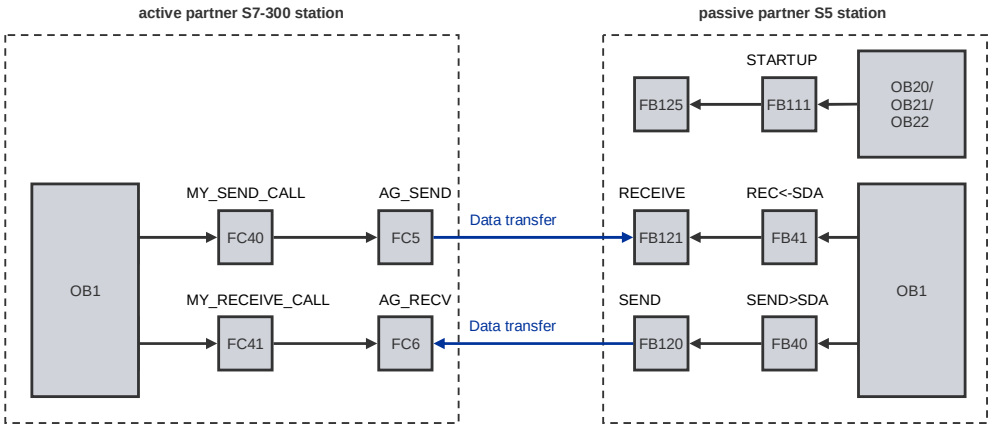
6 bytes of data are exchanged cyclically between the two stations involved in the communication. The 6 bytes of data consist of 4 bytes of header and 2 bytes of user data. The 4-byte header specifies the communication partner.

Active partner and passive partner

The active S7-300 station initiates establishing of the connection and sending of the new data. The passive S5 station receives the data from the active S7-300 and copies it into its send buffer, i.e. after the passive partner has completely received a data block, the passive partner sends it back to the active partner.

Program overview

Figure 2-3



User program of the active partner S7-300 station

The function FC5 "AG_SEND" is called in each cycle to send 2 bytes of user data.

The function FC6 "AG_RECV" is called in parallel to the send job to fetch a received data block from the CP.

Once a data block has been received completely, the data is saved.

If the receive job has been completed successfully, then the send data is incremented by the value "1" and the send/receive cycle starts over.

User program of the passive partner S5 station

An FB121 "RECEIVE" is triggered in each cycle.

When the FB121 "RECEIVE" receives a new data block, the data received triggers an FB 120 "SEND" to send back the data received.

Operating and monitoring

The operating and monitoring of the sample program is possible using the variable table provided.

The following requirements must be fulfilled for the "Monitor and modify variables" program.

- An online connection to the CPU must be established.
- The "Monitor variables" function must be activated.
- The control values must be marked as valid.

If the above-mentioned conditions are fulfilled, then you can tell that the sample program is working properly by the fact that the sent and received data changes constantly in the active partner.

3 Plant Configuration

This chapter gives you an overview of the configuration and the hardware and software components used to create the sample program.

3.1 Overview

Table 3-1 gives an overview of the configuration used to create the sample program.

Table 3-1

Bus system	PROFIBUS
Communication protocol	FDL with free layer 2 access
FMS Client	SIMATIC S7
FMS Server	SIMATIC S5
Communications processors	CP342-5 and CP5431
Services	SDA (Send Data with Acknowledge)

In this sample program the SDA (Send Data with Acknowledge) service and the free layer 2 access of the FDL protocol are used for data communication between a SIMATIC S7 and a SIMATIC S5.

In the active partner S7-300 station a CP342-5 communications processor is used for data communication using the FDL protocol and the SDA (Send Data with Acknowledge) service.

A CP5431 communications processor is used in the passive partner S5 station.

3.2 Hardware and Software Components Used

Hardware components

The following modules in the active partner S7-300 station were used to create the sample program.

Table 3-2

Slot	Module	Order number
1	PS 307 10A	6ES7307-1KA00-0AA0
3	CPU314	6ES7314-1AE02-0AB0
4	CP342-5	6GK7342-5DA00-0XE0

The following modules in the passive partner S5 station were used to create the sample program.

Table 3-3

Slot	Module	Order number
1	S5-135U/155U (CPU 928)	6ES5 928-3UA12
2	CP5431	6GK1543-1AA01

Note

The sample project has been created with a specific hardware configuration. This must be maintained to ensure proper functioning.

If you use a different configuration, with a different CPU or CP, for example, then you must change the sample program accordingly.

Required cables and other hardware

- MPI cable
- PROFIBUS bus cable with at least two male bus connectors
- SIMATIC Field PG or PC with MPI interface

Software components

- STEP 7 V5.0 SP3 or higher
- NCM S7 PROFIBUS V5.0 + SP3 or higher
- STEP 5 V6.65
- SINEC COM 5431

4 Function Mechanisms of the Sample Program

This chapter describes how the sample program functions and which blocks are required for communication and their communication structure.

4.1 Working Method of the Sample Program

4.1.1 Data Communication

2 bytes of user data are exchanged cyclically over PROFIBUS between the two stations involved in the communication. The SDA (Send Data with Acknowledge) service and the free layer 2 access of the FDL protocol are used for data transfer.

4.1.2 Active Partner S7-300 Station and Passive Partner S5 Station

The initiative for sending and receiving data comes from the active S7-300 station.

When it receives a data block, the passive S5 station sends it back to the active S7-300 station.

A PROFIBUS network with FDL protocol is used as the data transfer medium.

4.1.3 Sequence of the User Program in the Active Partner S7-300 Station

Specify communication partner

Since the SDA (Send Data with Acknowledge) service used over the free layer 2 access of the FDL protocol, the target of the data to be sent in the user program is specified with a 4-byte header.

Send data

In each cycle a data block with a length of 2 bytes is sent to the passive partner S5 station.

Read data

In each cycle a receive job is triggered and depending on the status value of the function FC6 "AG_SEND" the data received is transferred to the receive buffer. The receive data includes a 4-byte header to specify the source, i.e. the sender.

Increase data

The value of the data to be sent is increased by one and the send and receive cycle starts over.

4.1.4 Sequence of the User Program in the Passive Partner S5 Station

Receive data

A receive job is triggered in the passive partner S5 station in each cycle. When new data is received, it is transferred to the common receive and send buffer.

Send data

A send job is triggered when new data is received.

4.2 Functions and Function Blocks

4.2.1 Functions and Function Blocks in the User Program of the S7-300 Station

The functions FC5 "AG_SEND" and FC "AG_RECV" for data transfer are called in the user program of the S7-30 station.

Task of the function FC5 “AG_SEND"

The function FC5 “AG_SEND" transfers data from the specified send buffer of the CPU to the programmed partner station. The pointer of the send buffer can point to a process picture area, a marker area or a data block area.

With the S7-400 the function FC5 “AG_SEND" can only transfer a maximum of 240 bytes of data. Use the function FC50 "AG_LSEND" for transfer of up to 8192 bytes of data.

With the S7-300 the function FC5 “AG_SEND" can only transfer a maximum of 8192 bytes of data.

The PROFIBUS address and the LSAP of the communication partner are defined in the user program by a 4-byte header.

The ID (connection number), by way of which the function FC5 "AG_SEND" sends the data, is defined during configuration of an unspecified FDL connection.

Note Section 4.3.4 gives a description of the input and output parameters of the function FC5 "AG_SEND".

Task of the function FC6 "AG_RECV"

The function FC6 "AG_RECV" transfers data received from the defined station to the specified receive buffer of the CPU. The pointer of the send buffer can point to a process picture area, a marker area or a data block area.

With the S7-400 the function FC6 “AG_RECV" can only transfer a maximum of 240 bytes of data. Use the function FC60 "AG_LRECV" for transfer of up to 8192 bytes of data.

With the S7-300 the function FC6 "AG_SEND" can only transfer a maximum of 8192 bytes of data.

The PROFIBUS address and the LSAP of the communication partner are provided with the receive data in a 4-byte header.

The ID (connection number), by way of which the function FC5 "AG_RECV" receives the data, is defined during configuration of an unspecified FDL connection.

Note Section 4.3.5 gives a description of the input and output parameters of the function FC6 "AG_RECV".

4.2.2 Functions and Function Blocks in the User Program of the S5 Station

Task of the function block FB120 "SEND"

The function block FB120 "SEND" sends the data from the specified send buffer of the SIMATIC S5 to the communication partner.

The pointer of the send buffer can point to a process picture area, a marker area or a data block area.

The job number used is generated by the configuration software SINEC COM 5431 when configuring an FDL connection.

The PROFIBUS address and the LSAP of the communication partner are defined in the user program by an 8-byte header.

Note Section 4.4.5 gives a description of the input and output parameters of the function block FB120 "SEND".

Task of the function block FB121 "RECEIVE"

The function block FB121 "RECEIVE" receives the data sent by the partner station.

The pointer of the send buffer can point to a process picture area, a marker area or a data block area.

The job number used is generated by the configuration software SINEC COM 5431 when configuring an FDL connection.

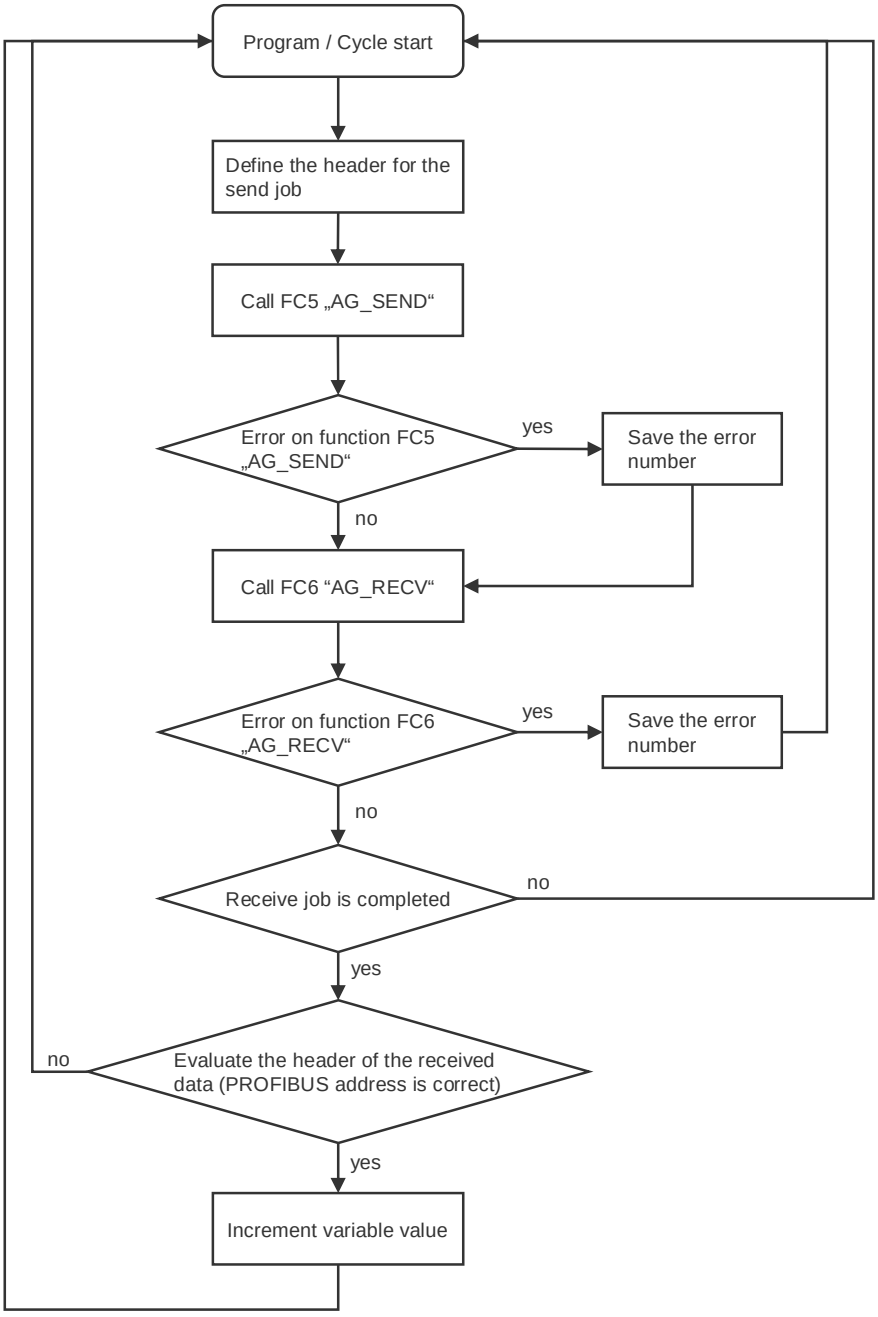
The PROFIBUS address and the LSAP of the communication partner are provided with the receive data in an 8-byte header.

Note Section 4.4.6 gives a description of the input and output parameters of the function block FB121 "RECEIVE".

4.3 Details of the User Programs of the S7-400 station

4.3.1 Program Sequence

Figure 4-1



4.3.2 Symbol Table

In the symbol table you assign symbolic names to the addresses used in the user program of the S7-300 station.

The use of symbols increases the readability of the program code. The symbolic name is displayed in the program code instead of the address.

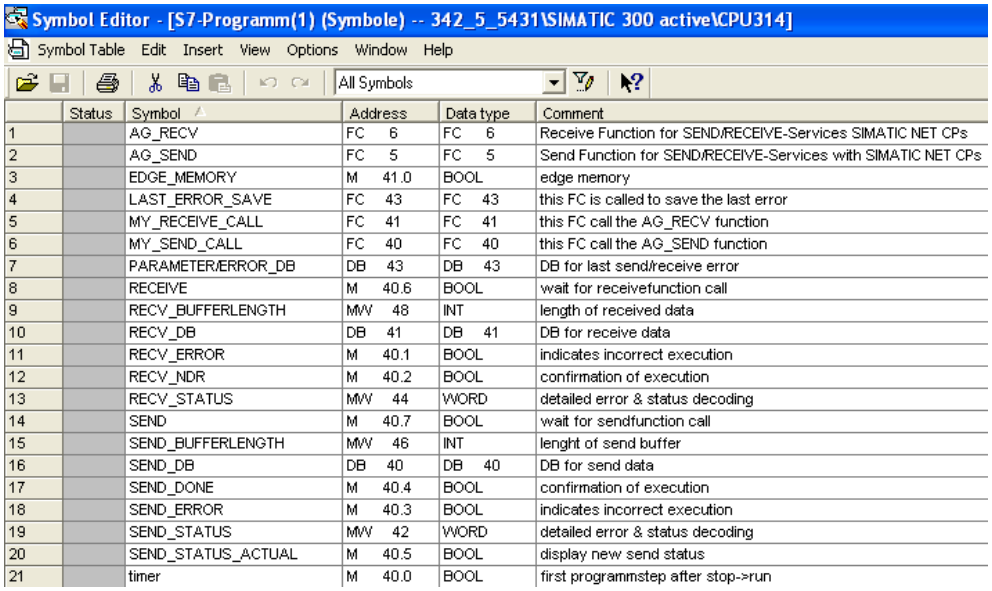
Example

The symbolic name "SEND_STATUS" is in the program code instead of the address MW42.

Overview

Figure 4-2 shows the symbol table used in the user program of the S7-300 station.

Figure 4-2



	Status	Symbol	Address	Data type	Comment
1		AG_RECV	FC 6	FC 6	Receive Function for SEND/RECEIVE-Services SIMATIC NET CPs
2		AG_SEND	FC 5	FC 5	Send Function for SEND/RECEIVE-Services with SIMATIC NET CPs
3		EDGE_MEMORY	M 41.0	BOOL	edge memory
4		LAST_ERROR_SAVE	FC 43	FC 43	this FC is called to save the last error
5		MY_RECEIVE_CALL	FC 41	FC 41	this FC call the AG_RECV function
6		MY_SEND_CALL	FC 40	FC 40	this FC call the AG_SEND function
7		PARAMETER/ERROR_DB	DB 43	DB 43	DB for last send/receive error
8		RECEIVE	M 40.6	BOOL	wait for receivefunction call
9		RECV_BUFFERLENGTH	MW 48	INT	length of received data
10		RECV_DB	DB 41	DB 41	DB for receive data
11		RECV_ERROR	M 40.1	BOOL	indicates incorrect execution
12		RECV_NDR	M 40.2	BOOL	confirmation of execution
13		RECV_STATUS	MW 44	WORD	detailed error & status decoding
14		SEND	M 40.7	BOOL	wait for sendfunction call
15		SEND_BUFFERLENGTH	MW 46	INT	lenght of send buffer
16		SEND_DB	DB 40	DB 40	DB for send data
17		SEND_DONE	M 40.4	BOOL	confirmation of execution
18		SEND_ERROR	M 40.3	BOOL	indicates incorrect execution
19		SEND_STATUS	MW 42	WORD	detailed error & status decoding
20		SEND_STATUS_ACTUAL	M 40.5	BOOL	display new send status
21		timer	M 40.0	BOOL	first programmstep after stop->run

4.3.3 OB1

OB1 is the block responsible for cyclic processing of the user program. The functions FC40 "MY_SEND_CALL" and FC41 "MY_RECEIVE_CALL" are called cyclically in OB1. The functions FC40 "MY_SEND_CALL" and FC41 "MY_RECEIVE_CALL" internally call the functions FC5 "AG_SEND" and FC6 "AG_RECV" to send and receive the data.

Figure 4-3

```
OB1 : Title:
Comment:

Network 1: Title:
Comment:

// example for send/receive with 2 byte data

//timer to call send function
      AN    "timer"
      L     S5T#50MS
      SD    T      0
      A     T      0
      =     "timer"
      A     "timer"
      CC    "MY_SEND_CALL"

      CALL  "MY_RECEIVE_CALL"
```

4.3.4 FC40 "MY_SEND_CALL"

Overview

Figure 4-4

```
FC40 : Title:
Comment:

Network 1: Title:
Comment:

      L     4                              //job header: PB address of dest.station
      T     DB40.DBB    2
      L     3                              //job header: LSAP of dest. station
      T     DB40.DBB    3
      L     B#16#0                         //job header: Service (SDA=00h)
      T     DB40.DBB    4

      CALL  "AG_SEND"
       ACT   :=TRUE                        // send is allways activ
       ID    :=1                           // ID of connenction
       LADDR :=W#16#100                    // logic moduladress of cp
       SEND  :=P#DB40.DBX2.0 BYTE 6        // any-pointer to send buffer
       LEN   :=6                           // length of send-data
       DONE  :="SEND_DONE"
       ERROR :="SEND_ERROR"
       STATUS:="SEND_STATUS"               // actual function status

      AN    "SEND_ERROR"                   // if no error, end
      BEC
//
      L     "SEND_STATUS"                  // save actual (error) send status
      T     "PARAMETER/ERROR_DB".send_error_status
```

Description

The function FC40 "MY_SEND_CALL" is called cyclically in OB1.

The header for the send job is defined, i.e. the data transferred as header of the send job is stored in bytes 2, 3, 4 and 5 of the DB40.

After the header has been defined the function FC40 "MY_SEND_CALL" internally calls the function block FC5 "AG_SEND". 6 bytes of data are transferred from the send buffer (DB40) to the specified communication partner.

Table 4-1 shows the structure of the send buffer of the active S7-300 station.

Table 4-1

Address in the send puffer DB40	Description	Value
Byte 2	Header: PROFIBUS address	4 (dec)
Byte 3	Header: LSAP	3 (dec)
Byte 4	Header: Service	00 (hex) = SDA
Byte 5	Header: unused	-
Byte 6	User data	0 to 255 (dec)
Byte 7	User data	0 to 255 (dec)

When the send job has been completed successfully, the function FC40 "MY_SEND_CALL" is quitted by means of a conditional block end.

If the send job is **not** completed successfully, the status value is stored in data block DB43.

Input parameters of FC5 "AG_SEND"

The function FC5 "AG_SEND" has the following input parameters.

Table 4-2

Input parameters	Data type	Description
ACT	Boolean	Job trigger ACT = 1 → LEN bytes are sent from the data area specified with the SEND parameter. ACT = 0
ID	Integer	Connection number
LADDR	WORD	Module start address The module start address is the address of the CP. It is configured in the Hardware Configuration.
SEND	ANY	The address and length of the data area serving as send buffer are specified at the SEND parameter.
LEN	Integer	The number of bytes sent from the data area with the job is specified at the LEN parameter.

Output parameters of FC5 "AG_SEND"

The function FC5 "AG_SEND" has the following output parameters.

Table 4-3

Output parameters	Data type	Description
DONE	Boolean	Status parameters DONE = 0 → job is running DONE = 1 → job has been executed
ERROR	Boolean	Error display
STATUS	WORD	Status display

4.3.5 FC41 "MY_RECEIVE_CALL"

Overview

Figure 4-5

```
FC41 : Title:
Comment:

Network 1: Title:
Comment:

      CALL  "AG_RECV"
       ID    :=1                          // id of connection
       LADDR :=W#16#100                   // logic moduladress of cp
       RECV  :=P#DB41.DBX2.0 BYTE 6       // any-pointer to receive buffer
       NDR   :="RECV_NDR"
       ERROR :="RECV_ERROR"
       STATUS:="RECV_STATUS"              // actual function status
       LEN   :="RECV_BUFFERLENGTH"

      A     "RECV_ERROR"                  // if function error, jump
      JC    err

      L     "RECV_BUFFERLENGTH"           // save length of receive-data
      T     "RECV_DB".receive_bufferlength

      A     "RECV_NDR"                    // received new data ?
      FP    "EDGE_MEMORY"
      JCN   m001

      L     DB41.DBB    2                 // if partner adress = 4, go on
      L     4
      ==I
      JCN   m001

      L     "SEND_DB".send_data[0]        // increment send data
      +     1
      T     "SEND_DB".send_data[0]
m001: BE

err:  L     "RECV_STATUS"                 // save actual (error) send status
      T     "PARAMETER/ERROR_DB".receive_error_status
```

Description

The function FC41 "MY_RECEIVE_CALL" is called cyclically in OB1. It internally calls the function FC6 "AG_RECV". In this example, 6 bytes of data are received and transferred to the receive buffer (DB41).

If the data has been received completely and successfully from the communication partner with the PROFIBUS address 4, the receive data is incremented, new send data is prepared and the received data length is adopted.

If the receive job is **not** completed successfully, the status value is stored in data block DB43.

Input parameters of FC6 "AG_RECV"

The function FC6 "AG_RECV" has the following input parameters.

Table 4-4

Input parameters	Data type	Description
ID	Integer	Connection number
LADDR	WORD	Module start address The module start address is the address of the CP. It is configured in the Hardware Configuration.
RECV	ANY	The address and length of the data area serving as receive buffer are specified at the RECV parameter.
LEN	Integer	The number of bytes sent from the data area with the job is specified at the LEN parameter.

Output parameters of FC6 "AG_RECV"

The function FC6 "AG_RECV" has the following output parameters.

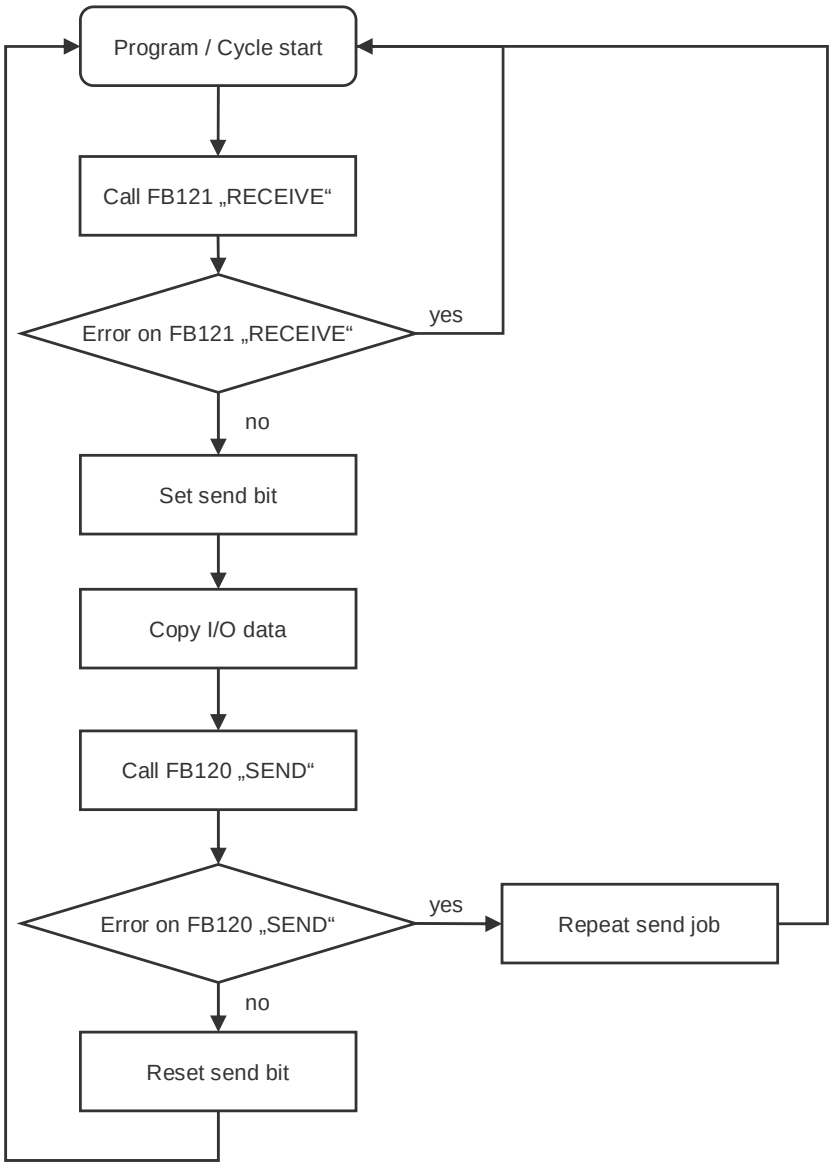
Table 4-5

Output parameters	Data type	Description
NDR	Boolean	The NDR parameter indicates whether new data has been received. NDR = 1 → new data
ERROR	Boolean	Error display
STATUS	WORD	Status display
LEN	Integer	The LEN parameter specifies the number of bytes transferred from the PROFIBUS CP to the data area.

4.4 Details of the User Program of the S5 station

4.4.1 Program Sequence

Figure 4-6



4.4.2 OB1

OB1 is the block responsible for cyclic processing of the user program. Function blocks FB40 "SEND>SDA" and FB41 "REC<-SDA" are called cyclically in OB1. These function blocks internally call the function blocks FB120 and FB121 to send and receive data.

Figure 4-7

```
      :JU  FB  41                              call receive-function
Name  :REC<-SDA
      :
      :JU FB  40                          call send function
Name  :SEND>SDA
      :
      :BE
```

4.4.3 Startup OBs (OB20, OB21 and OB22)

The startup OBs are required to program the different startup types of the CPU.

Depending on the startup type of the CPU, warm start or cold start, for example, the startup OBs OB20 to OB22 are called.
In this example the calls for all three types of startup are identical; in other words the startup OBs OB20, OB21 and OB22 each call the function block FB111 "STARTUP" to initialize the communications processor during startup of the CPU.

Overview

Figure 4-8

```
OB 20

      :JU FB 111                          synchron for CP 5431
Name  :STARTUP
ERR   :    F  200.0                        synchron error for CP 5431
      :
      :BE
```

4.4.4 FB111 "STARTUP"

The function block FB111 "STARTUP" is called by one of the startup OBs OB20, OB21 or OB22. In FB111 "STARTUP" the function block FB125 "SYNCHRONOUS" is called to initialize the communications processor.

Overview

Figure 4-9

```
 :
      :JU FB 125
Name  :SYNCHRON
SSNR  :    KY 0,0                              SSNR - CP5431
BLGR  :    KY 0,6
PAFE  :    FY 255
      :
      :A   F  255.0                            PAFE error ?
      :=   =ERR
      :
      :BE
```

4.4.5 FB40 "SEND>SDA"

The FB40 "SEND>SDA" is called cyclically in OB1.

Overview

Figure 4-10

```
Name      :SEND>SDA                send to remote-station 2 bytes

                  :A   F   45.7    "call-send-bit"
                  :JU FB 120
    Name : SEND
SSNR      :     KY 0,0
A-NR      :     KY 0,134           job number (ncm5431)
ANZW      :     FW  56
QTYP      :     KS DB              send buffer type is db
DBNR      :     KY 0,40            send buffer is db40
QANF      :     KF +1              send buffer offset is dw1
QLAE      :     KF +5              send length (5 words/10 bytes)
PAFE      :     FY  54
                  :
                  :A   F   57.2    anzw "job complete without err"
                  :AN  F   55.0
                  :=   F   55.1    edge flag "data transfer
                  :                completed"
                  :A   F   57.2
                  :=   F   55.0
                  :
                  :A   F   55.1    edge flag "data transfer
                  :                completed"
                  :AN  F   54.0    no pafe by send
                  :R   F   45.7    reset "call-send-bit"
                  :
                  :BE
```

Description

The FB40 "SEND_SDA" cyclically calls the function block FB120 "SEND" to transfer data.

In this example the FB120 "SEND" transfers 2 bytes of user data to the configured communication partner.

Depending on the data transfer and the value of the parameter "PAFE" the Send bit is reset and the function block FB40 is terminated.

Parameters

The table gives an overview of the parameters of FB120 "SEND".

Table 4-6

Parameter	Description
SSNR	Interface number of the CP5431.
A-NR	Job number which identifies the S/R connection of the CP5431.
ANZW	Job status.
QTYP	ID for the send buffer type.
DBNR	Number of the data block (DB).
QANF	Offset in the send buffer.
QLAE	Length of the area to be transferred.
PAFE	Error display of the block.

4.4.6 FB41 "REC<-SDA"

The FB41 "REC>SDA" is called cyclically in OB1.

Overview

Figure 4-11

```
   FB41
Name      :REC<-SDA                  receive data from remote-station
                :O   F    0.0
                :ON  F    0.0
                :JU  FB 121          call receive data
Name      :RECEIVE
SSNR      :    KY 0,0
A-NR      :    KY 0,134              job number (ncm5431)
ANZW      :    FW  46
ZTYP      :    KS DB                 receive buffer type is db
DBNR      :    KY 0,41               dB number is 41
ZANF      :    KF +1                 receive buffer offset is dw1
ZLAE      :    KF -1                 receivel ength is joker
PAFE      :    FY  44
                :
                :A   F   47.2        anzw "job complete without err"
                :AN  F   45.0
                :=   F   45.1         edge flag "data acceptance  complete"
                :A   F   47.2
                :=   F   45.0
                :
                :A   F   45.1         edge flag "data acceptance complete"
                :AN  F   44.0         no pafe error
                :S   F   45.7         set "call send bit"
                :
                :C   DB  41           data transfer
                :L   DW   5           receive
                :C   DB  40           to
                :T   DW   5           send
                :
                :BE
```

Description

The FB41 "REC<-SDA" cyclically calls the function block FB121 "RECEIVE" to receive data.

In this example 2 bytes of user data are received with the FB121 "RECEIVE".

When a receive job has been completed successfully, the Send bit is set in FB41 "REC<-SDA" to trigger a send job.

FB41 "REC<-SDA" is then terminated.

Parameters

Table 4-7

Parameter	Description
SSNR	Interface number of the CP5431.
A-NR	Job number which identifies the S/R connection of the CP5431.
ANZW	Job status.
ZTYP	ID for the receive buffer type.
DBNR	Number of the data block (DB).
ZANF	Offset in the receive buffer.
ZLAE	Length of the area to be transferred. If the ZLAE parameter has the value "-1", the length is determined when the data is received.
PAFE	Process picture error during processing of the function block FB121 "RECEIVE".

5 How to Use the Sample Program

You use the variable table supplied with the user program of the S7-300 to operate the sample program.

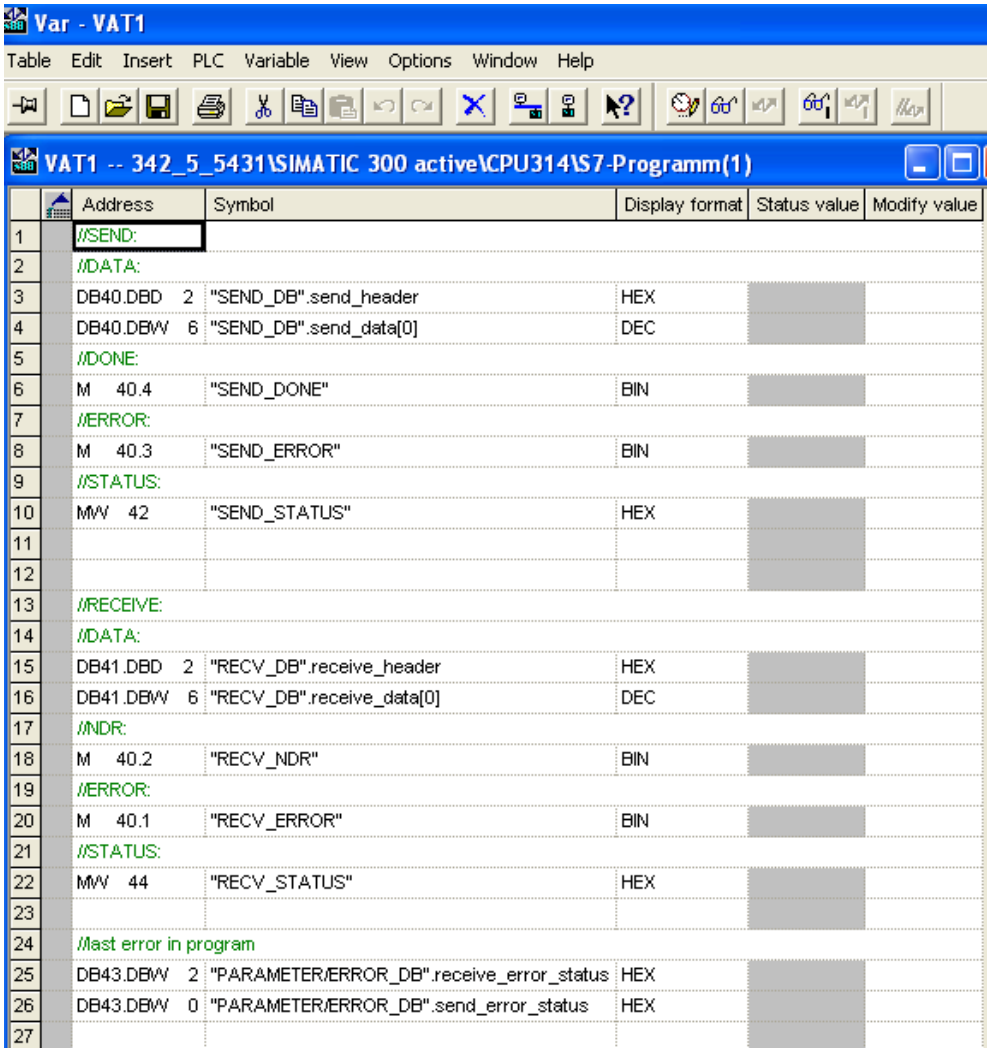
Opening the variable table in the user program of the S7-300

Table 5-1

No.	Action
1.	Use the MPI cable to connect the SIMATIC Field PG to the MPI/DP interface of the S7-300 CPU.
2.	Open the SIMATIC Manager and navigate in the project window to the block folder of the SIMATIC 300 station.
3.	In the block folder you double-click the variable table "VAT1".
4.	In the variable table you establish a connection to the S7-300 by means of the menu `Target system` → `Establish connection to` → `Configured CPU`.
5.	In the variable table you select the menu `Variable` → `Monitor` to control and monitor the defined variables.

Variable table

Figure 5-1



	Address	Symbol	Display format	Status value	Modify value
1	//SEND:				
2	//DATA:				
3	DB40.DBD 2	"SEND_DB".send_header	HEX		
4	DB40.DBW 6	"SEND_DB".send_data[0]	DEC		
5	//DONE:				
6	M 40.4	"SEND_DONE"	BIN		
7	//ERROR:				
8	M 40.3	"SEND_ERROR"	BIN		
9	//STATUS:				
10	MW 42	"SEND_STATUS"	HEX		
11					
12					
13	//RECEIVE:				
14	//DATA:				
15	DB41.DBD 2	"RECV_DB".receive_header	HEX		
16	DB41.DBW 6	"RECV_DB".receive_data[0]	DEC		
17	//NDR:				
18	M 40.2	"RECV_NDR"	BIN		
19	//ERROR:				
20	M 40.1	"RECV_ERROR"	BIN		
21	//STATUS:				
22	MW 44	"RECV_STATUS"	HEX		
23					
24	//last error in program				
25	DB43.DBW 2	"PARAMETER/ERROR_DB".receive_error_status	HEX		
26	DB43.DBW 0	"PARAMETER/ERROR_DB".send_error_status	HEX		
27					

In the variable table you can monitor the values of the send and receive data and the values at the output parameters of the functions FC5 "AG_SEND" and FC6 "AG_RECV".

Data is successfully sent and received

If the data is successfully sent and received, the output parameters of the functions FC5 "AG_SEND" and FC6 "AG_RECV" have the following values.

Table 5-2

Output parameters	Address	Symbolic name	Value
DONE	M40.4	SEND_DONE	The value of marker bit M40.4 changes constantly between 0 and 1.
ERROR	M40.3	SEND_ERROR	M40.3 = 0
STATUS	MW42	SEND_STATUS	MW42 = 0
NDR	M40.2	RECV_NDR	The value of marker bit M40.2 changes constantly between 0 and 1.
ERROR	M40.1“	RECV_ERROR	M40.1 = 0
STATUS	MW44	RECV_STATUS	MW44 = 0

The send and receive data in DB40 and DB41 changes constantly.

Errors in sending and receiving the data

If the data is **not** successfully sent, the output parameters of the functions FC5 "AG_SEND" and FC6 "AG_RECV" have the following values.

Table 5-3

Output parameters	Address	Symbolic name	Value
DONE	M40.4	SEND_DONE	M40.4 = 0
ERROR	M40.3	SEND_ERROR	M40.3 = 1
STATUS	MW42	SEND_STATUS	MW42 <> 0
NDR	M40.2	RECV_NDR	M40.2 = 0
ERROR	M40.1	RECV_ERROR	M40.1 = 1
STATUS	MW44	RECV_STATUS	MW44 <> 0

The status value of the function "AG_SEND" is stored in data word 0 of data block DB43.

The status value of the function "AG_RECV" is stored in data word 2 of data block DB43.

Send data

Proceed as follows for sending data to the passive S5 station.

Table 5-4

No.	Action
1.	In the variable table you enter a control value of between 0 and 32767 for the variable DB40.DBW6.
2.	The control value entered is accepted for the variable DB40.DBW6 by means of the menu `Variable → Activate control values`.

When the data has been transferred successfully, then the receive value transferred to the variable DB40.DBW6 also changes.

Closing the variable table in the user program of the S7-300

Close the variable table by means of the menu `Table` → `Close`.

6 Other Notes, Tips and Tricks, etc.

This chapter gives you more notes, tips and tricks for the commissioning and working of the sample program.

6.1 Not Possible to Download Hardware Configuration, Connection or Blocks to the S7-300 CPU

If it is not possible to download the hardware configuration, connection or blocks to the CPU, then make the following checks and take the following measures to remedy the situation.

Table 6-1

Check	Remedy
Check that the MPI cable is connected on the SIMATIC Field PG and on the MPI or MPI/DP interface of the S7-300 CPU. If the MPI cable is not connected to the SIMATIC Field PG and to the MPI or MPI/DP interface of the S7-300 CPU, no connection can be established to the S7-300 station and the configuration cannot be downloaded to the CPU.	Connect the MPI cable to the RS485 interface of the SIMATIC Field PG and to the MPI or MPI/DP interface of the S7-300 CPU.
Check the settings in "Set PG/PC interface...". The interface parameters used must be assigned to the access point of the application "S7ONLINE (STEP 7)". If the settings in "Set PG/PC interface..." are not correct, no connection can be established between the SIMATIC Field PG and S7-300 CPU.	Go to `Start → SIMATIC → STEP 7` and select the menu item "Set PG/PC interface". Under "Interface parameters used" you select the module to which the MPI cable on the SIMATIC Field PG is connected, CP5611 (MPI), for example. Apply the settings with "OK".
Open the hardware configuration. The hardware configuration in the STEP 7 project must match the configuration of the S7-300 station.	Change the hardware configuration in the STEP 7 project to match the configuration of the S7-300 station.
Check that the CPU has been completely reset.	If the CPU has not been completely reset, then do a complete reset of the S7-300 CPU.

6.2 Values of the Send and Receive Data Do Not Change in the Variable Table

If the values of the send and receive data do not change in the variable table, then make the following checks and take the following measures to remedy the situation.

Table 6-2

Check	Remedy
Check whether the PROFIBUS bus cable is connected to the CP342-5 in the S7-300 station and to CP5431 in the S5 station. If the PROFIBUS bus cable is not connected to CP342-5 in the S7-300 station and to CP5431 in the S5 station, no connection can be established between the two stations. Data exchange is not possible.	Connect the PROFIBUS bus cable to the RS485 interface of the CP342-5 and to the L2 interface of the CP5431. Switch on the terminator of the PROFIBUS connector.
Check whether "Monitor variables" function is activated in the variable table.	Activate the "Monitor variable" function by means of the menu `Variable` → `Monitor`.

6.3 Control Values are Not Applied for the Variables in the Variable Table

If the control values for the variables in the variable table are not applied, then make the following checks and take the following measures to remedy the situation.

Table 6-3

Check	Remedy
Check whether the control value of the variable DB40.DBW6 is in the range of valid values.	Enter a control value for the variable DB40.DBW6 from the valid range of values of between 0 and 32767.

Note If these notes, tips and tricks etc. for the commissioning and working of the sample program have not been of assistance, then repeat the commissioning of the sample program.