SIEMENS

Sending and Receiving of Text Messages via serial CPs/CMs and GPRS/GSM Modem MD720-3

CP340, CP341, CP441-2, 1SI, CM PtP, SINAUT MD720-3, STEP 7 V13

http://support.automation.siemens.com/WW/view/en/25545680

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

Table of contents

1 Library Overview

This library enables you to send any messages (e.g., messages regarding the plant status) by SMS using the MD720-3 GSM modem to a GSM-capable mobile terminal and receive messages from this terminal.

This document contains the description of the library available for download.

The present documentation furthermore illustrates possible applications and the included step-by-step instructions help you to integrate the library into your STEP 7 project.

1.1 User Scenarios

Display

The figure below shows all of the possible application cases of the library in the various SIMATIC S7 controllers with the appropriate serial communication modules/processors.

Figure 1-1
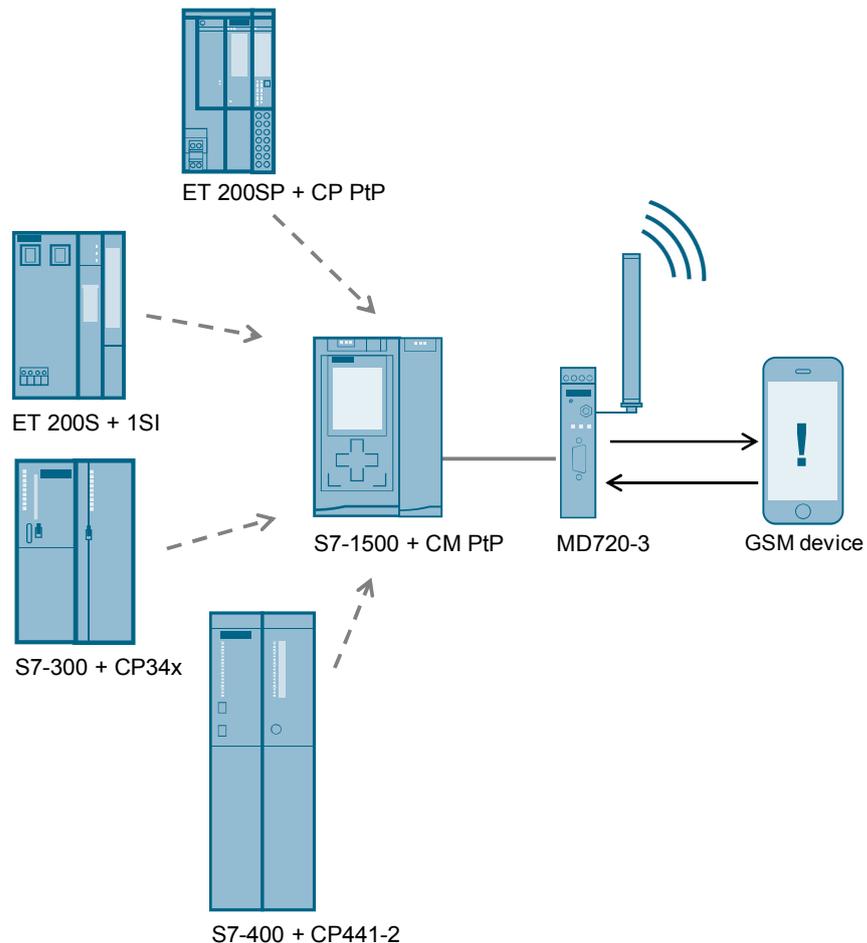
1.2 Functions

The blocks of SMS_MD720-3_Library_V13 are required for the data exchange between a SIMATIC S7-CPU and the GSM modem. The following table describes the core functions of the SMS_sr_xxxx function blocks.

Table 1-1

Function	Description
INIT	Initialize MD720-3: • Disable local echo • Enter PIN • Enter short message service center • Set parameters for SMS text mode • Set SMS memory • Delete stored SMS messages from the buffer.
SEND SMS MESSAGE	Send SMS message to a GSM-capable mobile terminal via the MD720-3 GSM modem.
RECEIVE SMS MESSAGE	Receive SMS message from a GSM-capable mobile terminal via the MD720-3 GSM modem.

1.3 Hardware and software requirements

Requirements for this library

To be able to use the functionality of the library described here, the following hardware and software requirements must be met.

1.3.1 SIMATIC components

Hardware for the S7-1500 station

The following components are necessary if you want to set up the example with an S7-1500 station.

Table 1-2

Component	No.	Order number	Note
CPU 1516-3 PN/DP	1	6ES7516-3AN00-0AB0	Alternatively, you can also employ a different S7-1500 CPU.
CM PtP RS232 HF alternative: CM PtP RS232 BA	1	6ES7541-1AD00-0AB0 alternative: 6ES7540-1AD00-0AA0	

Alternative hardware for the S7-300 station

The following components are necessary if you want to set up the example with an S7-300 station.

Table 1-3

Component	No.	MLFB / order number	Note
CPU 315-2 PN/DP	1	6ES7315-2EH14-0AB0	Alternatively, you can also employ a different S7-300 CPU or an ET 200MP.
CP 341	1	6ES7341-1AH01-0AE0	Alternatively, the CP 340 can also be used (6ES7340-1AH02-0AE0)

Alternative hardware for the S7-400 station

The following components are necessary if you want to set up the example with an S7-400 station.

Table 1-4

Component	No.	Order number	Note
CPU 414-2	1	6ES7414-2XG04-0AB0	Alternatively, you can also employ a different S7-400 CPU.
CP 441-2	1	6ES7441-2AA04-0AE0	
RS232 interface module	1	6ES7963-1AA00-0AA0	

Alternative hardware for the ET 200S station

The following components are necessary if you want to set up the example with an ET 200S station.

Table 1-5

Component	No.	Order number	Note
PS307 5A	1	6ES7307-1EA00-0AA0	
CPU 315-2 PN/DP	1	6ES7315-2EH14-0AB0	Alternatively, you can also use a different S7-CPU.
Interface module IM151-3 PN STANDARD	1	6ES7151-3AA20-0AB0	Alternatively, you can also use a different head-end (PROFIBUS, for example).
PM-E DC24V	1	6ES7138-4CA01-0AA0	
ET 200S 1SI 3964/ASCII	1	6ES7138-4DF01-0AB0	
ET 200S, TERM. MOD. TM-E15S24-01	1	6ES7193-4CB20-0AA0	
ET 200S, TERM.-MOD. TM-P15S23-A0	1	6ES7193-4CD20-0AA0	

Alternative hardware for the ET 200SP station

The following components are necessary if you want to set up the example with an ET 200SP station.

Table 1-6

Component	No.	Order number	Note
PS 25W 24VDC	1	6ES7505-0KA00-0AB0	
CPU 1516-3 PN/DP	1	6ES7516-3AN00-0AB0	Alternatively, you can also use a different S7-CPU.
IM 155-6 PN ST	1	6ES7155-6AU00-0BN0	Alternatively, you can use the PROFIBUS head of the ET 200SP.
Base unit	1	6ES7193-6BP00-0DA0	
CM PtP	1	6ES7137-6AA00-0BA0	
Server module	1	6ES7193-6PA00-0AA0	

1.3.2 GSM components

Table 1-7

Component	No.	Order number	Note
MD720-3	1	6NH9720-3AA00	
GSM antenna	1	6NH9860-1AA00	
SIM card	2		
Cable with 9-pole Sub-D connectors.	1		

CAUTION	**Do not send an SMS message containing the key word 'ERROR' or 'OK', since MD720-3 evaluates these words when a faulty behavior occurs during sending the message from MD720-3 to the communication module.**

1.3.3 Software components

Table 1-8 Software

Component	Order number	Qty.
TIA Portal as of V13	6ES7822-1AA03-0YA5	1

1.4 Library resources and performance data

The following section gives you an overview of the size of the blocks of the SMS_MD720-3_Library_V13 in the main memory.

Memory requirement

The following table shows the size of the library blocks in the main memory.

Table 1-9

Block	Main memory (bytes)	Load memory (bytes)
SMS_sr_1SI	8084	8800
SMS_sr_CM_PtP	S7-1500: 4781	S7-1500: 64392
SMS_sr_CP_340	8084	8818
SMS_sr_CP_341	8084	8946
SMS_sr_CP_441	8132	8718
string_to_DT	S7-1500: 1240	S7-1500: 14186

Transfer time without an additional user program in OB1

The following table shows the average times measured for initializing the modem and sending an SMS message.

Table 1-10

Command	Average time
INIT	25 s
SEND SMS MESSAGE	10 s

2 Blocks of the Library

The appropriate FB SMS_sr_xxxx is used for data exchange between a SIMATIC S7-CPU and a serial communication module or a serial communication processor and the GSM modem.

2.1 Block list

The following table lists all blocks of the SMS_MD720-3_Library_V13. These function blocks must be called in a cyclic OB.

The blocks realize the functions listed in .

Table 2-1

Block	CM/CP module	Used send/receive system function
SMS_sr_1SI	ET 200S 1SI	S_SEND, S_RCV
SMS_sr_CM_PtP	CM PtP	Send_P2P, Receive_P2P
SMS_sr_CP_340	CP340	P_SEND, P_RCV
SMS_sr_CP_341	CP341	P_SND_RK, P_RCV_RK
SMS_sr_CP_441	CP441-2	BSEND / BRCV
string_to_DT	all	-

2.2   FB SMS_sr_CM_PtP

The following figure and table show the call interface of the SMS_sr_CM_PtP library block (for communication module CM PtP).
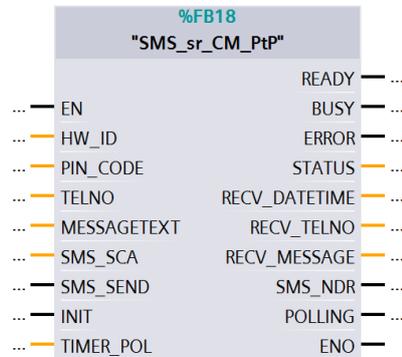
Figure 2-1

```
            %FB18
        "SMS_sr_CM_PtP"

                         READY  ─ ...
...  ─  EN                 BUSY  ─ ...
...  ─  HW_ID             ERROR  ─ ...
...  ─  PIN_CODE         STATUS  ─ ...
...  ─  TELNO     RECV_DATETIME  ─ ...
...  ─  MESSAGETEXT   RECV_TELNO  ─ ...
...  ─  SMS_SCA     RECV_MESSAGE  ─ ...
...  ─  SMS_SEND        SMS_NDR  ─ ...
...  ─  INIT           POLLING  ─ ...
...  ─  TIMER_POL          ENO  ─
```

Table 2-2

	Symbol	Data type	Explanation
INPUT	EN	BOOL	Release input.
	HW_ID	PORT	Hardware identifier of CM PtP (central at the S7-1500 or distributed as module of ET 200SP). The value of the HW identifier is available in HWCN. Hardware identifier **Hardware identifier** Hardware identifier: 258
	PIN_CODE	STRING[10]	PIN of the SIM card in the modem Example: 'xxxx$R' > '1234$R' Make sure that you replace only the PIN (+49xxxxxxxxxx). The "$R" control character must not be deleted!
	TELNO	STRING[24]	Recipient's telephone number of the device to which the SMS message is to be sent. Example: ' "+49xxxxxxxxx"$R' > ' "+49123456789"$R' Make sure that you replace only the telephone number (+49xxxxxxxxx). The "$R" control character and the quotation marks must not be deleted! Permissible value: Max. 24 characters
	MESSAGETEXT	STRING[160]	Content of the SMS message to be sent. Maximum text length: 159 characters (without quotation marks) Example: 'Point to Point Communication'
	SMS_SCA	STRING[24]	The short message service center of your provider has to be entered here Example: ' "+49xxxxxxxxx"$R', "+49123456789"$R' Make sure that you replace only the telephone number (+49xxxxxxxxx). The "$R" control character and the quotation marks must not be deleted! Permissible value: Max. 24 characters List (e.g. for Germany, see \7\):
	INIT	BOOL	Activates the initialization process Reacts only to a positive edge Deletes all SMS messages stored in the modem.

	Symbol	Data type	Explanation
	SMS_SEND	BOOL	Starts the send process Reacts only to a positive edge
	TIMER_POL	TIME	Timer for receive polling When this timer has expired, polling of the received data will be triggered If this timer expires while a send operation is active, the received SMS messages will not be fetched before the next cycle Permissible value: You can enter any time value in S7 format, for example: T#1M
OUTPUT	READY	BOOL	Sending and receiving an SMS message is possible only when TRUE. If initialization was completed successfully, "READY" will be set to TRUE. If the "SMS_SR_XXXX" block the busy with initializing the modem, the sending process or receive polling, READY=FALSE is set.
OUTPUT	BUSY	BOOL	If the "SMS_SR_XXXX" block is busy with initializing the modem, the sending process or receive polling, BUSY=TRUE is set. As soon as the above operations are complete, BUSY will be set to FALSE.
OUTPUT	ERROR	BOOL	Provides feedback if an error occurs when executing a routine. Is TRUE for one cycle only. Default value: FALSE
OUTPUT	STATUS	WORD	When ERROR = TRUE, it returns the status to narrow down the cause of the error (for only one cycle). (see chapter 2.5).
OUTPUT	RECV_DATETIME	DATE_AND_TIME	Time stamp of the received SMS message
OUTPUT	RECV_TELNO	STRING[24]	Sender's telephone number
OUTPUT	RECV_MESSAGE	STRING[170]	Receive SMS message
OUTPUT	SMS_NDR	BOOL	Signals that an SMS message has been received. The RECV_DATETIME, RECV_TELNO and RECV_MESSAGE parameters are not valid until this output is set. The user must make sure to back up this data immediately after setting this bit. TRUE for only one cycle.
OUTPUT	POLLING	BOOL	Indicates that receive buffer polling of the modem is active.
OUTPUT	ENO	BOOL	Release output.

2.3 FB SMS_sr_1SI and FBs SMS_sr_CP_xxx

As an example for the four blocks, the following figure and table shows the call interface of SMS_sr_CP_340, in place of the SMS_sr_CP_xxx blocks and the SMS_sr_1SI block. (The blocks are used for CPs 340,341, 441-2 and 1SI).
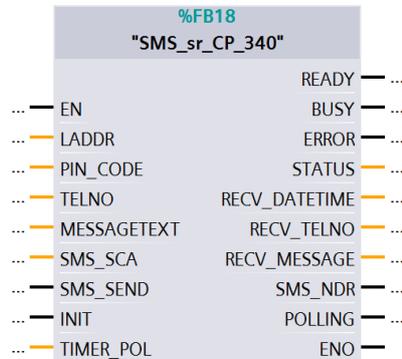
Figure 2-2

Table 2-3

| Symbol		Data type	Explanation
INPUT	EN	BOOL	Release input.
	LADDR	INT	The LADDR parameter is assigned with the first address of the input address of the communication module. This information is available in the HWCN. **I/O addresses** **Input addresses** Start address: 256
	PIN_CODE	STRING[10]	PIN of the SIM card in the modem Example: 'xxxx$R' > '1234$R' Make sure that you replace only the PIN (+49xxxxxxxxxx). The "$R" control character must not be deleted!
	TELNO	STRING[24]	Recipient's telephone number of the device to which the SMS message is to be sent Example: ' "+49xxxxxxxxx"$R' > ' "+49123456789"$R' Make sure that you replace only the telephone number (+49xxxxxxxxx). The "$R" control character and the quotation marks must not be deleted! Permissible value: Max. 24 characters
	MESSAGETEXT	STRING[160]	Content of the SMS message to be sent Maximum text length: 159 characters (without quotation marks) Example: 'Point to Point Communication'
	SMS_SCA	STRING[24]	The short message service center of your provider has to be entered here Example: ' "+49xxxxxxxxx"$R', "+49123456789"$R' Make sure that you replace only the telephone number (+49xxxxxxxxx). The "$R" control character and the quotation marks must not be deleted! Permissible value: Max. 24 characters List (e.g. for Germany, see \7\):
	INIT	BOOL	Activates the initialization process Reacts only to a positive edge Deletes all SMS messages stored in the modem.

	Symbol	Data type	Explanation
	SMS_SEND	BOOL	Starts the send process Reacts only to a positive edge
	TIMER_POL	TIME	Timer for receive polling When this timer has expired, polling of the received data will be triggered If this timer expires while a send operation is active, the received SMS messages will not be fetched before the next cycle Permissible value: You can enter any time value in S7 format, for example: T#1M
OUTPUT	READY	BOOL	Sending and receiving an SMS message is possible only when TRUE If initialization was completed successfully, "READY" will be set to TRUE If the "SMS_SR_XXXX" block the busy with initializing the modem, the sending process or receive polling, READY=FALSE is set
OUTPUT	BUSY	BOOL	If the "SMS_SR_XXXX" block is busy with initializing the modem, the sending process or receive polling, BUSY=TRUE is set As soon as the above operations are complete, BUSY will be set to FALSE
OUTPUT	ERROR	BOOL	Provides feedback if an error occurs when executing a routine. Is TRUE for one cycle only. Default value: FALSE
OUTPUT	STATUS	WORD	When ERROR = TRUE, it returns the status to narrow down the cause of the error (for only one cycle). (see chapter 2.5).
OUTPUT	RECV_DATETIME	DATE_AND_TIME	Time stamp of the received SMS message
OUTPUT	RECV_TELNO	STRING[24]	Sender's telephone number
OUTPUT	RECV_MESSAGE	STRING[170]	Receive SMS message
OUTPUT	SMS_NDR	BOOL	Signals that an SMS message has been received. The RECV_DATETIME, RECV_TELNO and RECV_MESSAGE parameters are not valid until this output is set. The user must make sure to back up this data immediately after setting this bit. TRUE for only one cycle.
OUTPUT	POLLING	BOOL	Indicates that receive buffer polling of the modem is active.
OUTPUT	ENO	BOOL	Release output.

2.4 Function charts

The following charts show the graphical representation of the functional sequences of the SMS_MD720-3_Library_V13 function block.
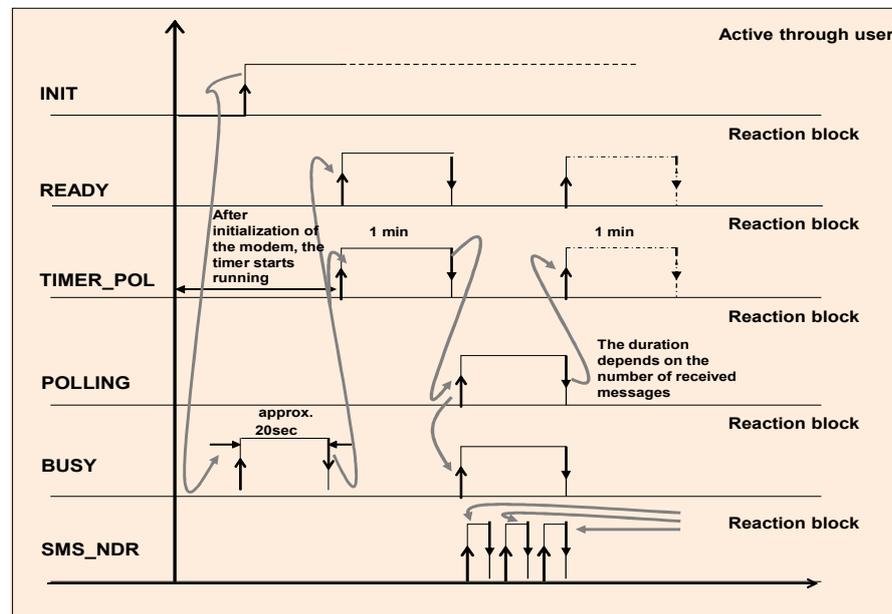
Function chart of a send operation

Figure 2-3
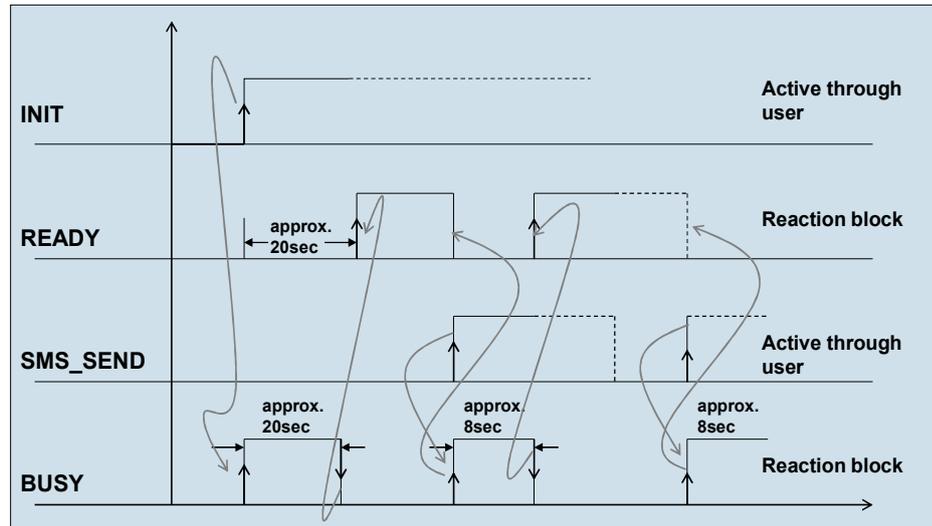
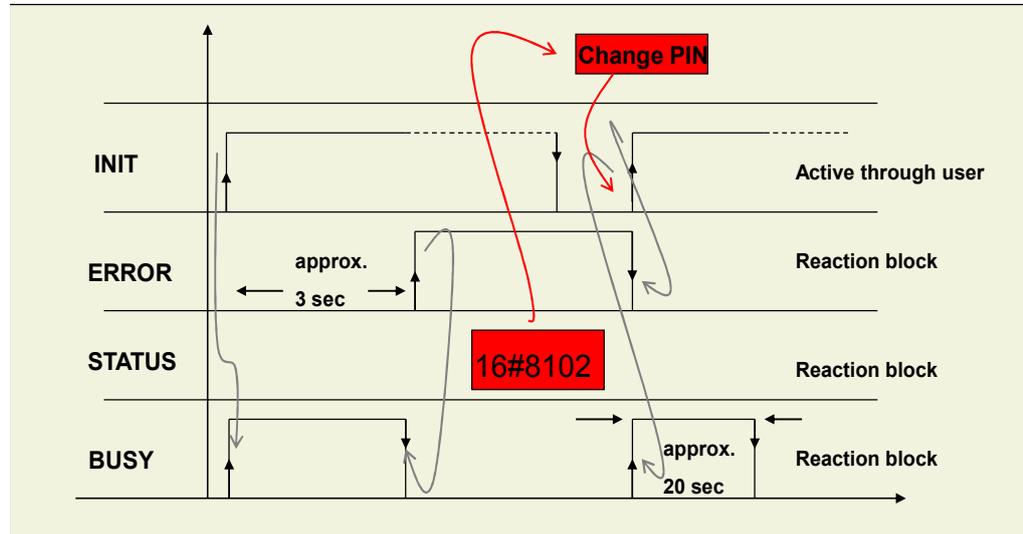**Function chart of a receive operation**

Figure 2-4

Function chart of an error status

The following figure shows an example of an error that may occur during initialization as, for example, the PIN could not be transferred to the modem.

Figure 2-5

2.5 STATUS output of the function blocks

For error diagnostics, the function blocks of the SMS_MD720-3_Library_V13 library have a STATUS output. By reading the STATUS output of the function block, you are provided with information on logical errors and error messages that may occur during the transfer between the communications processor and the GSM modem.

Table 2-4

Status	Meaning	Support / Remarks
16#8101	The watchdog timer has expired during modem initialization because: 1. The short message service center number is incorrect 2. Communication between the controller and the modem is interrupted during initialization	• Check and change the short message service center number • Check the cable between the controller and the modem • Restart initialization
16#8102	Incorrect PIN	• Check and change the PIN • Restart initialization
16#8103	The modem could not be set to text mode.	Restart initialization
16#8104	The SMS indicators could not be transferred.	Restart initialization
16#8105	The storage duration of the SMS message could not be transferred to the modem.	Restart initialization

Status	Meaning	Support / Remarks
16#8106	The watchdog timer has expired during sending because: 3. The recipient's telephone number is incorrect 4. Communication between the controller and the modem is interrupted during sending	• Check the parameters and, if necessary, change them (recipient's telephone number) • Check the cable between the controller and the modem • Restart initialization • Then restart sending.
16#8107	The previous job has not been completed yet. (You have started a new send operation, although BUSY was still active)	Restart initialization
16#8108	Error while reading the SMS message	Restart initialization
16#8109	The modem must be initialized. (This error occurs if the modem has not yet been initialized and you have started a send operation.)	• Restart initialization • Then restart sending.
16#8110	The watchdog timer has expired during polling because: • Communication between the controller and the modem is interrupted • Too many SMS messages are stored in the buffer	• Check the cable between the controller and the modem • Change the "TIMER_CHECK" time in the instance DB of SMS_sr_xxxx • Restart initialization

Note   Errors that do not have a 16#81xy status, are error codes from the system-internal communication blocks (e.g. S_RECV). (see online help V13)
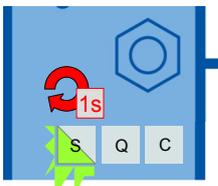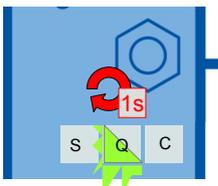
Note   If the support does not lead to the desired result, it may be useful to load the MD720-3 factory settings. To do so, use a paper clip. Press the SET button until the "C" LED lights up and then remove the paper clip.

Note   Once the MD720-3 has been initialized, all SMS messages stored in the buffer will be deleted.

2.6   Registration process of the modem MD720-3

The modem automatically logs onto the provider's GSM network, provided the **PIN** number of the inserted SIM card was validated. The table below shows this process on the basis of the diagnostic LEDs on the modem.

Table 2-5

No.	Operation	Screenshot
1.	After applying the power supply voltage, the S and C LEDs will each flash cyclically every second or once every two seconds.	
2.	After initialization has been triggered, the modem performs a parameter check. LED S flashes cyclically once every second.	
3.	The modem tries to establish a GSM connection. LED Q flashes cyclically once every second.	
4.	LED lights up continuously. The modem successfully logs into the provider's GSM network.	
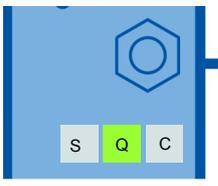
Note	The modem has to be in command phase for SMS operation (accepts AT commands). If this is not the case (e.g. due to modem in GPRS operation), the modem has to be reset to factory settings first.

3 How to Work with the Library

This chapter consists of instructions for integrating the SMS_MD720-3_Library_V13 into STEP 7 and instructions for integrating the library blocks into a STEP 7 project.

| Note	The following section assumes that a STEP 7 project exists.

3.1 Preparation

Configuring the used communication module/communication processor

The communication module/communication processor must be parameterized as follows:

- Protocol   ASCII/Freeport
- Data transmission rate   9600 bit/s
- Parity check   none
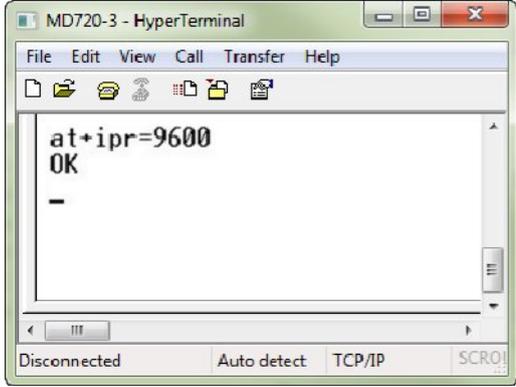- Data bits   8
- Stop bits   1

Table 3-1

No.	Procedure
5.	Open your existing STEP 7 V13 project.
2.	Configure the used communication module to the assigned parameters. "Device configuration> Device view> Double-click on CM PtP RS232> Properties> RS-232 interface"
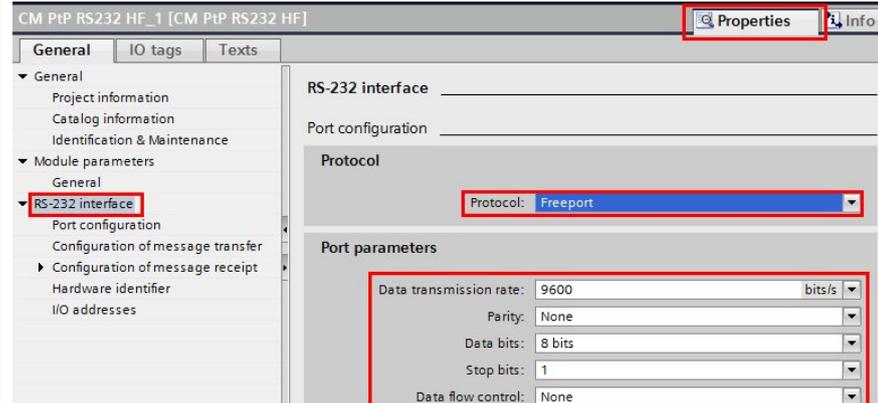
Setting the baud rate of the MD720-3

Communication module and MD720-3 must use the same baud rate. The baud rate on the MD720-3 is changed using a terminal program.

Table 3-2

Step	Procedure
1.	Connect a PC to the serial interface of the MD720-3.
2.	Start a terminal program, for example HyperTerminal.
3.	Select the appropriate COM interface to which the MD720-3 modem has been connected.
4.	Set the character format and baud rate to the same values as the serial interface of the MD720-3. The factory settings of the MD720-3 are as follows: Baud rate: 19200 bits/s Character format: 8N1. The baud rate is changed via AT command: **AT+IPR=<baud rate>**. Enter this command in the terminal program and press the return key. MD720-3 - HyperTerminal File Edit View Call Transfer Help at+ipr=9600 OK Disconnected Auto detect TCP/IP SCRO|

Note	The modem is only accessed by AT commands when it is in terminal mode. If this is not the case, the modem must be reset to factory settings (see \4\, Chapter 4).

Note	For information on how to insert the SIM card, please refer to \4\, Chapter 2.

3.2 Integrating the library into STEP 7 V13

In order that the previously described functions of the SMS_sr_xxxx can be used, it is necessary to integrate the library into the configuration software first. The necessary steps are listed in the following table.
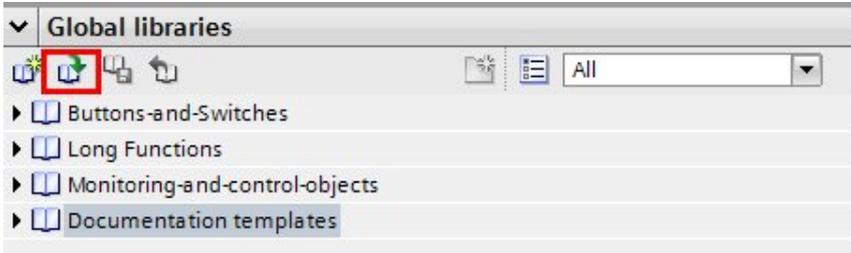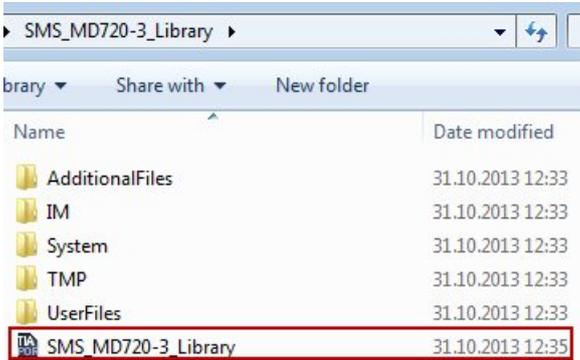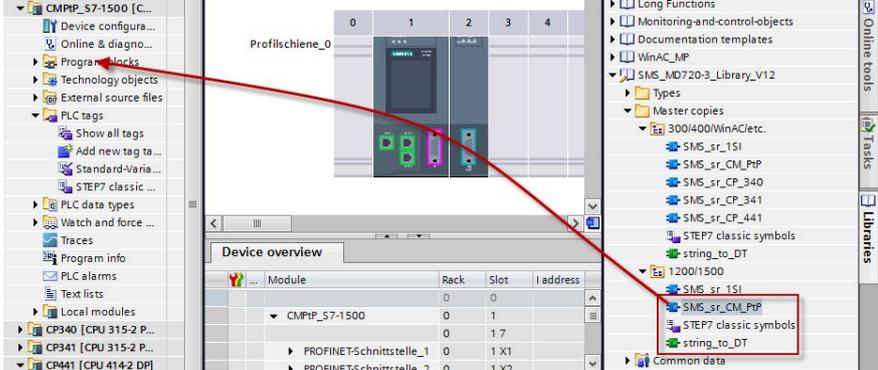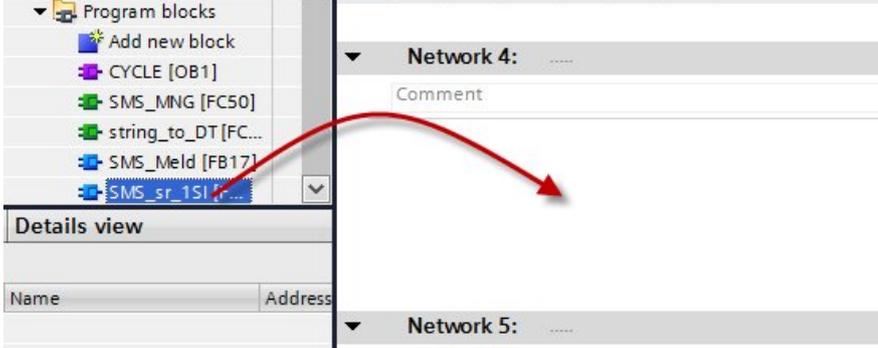
Table 3-3

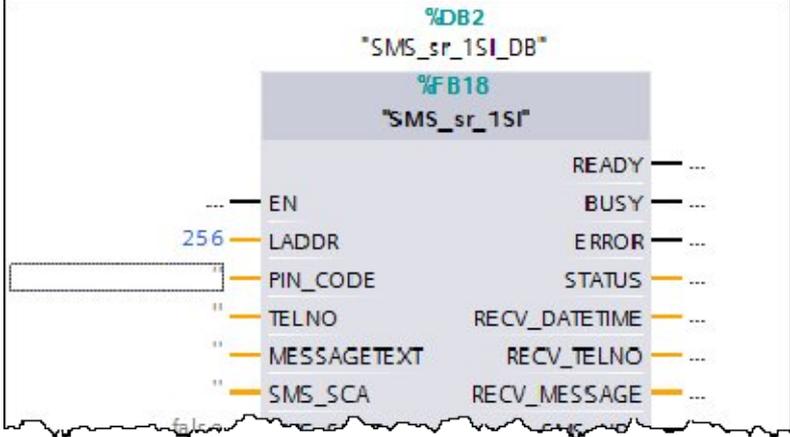| No.	Procedure
1.	The library is available on the HTML page from which you downloaded this document (\1\). Save the **SMS_MD720-3_Library_V13_V1_0.zip** library to your hard drive.
2.	Unzip the library.

3.3 Integrating the library blocks into the STEP 7 V13 project

The table below lists the steps for integrating the blocks of the SMS_MD720-3_Library_V13 into your STEP 7 project. Subsequently, you can use the blocks of library.

Table 3-4

No.	Procedure
1.	Open the existing STEP 7 V13 project.
2.	In the "Global Libraries" palette, click on "Open global library" in the toolbar or select "Global libraries > open library..." in the "Options" menu. The "Open global library" dialog box opens.
3.	Select the global SMS_MD720-3_Library_V13.al12.

No.	Procedure
4.	Use drag and drop to move depending on the used PLC and the used CP • string_to_DT • SMS_sr_xxxx • STEP 7 classic symbols from the "Master copies" folder to the "Program blocks" folder of your device.
5.	In the "Program blocks" folder of your device, open the organization block OB1 and use drag and drop to move the function block to any network.
6.	Enter the name and number of the associated instance data block. Click on "OK" to exit the dialog box.
7.	Assign values to all necessary parameters. The values can be used from a data block created for it.
8.	Compile the hardware and software of the S7 station: In the Project tree, right-click on the device and select the "Compile > Hardware and software (only changes)" menu.
9.	Download the new project to your controller.

3.4 Checking and updating the library

The following instructions show you

- how to check whether the library is up to date and
- how to integrate a newer version of the SMS_MD720-3_Library_V13 into your STEP 7 project.
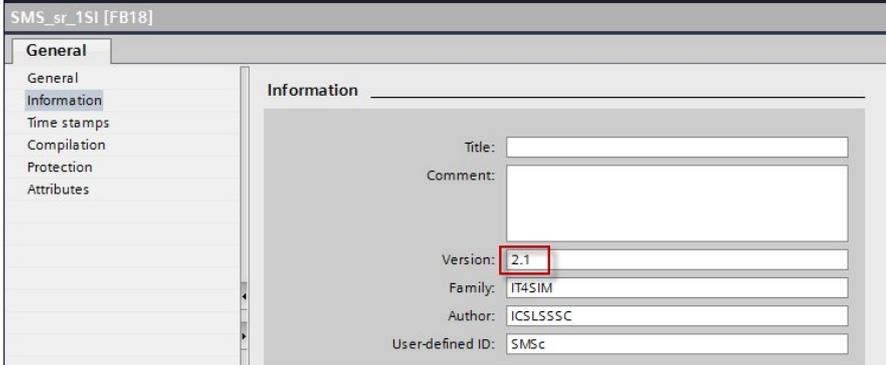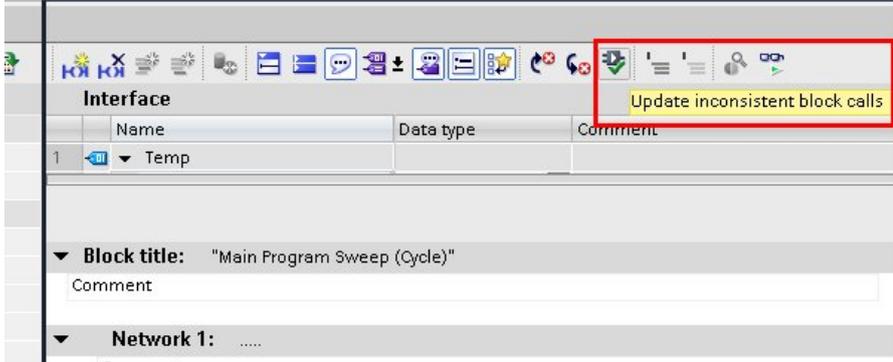
Table 3-5

No.	Procedure
1.	Open TIA Portal and compare the current version number of each element of the library with the latest version from the Industry Online Support portal. In the Project tree, right-click on the blocks in the library. In the context menu, select the "Properties" option. In the displayed "Properties" window, select the "Information" tab.
2.	If you wish to update the library, integrate the latest library as described in Chapter 3.2.
3.	Delete all blocks of the old library in the "Program blocks" folder of your STEP 7 project. Do not delete the function block call in OB1.
4.	Insert the elements of the new library as described in Chapter 3.3, steps 1 to step 4.

No.	Procedure
5.	The updated blocks have now been inserted. In the toolbar, click on "Update inconsistent block calls" to update or regenerate the instance DBs.
6.	Once you have inserted the updated blocks into your STEP 7 project, compile the software and save the project.
7.	The library update is now complete.

4 Literature

Table 4-1

	Topic	Link
\1\	Reference to this document	http://support.automation.siemens.com/WW/view/en/25545680
\2\	Siemens Industry Customer Support	https://support.automation.siemens.com
\3\	MD720-3 manual	http://support.automation.siemens.com/WW/view/en/23117745
\4\	CP 340 manual	http://support.automation.siemens.com/WW/view/en/1137332
\5\	First steps with the CP 340	http://support.automation.siemens.com/WW/view/en/12108826
\6\	CP 341 manual	http://support.automation.siemens.com/WW/view/en/1117397
\7\	First steps with the CP 341	http://support.automation.siemens.com/WW/view/en/1188622
\8\	CP 441-2 manual	http://support.automation.siemens.com/WW/view/en/1137419
\9\	First steps with CP 441-2	http://support.automation.siemens.com/WW/view/en/1188835
\10\	SIMATIC ET 200S manual	http://support.automation.siemens.com/WW/view/en/9260793
\11\	PROFINET S7-300 CPU manual	http://support.automation.siemens.com/WW/view/en/48080216
\12\	WAN Access Methods	http://support.automation.siemens.com/WW/view/en/26662448
\13\	STEP 7 V13 system manual	http://support.automation.siemens.com/WW/view/en/77991795
\14\	CM PtP Configurations for Point-to-Point Connections	http://support.automation.siemens.com/WW/view/en/59057093
\15\	SIMATIC S7-1500 CM PtP RS232 BA	http://support.automation.siemens.com/WW/view/en/59057152
\16\	SIMATIC S7-1500 CM PtP RS232 HF	http://support.automation.siemens.com/WW/view/en/59057160
\17\	CM PtP operation with PROFINET	http://support.automation.siemens.com/WW/view/en/68075812
\18\	SIMATIC S7-1500, ET 200MP, ET 200SP communication	http://support.automation.siemens.com/WW/view/en/59192925
\19\	SIMATIC ET 200SP CM Freeport/3964	http://support.automation.siemens.com/WW/view/en/59061378
\20\	S7-1500 Automation System	http://support.automation.siemens.com/WW/view/en/59191792
\21\	List of short message service centers	http://www.telespiegel.de/html/sms-kurzmitteilungszentralen.html

5 History

Table 5-1

Version	Date	Modifications
V1.0	09/2013	First version of the library description for STEP 7 V13.