Wireless Data Communication via SMS with SIMATIC S7-1200

SIMATIC S7-1200, SINAUT MD720-3

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SIMATIC

Wireless Signaling and Switching per SMS with S7-1200

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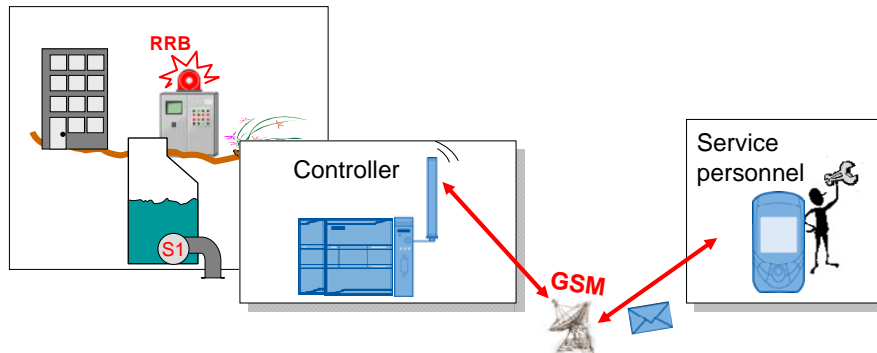
Table of Contents

1 Automation Task

1.1 Application environment

The functions and features in this configuration example are explained based on some scenarios of a wireless SMS message system for a rainwater retention basin (RRB).

Figure 1-1

Excess water is retained in the RRB to relive the sewer system. A continuous filling level measurement takes place in the RRB. An electronically controlled lock S1 is opened automatically as soon as capacities in the sewer are free.

The alarm reporting system is to cover the following message scenarios.

Figure 1-2
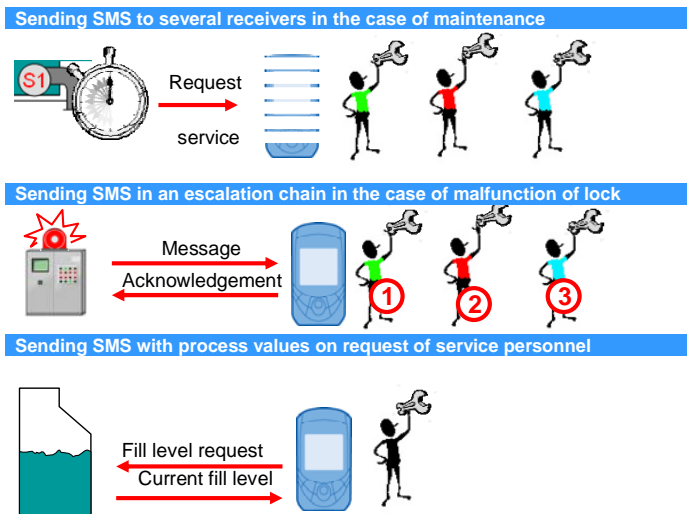
The available start-up code does not contain a variable simulation for the fictitious rainwater retention basin. The process values and trigger for starting the scenarios are manually preset.

1.1 Product-related environment

A GSM **SINAUT MD720-3 (4)** modem shall be coupled with a

SIMATIC S7-1200 controller (3) using a **RS232 communication module (2)**. As connection cable a **SINAUT ST7 connecting cable (7)** is used.

The SINAUT MD720-3 has a **SIM card (6)** inserted and a quad-band antenna **ANT 794-4MR (5)** is used to receive the signal.

The power supply of all components is provided via a **SIMATIC PM1207 power module (8)**.

Figure 1-3
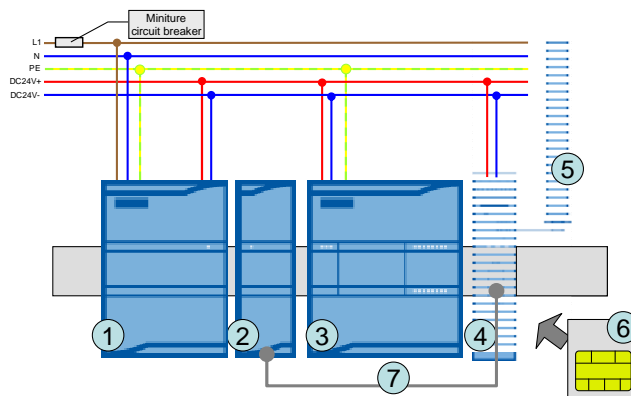
2 Automation Solution

The various scenarios of the automation task are realized with the help of the already existing library blocks on the user level. For each scenario a function block was created.

2.1 Sending SMS to several receivers

The "broadcast" function block [FB1] automatically searches a variable for several included receiver telephone numbers once it was called. Each number has to be marked by a semicolon ";" at the end.

Figure 2-1
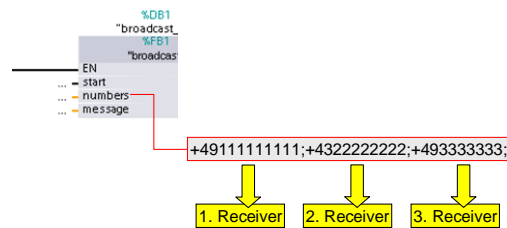
To send the SMS this "broadcast[FB1]" function block calls the "com[FB154]" library block and uses its routine for sending the SMS.

Figure 2-2
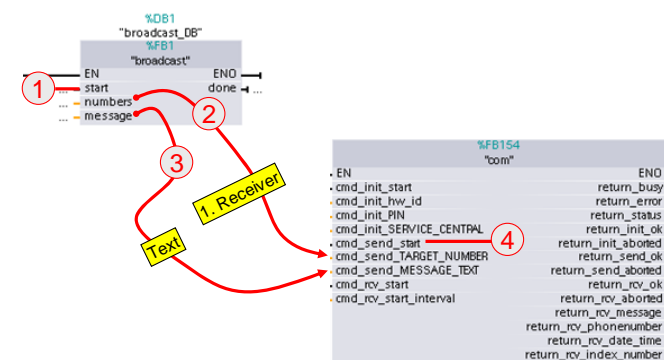
The "com[FB154]" function block is called until all the receivers in the "numbers" input variable of the "broadcast[FB1]" function block have been found.

2.2 Sending SMS in an escalation chain

The "waitforreply[FB2]" function block uses the same mechanisms for sending several SMS as described in chapter 2.1.

In addition, after each sending of an SMS it is waited for the reply of the receiver for a certain time. The content of the SMS reply is not relevant. Only the mobile number is checked. For this purpose, the routine for receiving SMS of the "com[FB154]" function block is used.

Figure 2-3
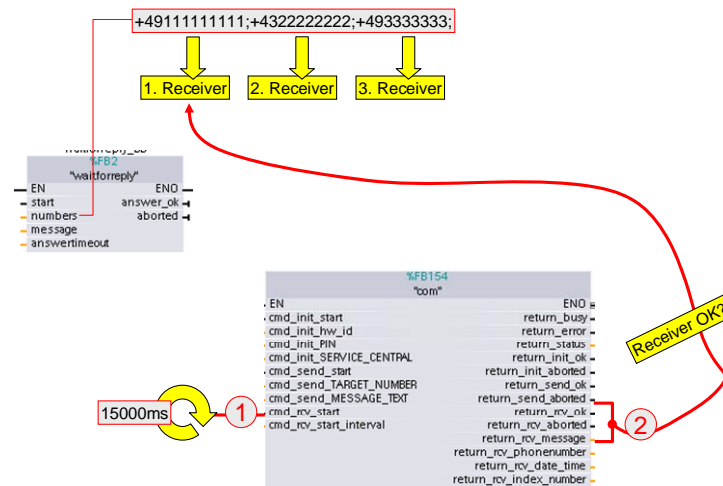
The "answertimeout" input parameter of the "waitforreply[FB2]" block indicates the time, how long it should be waited for.

Assuming a timeout time of 60 seconds and a SMS call time of 15 seconds, the following time flow results for the three entered receivers.

Figure 2-4
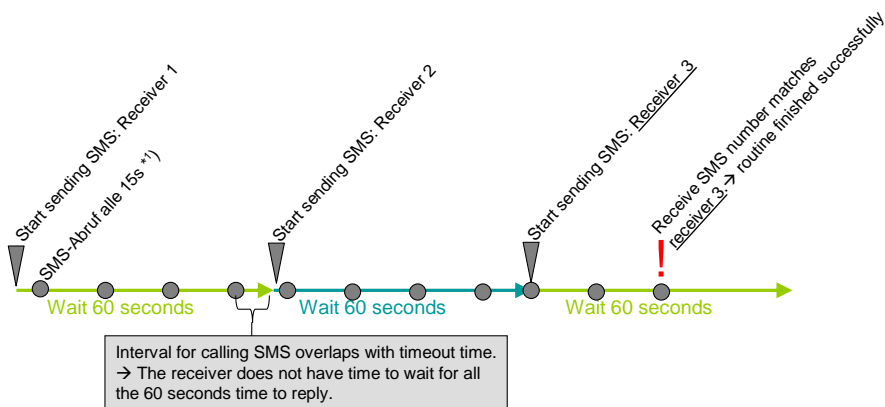
*1) The modem memory is checked for the existing short messages.

2.3 Replying process value request via SMS

The "requestvalue[FB3]" function block checks all incoming SMS for certain "keywords" and the mobile number of the sender.

Figure 2-5
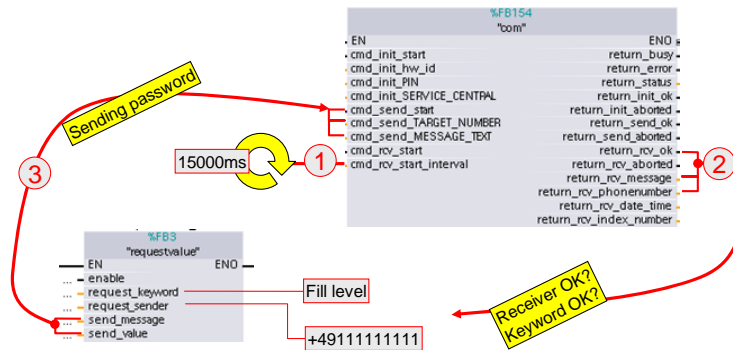
This function block uses the mechanisms for receiving SMS and sending the "com[FB154]" function block.

The "requestvalue[FB3]" function block depends on the configured call time on the COM block (here, in this example 15s).

2.4 Required Hardware and Software Components

The application was generated with the following components:

Hardware components

Table 2-1

| Component	No.	MLFB / order number	Note
SIMATIC S7-1200, PM 1207, 2,5A	1	6EP1332-1SH71	
SIMATIC S7-1200 CPU 1211C	1	6ES7211-1AD30-0XB0	
SIMATIC S7-1200 CM 1241, RS232	1	6ES7241-1AH30-0XB0	
SINAUT MD720-3, GSM/GPRS modem	1	6NH9720-3AA00	**from HW3.4, FW1.7.4**
SINAUT ANT 794-4MR, antenna	1	6NH9860-1AA00	
SINAUT ST7 connecting cable, RS232, 1:1, or comparable cable "modem cable"	1	6NH7701-5AN	
Ethernet line for configuring, 2 meters or comparable cable	1	6XV1870-3QH20	
Miniature circuit breaker, 1 pole B, 16A	1	5SX2116-6	
Standard 35mm DIN rail	1	6ES5 710-8MA11	
SIM card	1	Available at your mobile phone provider	

Standard software components

Table 2-2

Component	No.	MLFB / order number	Note
STEP 7 Basic V11	1	6ES7822-0AA01-0YA0	

Sample files and projects

The following list includes all files and projects that are used in this example.

Table 2-3

Component	Note
CE-X25_StartupProject_Vxx.ap11	Startup project of the remote station for the STEP 7 Basic V11 development environment.

3 Configuration

3.1 Network plan

Figure 3-1
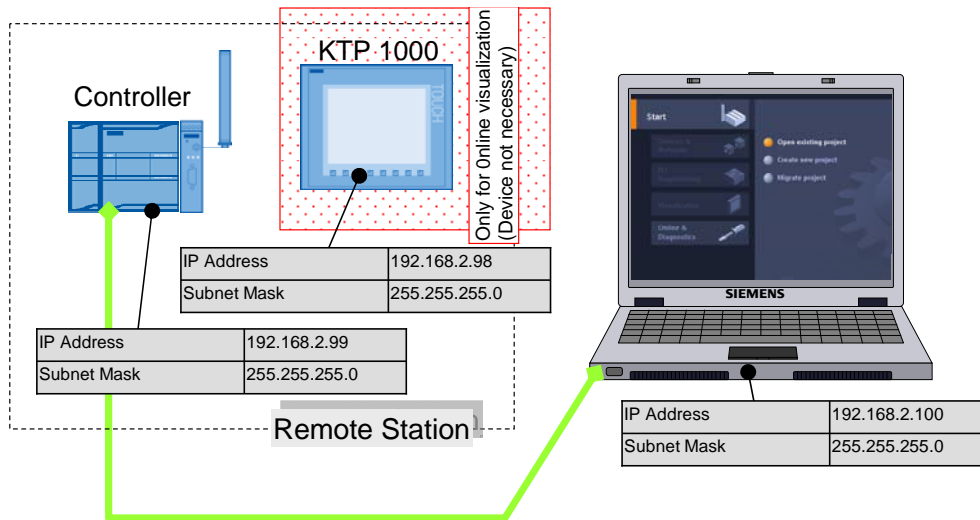
3.2 Installing and wiring hardware
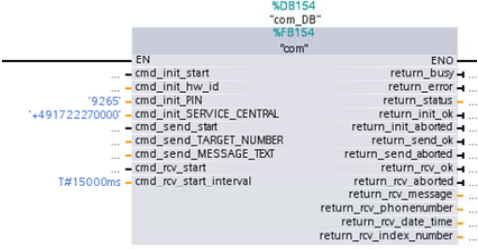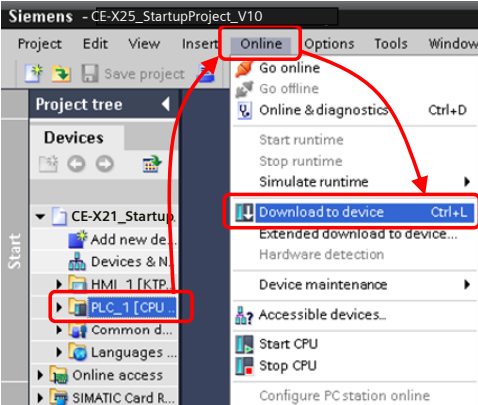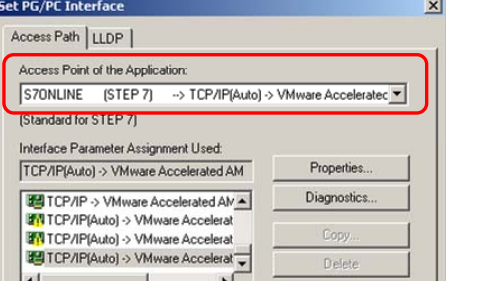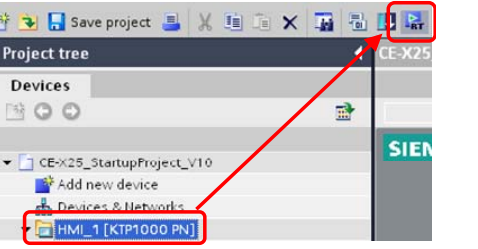
Table 3-1

No.	Instruction	Remark
1.	Mount all required components on a top-hat rail.	Component list Table 2-1
2.	Wire and connect all necessary components for the remote station as described. Please watch the ground connections of the components and only activate the power supply for the SIMATIC PM 1207 at the very end.	Configuration figure Figure 1-3

3.3 Configuration remote station

Table 3-2

No.	Instruction	Remark
1.	Network the S7-1200 controller with your programming device. Assign the Ethernet parameter indicated in Figure 3-1.	Assign an S7-1200 IP address: http://support.automation.siemens.com/WW/view/en/36932465 --> Chapter 7.1.3
2.	Extract the file from Table 2-3 no. 1 and open it with STEP 7 Basic V11.	

No.	Instruction	Remark
3.	Configure the "com[FB154]" instance data block which is called in "Main[OB1]" as described in the library description from chapter 3 onwards. Please observe the following particularities: • The SMS receiver ("cmd_send_TARGET_NUMBER" parameter) is later passed on with the help of the user program or with the runtime of the KTP1000. This is where the parameter has to be left empty. • The SMS text ("cmd_send_MESSAGE_TEXT" parameter) is later passed on with the help of the user program or with the runtime of the KTP1000. This is where the parameter has to be left empty. On the "cmd_rcv_start_interval" parameter the value 15000 (15s) is to be indicated.	
4.	Select the program folder of the S7-1200 and transfer the program into the controller "Online/Download to device". Make sure that the LED of the S7-1200 controller shows the "RUN" state.	
5.	Open the "PG/PC Interface" via Start/Control Panel/PC/PC Interface. Select the S7ONLINE connection as the used Ethernet network card. Confirm with OK.	
6.	Select the configured KTP1000 and start runtime.	

4 Operation of the Application

4.1 Operating the library for sending and receiving SMS

Table 4-1

No.	Function
1	With this button the modem is configured with the parameters indicated in the user program. All the steps below can only be executed once the modem was correctly initialized; this means the "return_init_ok" output has to be set to TRUE.
2	This button triggers the routine for sending the SMS in the library block. For this purpose the text to be sent and the receiver telephone number are to be entered.
3	The routine for receiving SMS can be executed event-controlled with the help of the button or in the interval via entering milliseconds.
4	The output parameters are to be assigned to the input parameters by name and will indicate whether the last routine was successfully completed. Example: All "return_rcv" output values belong to the "cmd_rcv" input parameters.
5	With this button you get to the next figure of the KTP1000 configuration: "Broadcast".

For the scenario described below the following has to be observed/carried out regarding this KTP1000 operating screen:

1. Start the initialization. Check the successful termination on the "return_init_ok" and "return_init_aborted" outputs.

2. All "cmd_send_" input parameters have to be released since the receiver numbers and the text to be sent will later be transferred in the user program.

3. The interval for receiving SMS is to be assigned with 15000ms (15s).
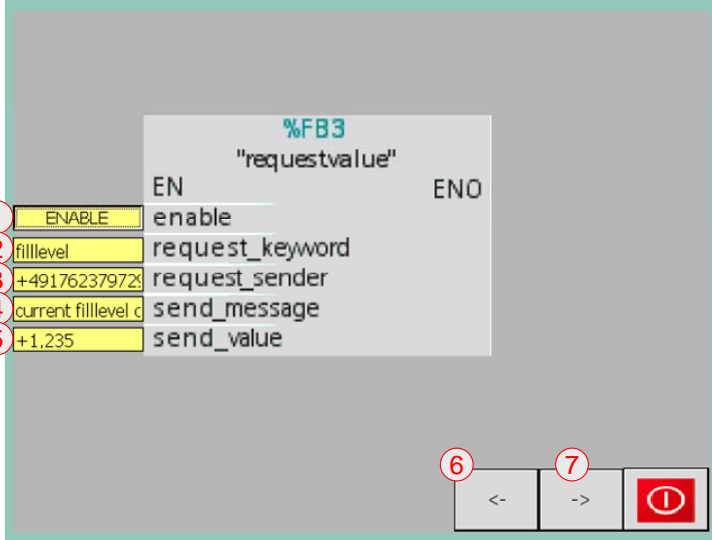
Note Please also make sure to observe the included library description especially from chapter 3 onwards

4.2   Executing the broadcast scenario

Table 4-2

No.	Function
1	This button starts the routine for sending several SMS subsequently and to different receivers.
2	This is where you enter the receiver addresses. The variable is a "String" data type with a maximum size of 254 characters. You can assign as many numbers until the size of the variable has been reached. The numbers always have to be completed with a ";"semicolon. Example: ,+4911111111111;+4922222222;+49333333333;'
3	This parameter includes the text of the SMS which is to be sent to the different receivers.
4	Once all messages have been sent, this exit is set to TRUE. Selecting the "start" input parameter resets this output again.
5	With this button you get to the previous figure of the KTP1000 configuration: "com".
6	With this button you get to the next figure of the KTP1000 configuration: "requestvalue".

4.3 Requesting the process value via SMS

Table 4-3

No.	Function
1	With this button the routine for sending process values after receiving a respective request is activated.
2	Here, you enter the keyword which must be contained in the SMS text to evaluate the request as valid. This field must not be empty. It is distinguished between lower and upper case.
3	Here you enter the telephone number from which the request may be carried out. If the field is left empty, all numbers are entitled to request a value as long as the keyword (no. 2) is matched.
4	This parameter contains the first part of the SMS text which is sent as an answer to the request.
5	This value is a REAL data type and is attached to the SMS text from no 4 and sent.
6	With this button you get to the previous figure of the KTP1000 configuration: "broadcast".
7	With this button you get to the next figure of the KTP1000 configuration: "waitforreply".

4.4 Executing a scenario with escalation chain

Table 4-4

No.	Function
1	This button starts the routine for sending several SMS and waiting for the acknowledgement of receipt.
2	This is where you enter the receiver addresses. The variable is a "String" data type with a size of 254 characters. You can assign as many numbers until the size of the variable has been reached. The numbers always have to be completed with a ";"semicolon. Example: ,+4911111111111;+4922222222;+49333333333;'
3	This parameter includes the text of the SMS which is to be sent to the different receivers.
4	This parameter contains the time which has to pass until the "waitforreply" routine sends a SMS to the next receiver from no. 2, as long as there is no reply from the current receiver. This parameter is to be selected whilst taking the entries from Table 3-2 no 2 into account. In case of an interval of 15 seconds for the SMS call and a timeout time of 60 seconds the receiver also has a minimum of 45 seconds until a reply has to be sent.
5	Time past since the last SMS sent.
6	If a receiver answers within a given time the escalation chain is interrupted and this output is set. The "start" input parameter resets this output again.
7	If no receiver from no. 2 will reply, the escalation chain will be finished and this output will be set. The "start" input parameter resets this output again.
8	With this button you get to the previous figure of the KTP1000 configuration: "requestvalue".

5 Related Literature

5.1 Internet Link Specifications

This list is not complete and only represents a selection of relevant information.

Table 5-1

	Subject	Title
\1\	SIMATIC S7-1200 System Manual	http://support.automation.siemens.com/WW/view/en/36932465
\2\	SINAUT MD720-3 GSM/GPRS Modem Manual	http://support.automation.siemens.com/WW/view/en/23117745
\3\	S7-200 based telecontrol solution with SMS	http://support.automation.siemens.com/WW/view/en/21063345

6 History

Table 6-1

Version	Date	Modifications
V1.2	09.08.2011	Application adapted to STEP 7 V11.
V1.0	10.06.2010	First issue.