

# Sending and Receiving SMS Messages via serial CPs and the GPRS/GSM Modem MD720-3

SIMATIC S7-300/400/ET 200S, SINAUT MD 720-3

[Library Description](#) • February 2013

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## SIMATIC Sending and Receiving SMS Messages with MD720-3

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# 1 Application of the Library

## Overview

With the help of this library an S7-300/S7-400 station or an ET200S station with 1SI module can send and receive any amount of messages (for example, message concerning your plant state) through SMS message via the GSM modem MD720-3 to a GSM capable mobile end device .

This document contains the description for the downloadable library.

In any case, the documents listed in Table 5-1 are recommended as accompanying literature.

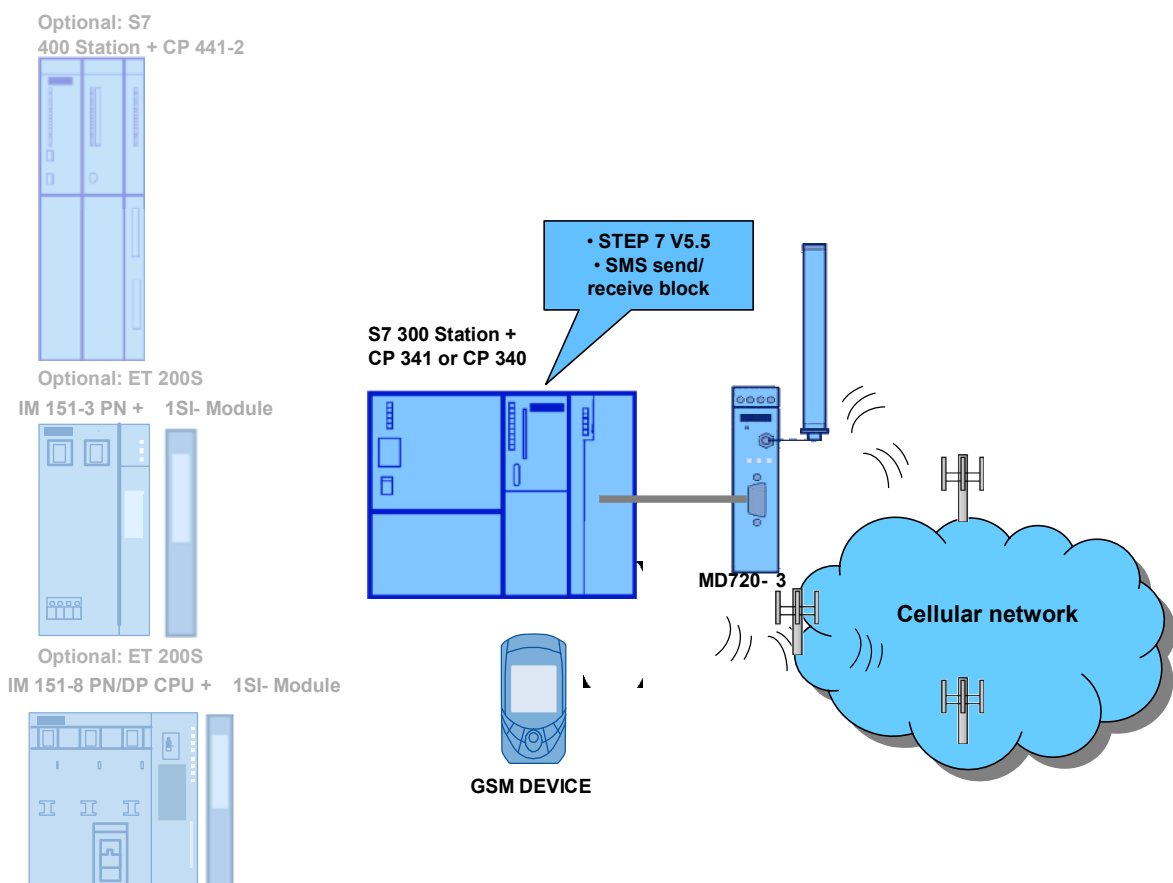
## Scope of validity of the library V2.0

- STEP 7 V5.5
- S7-300/400/ ET 200S Station
- GPRS/GSM Modem MD720-3

## Schematic layout

The following figure gives a schematic overview of the most important components of the solution:

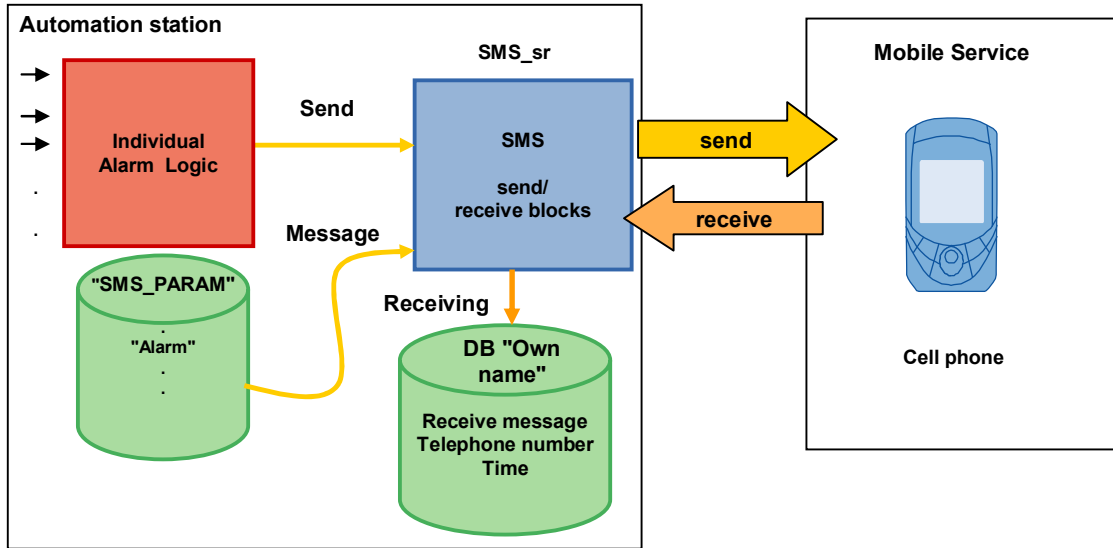
Figure 1-1



**Scope of "Sending and receiving test messages"**

The figure below shows a schematic illustration of the functionality of this solution:

Figure 1-2



## 2 Library Overview

### 2.1 Program blocks

#### Overview

For the data exchange between S7-CPU, communication processor and GSM modem, different blocks are required, depending on the CP type and S7-CPU family.

#### Content of the “SMS\_SR\_Library” library

The table below shows what blocks you have to insert for what hardware.

Table 2-1

S7-Station	CP	Program block	Object name
<b>S7- 300</b>	CP 340	Function blocks: SMS_sr_CP_340 P_RCV P_SEND	[FB18] [FB2] [FB3]
		Global data block: SMS_PARAM	[DB11]
		Variable table: VAT_CP340	VAT_CP340
	CP 341	Function blocks: SMS_sr_CP_341 P_RCV_RK P_SND_RK	[FB18] [FB7] [FB8]
		Global data block: SMS_PARAM	[DB11]
		Variable table: VAT_CP341	VAT_CP341
<b>S7- 400</b>	CP 441	Function block: SMS_sr_CP_441 System function blocks: BRCV BSEND	[FB18] [SFB13] [SFB12]
		Global data block: SMS_PARAM	[DB11]
		Variable table: VAT_CP441	VAT_CP441
<b>ET 200S</b> IM 151-3 PN or IM 151-8 PN/DP CPU	ET 200S_1SI	Function blocks: SMS_sr_ET_200S S_RECV_SI S_SEND_SI	[FB18] [FB2] [FB3]
		Global data block: SMS_PARAM	
		Variable table: VAT_ET200S_1SI	VAT_ET200S_1SI
Blocks used in all stations		IEC functions	FC2, FC10, FC11, FC17, FC20, FC21, FC26, FC29, FC32, FC38, FC91, SFB4



### **Call environment**

The SMS block (SMS\_sr\_xxx) must be called cyclic. It can be called in the OB1 or as an alternative in an interrupt OB.

We recommend the use of the OB35 (100ms) interrupt. A time interval larger than 200ms cannot be used due to the time monitoring of 30 sec during the configuration of the modem or the send process.

A detailed application example for the use of the SMS block can be found on the HTML page from which you downloaded this document.

## 2.2 Library resources

### 2.2.1 Main memory requirements

#### CP 340

The size of all program blocks in the main memory is approx. 15.5 Kbytes. They are composed as follows:

Table 2-2

Symbolic name	Object name	Size in main memory
SMS_sr_CP_340	FB18	7.834 Kbytes
P_SEND	FB3	1.59 Kbytes
P_RCV	FB2	1.9 Kbytes
SMS_PARAM	DB11	0.468 Kbytes
Called functions	FC2, FC10, FC11, FC17, FC20, FC21, FC26, FC29, FC32, FC38, FC91	3.54 Kbytes

#### CP 341

The size of all program blocks in the main memory is approx. 18 Kbytes. They are composed as follows:

Table 2-3

Symbolic name	Object name	Size in main memory
SMS_sr_CP_341	FB18	7.838 Kbytes
P_SND_RK	FB8	2.9 Kbytes
P_RCV_RK	FB7	3.144 Kbytes
SMS_PARAM	DB11	0.468 Kbytes
Called functions	FC2, FC10, FC11, FC17, FC20, FC21, FC26, FC29, FC32, FC38, FC91	3.54 Kbytes

#### CP 441

The size of all program blocks in the main memory is approx. 12 Kbytes. They are composed as follows:

Table 2-4

Symbolic name	Object name	Size in main memory
SMS_sr_CP_441	FB18	7.762 Kbytes
B_SEND	SFB12	-----
B_RCV	SFB13	-----
SMS_PARAM	DB11	0.468 Kbytes
Called functions	FC2, FC10, FC11, FC17, FC20, FC21, FC26, FC29, FC32, FC38, FC91	3.54 Kbytes

**ET 200S\_1SI Standard (alternatively: IM151-8 PN/ DP CPU)**

The size of all program blocks in the main memory is approx. 17 Kbytes. They are composed as follows:

Table 2-5

Symbolic name	Object name	Size in main memory
SMS_sr_ET_200S	FB18	7.838 Kbytes
S_SEND_SI	FB3	2.604 Kbytes
S_RECV_SI	FB2	2.4 Kbytes
SMS_PARAM	DB11	0.468 Kbytes
Called functions	FC2, FC10, FC11, FC17, FC20, FC21, FC26, FC29, FC32, FC38, FC91	3.54 Kbytes

**Note**

The required main memory for calling the “SMS\_sr\_CPxxx” function data block varies depending on the length of the input parameters.

**2.2.2 Local data storage requirement**

Table 2-6

Symbolic name	Object name	Local data
SMS_sr_CP_340	FB18	60 bytes
SMS_sr_CP_341	FB18	60 bytes
SMS_sr_CP_441	FB18	62 bytes
SMS_sr_ET_200S	FB18	60 bytes

## 2.3 Hardware/software requirements for this library

The following hardware and software components are the minimum requirement for operating the library.

### Hardware

#### CP 341/ CP 340

Table 2-7

No.	Order no.	No.	Component
1.	6ES7341-1AH01-0AE0 alternatively 6ES7340-1AH02-0AE0	1	Alternatively CP 341 CP 340
2.	6ES7 901-0BF00-0AA0	1	MPI connecting cable to load the project into the CPU

#### CP 441-2

Table 2-8

No.	Order no.	No.	Component
1.	6ES7441-2AA04-0AE0 alternatively <ul style="list-style-type: none"> <li>• 6ES7441-2AA05-0AE0</li> <li>• 6ES7441-1AA04-0AE0</li> <li>• 6ES7441-1AA05-0AE0</li> </ul>	1	CP 441-2
2.	6ES7 901-0BF00-0AA0	1	MPI connecting cable to load the project into the CPU

#### ET 200S\_1SI

Table 2-9

No.	Order no.	No.	Component
1.	6ES7151-3AA20-0AB0 alternatively 6ES7151-3AB01-0AB0	1	IM151-3 PN STANDARD interface module IM151-8 PN/ DP CPU
2.	6ES7138-4DF01-0AB0	1	ET 200S 1SI 3964/ASCII
3.	6ES7193-4CB20-0AA0	1	ET 200S, Terminal module TM E15S24-01
4.	6ES7193-4CD20-0AA0	1	ET 200S, terminal module TM-P15S23-A0
5.	6XV1 850-2GH60	2	Industrial Ethernet Twisted Pair cable
6.	6ES7972-0BA12-0XA0	1	Bus connector

### GSM components

The components are the same for all groups.

Table 2-10

No.	Order no.	No.	Component
1.	6NH9720-3AA00	1	MD720-3
2.	6NH9860-1AA00	1	GSM antenna
3.		2	SIM card
4.		1	Serial 9 pole 1:1 cable

<b>CAUTION</b>	<b>Do not send SMS messages containing the letter combination 'ERROR' or 'OK', since these are evaluated in MD720-3 and could cause faulty behavior when sent from MD720-3 to the communication module.</b>
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### Configuration software and tools

The configuration tools are the same for all groups.

Table 2-11

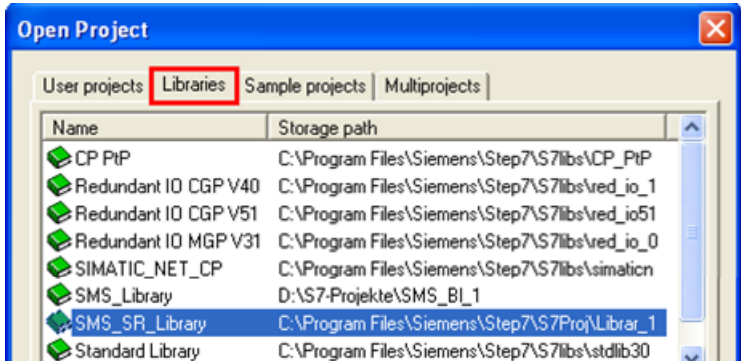
No.	Order no.	No.	Component
1.	6ES7810-4CC10-0YA5	1	STEP 7 V5.5
2.	This CD is delivered with the serial CPs and contains the hardware configuration of STEP 7 as well as handbooks.	1	S7-PTP_PARAM

## 3 Working with the Library

### 3.1 Integrating the library into STEP 7 V5.5

In order to use the previously described library functions, they have to be integrated into the configuration software first. The necessary steps are shown in the following table.

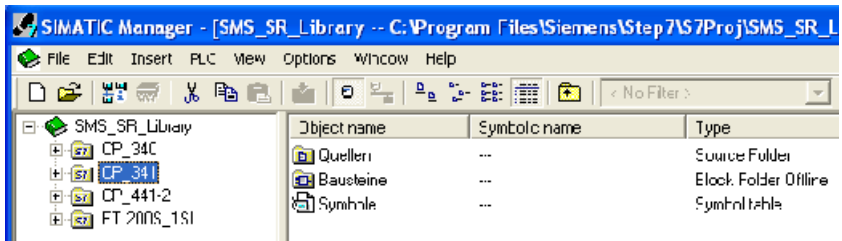
Table 3-1

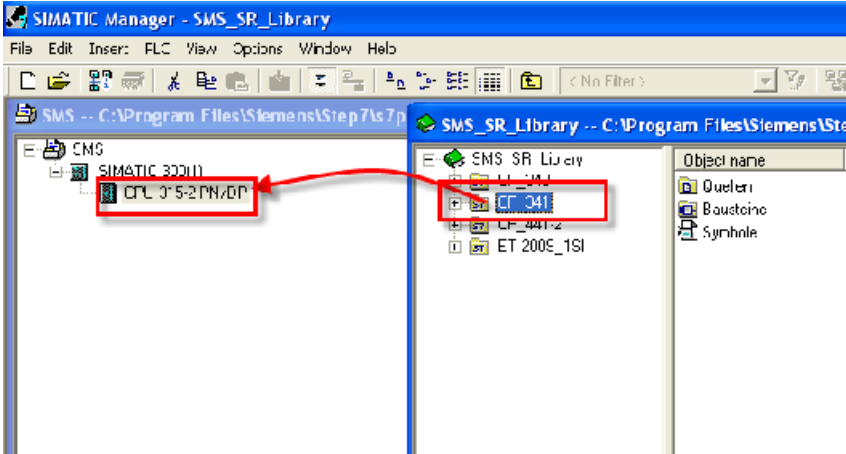
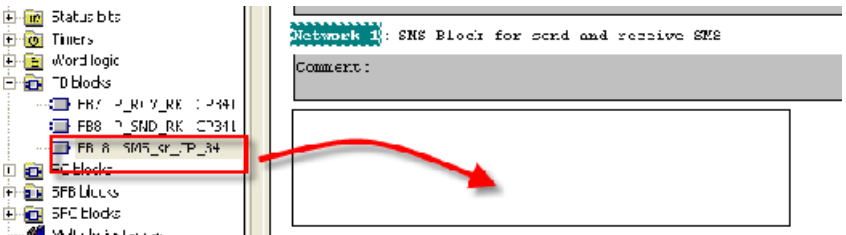
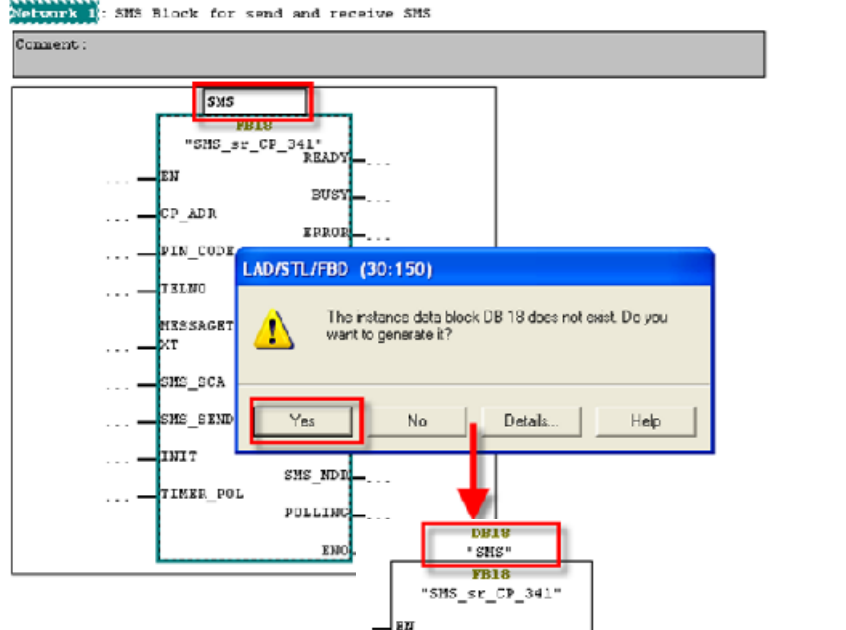
Step	Instruction
1.	The library is available on the HTML page where you loaded this document. Save the <b>SMS_SR_Library.zip</b> library to your hard disk.
2.	Open the <b>SIMATIC MANAGER</b> and unzip the STEP 7 <b>SMS_SR_Library.zip</b> library.  File -> Retrieve...
3.	From now on, the library is available under "Libraries". 

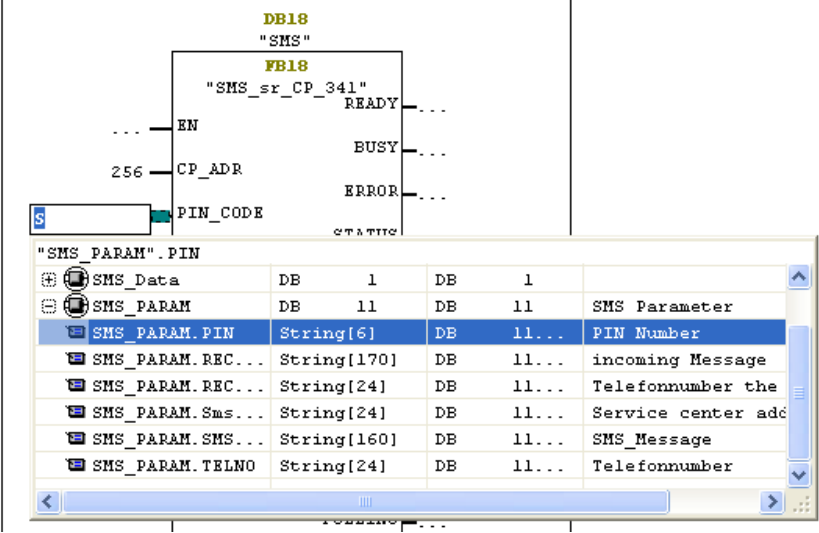
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### 3.2 Using library blocks

Table 3-2

Step	Instruction
1.	Open an already existing STEP 7 project .
2.	Open the CP folder you are using in your project in the <b>Library</b> . 

Step	Instruction
3.	<p>Select the <b>S7 program</b> of the library and insert it in your STEP 7 project using Drag&amp;Drop.</p> 
4.	<p>Save and once again Compile the HWConfig to create the System data.</p>
5.	<p>Insert the OB1 “organization block”, open it and now drag the “SMS_sr” function block via Drag&amp;Drop into any network.</p> 
6.	<p>Enter the name of the instance data block (recommended: “SMS”). Generate the instance data block if it does not exist.</p>  <p>Set within the properties of the Instance-DB the option "Non Retain". „Object Properties&gt; General Part2&gt; Non Retain“</p>

Step	Instruction
6.	<p>Assign all formal parameters with values of your choice. The values can be stored in any data block (e.g. "SMS_PARAM").</p>  <p>Save the OB1 "organization block" and load the STEP 7 Project.</p>



### 3.3 The “SMS\_PARAM” global data block

The following data records are stored in the “SMS\_PARAM” global DB.

- Modem parameters
- Send data
- Receive data
- Timer for receive polling

Figure 3-1 Data view in DB SMS\_PARAM

Address	Name	Type	Initial value	Actual value
0.0	PIN	STRING[10]	''	'xxxx#R'
12.0	TELNO	STRING [ 24 ]	''	''+49xxxxxxxxxxxxx"R'
38.0	SMS_TEXT	STRING [ 160 ]	''	'Point to Point Communication'
200.0	RECV_Message	STRING [ 170 ]	''	''
372.0	RECV_TELNO	STRING [ 24 ]	''	''
398.0	RECV_Date	DATE_AND_TIME	DT#90-1-1-0:0:0.000	DT#90-1-1-0:0:0.000
406.0	Sms_csa	STRING [ 24 ]	''	''+49xxxxxxxxxxxxx"R'
432.0	Timer_Polling	TIME	T#1M	T#1M

You can also store these data records in other data blocks for your solution.

At the time of **Initialization** the following modem parameters are sent to the modem:

- PIN (PIN number)
- Sms\_csa (number of the provider's service center)

During the **send process** the following values are sent to the modem:

- variable TELNO (STRING[24]) and
- variable SMS\_TEXT (STRING[160]).

The receive buffer of the GSM modem is polled at regular intervals. The time value is determined by the value of the Timer\_Polling parameter (in this configuration 1 minute). When **receiving** a new message, the “RECV\_MESSAGE”, “RECV\_TELNO” and “RECV\_DATETIME” information contained in the message is stored in the area of the receive data. The user must provide, immediately after setting the SMS\_NDR bit, to secure that data.

#### Note

The initialization, the Polling process and each send process is time monitored through the internal timer. An error is output if the two processes are not successfully completed within the monitored time.

**TIMER\_INIT** default value : 30 sec

**TIMER\_CHECK** default value : 10 sec

**TIMER-SEND** default value : 15 sec

If you want to change the times, you can enter the values directly in the instance data block of the SMS\_sr\_xxx block (see figure 3-2).

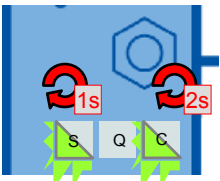
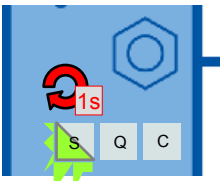
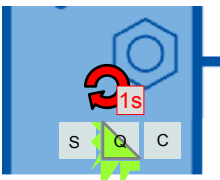
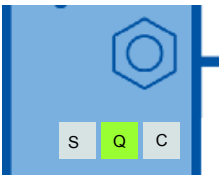
Figure 3-2 Data view monitoring timer in DB "SMS\_sr\_XXX"

TIMER_INIT	TIME	T#30S	T#30S
TIMER_SEND	TIME	T#15S	T#15S
TIMER_CHECK	TIME	T#10S	T#10S

### 3.4 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 3-3

No.	Principle of 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.	If the initialization was triggered, the modem will check the parameters. 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.

### 3.5 Configuration of the serial CPs

All serial CPs in this library use the ASCII driver. This makes it possible to send or receive AT commands and plain text code through the interface.

The ASCII driver has to be configured with the following properties (also see application description chapter 5.1.4 Configuration of serial CPs):

- Transmission rate      9600 bit/s
- Data bits                      8
- Stop bits                      1
- No parity check              none

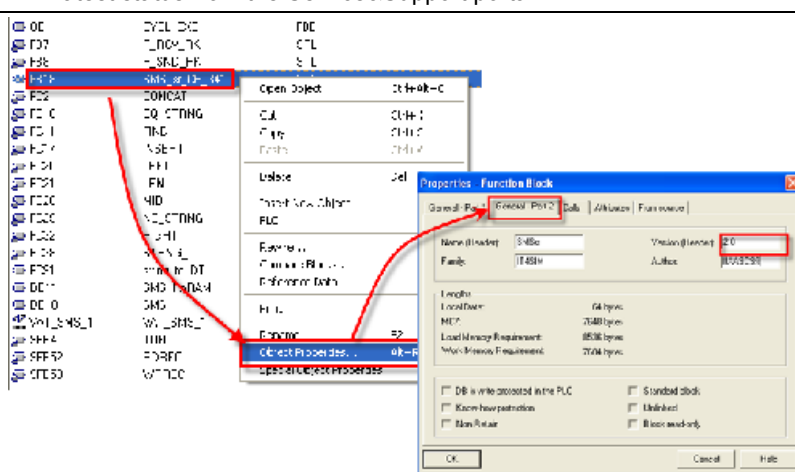
#### Note

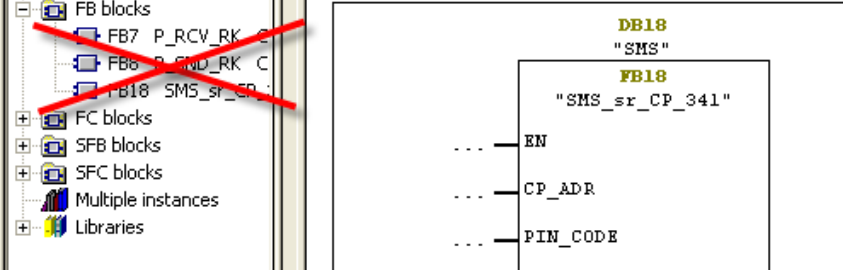

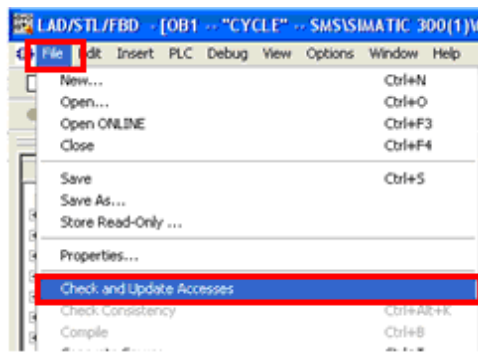
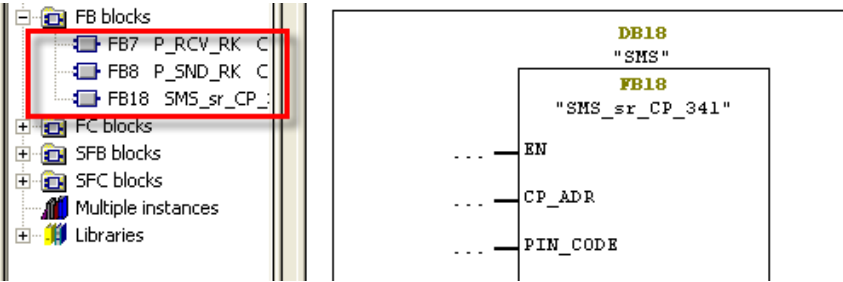
If you use an S 7-400 you also must configure and load NetPro. Select **Lokale ID 1000**. This ID is used by the cp\_send and cp\_rec (con\_id).

### 3.6 Checking and updating the library

The following instruction shows you how to check the library version and how you update it, if necessary.

Table 3-4

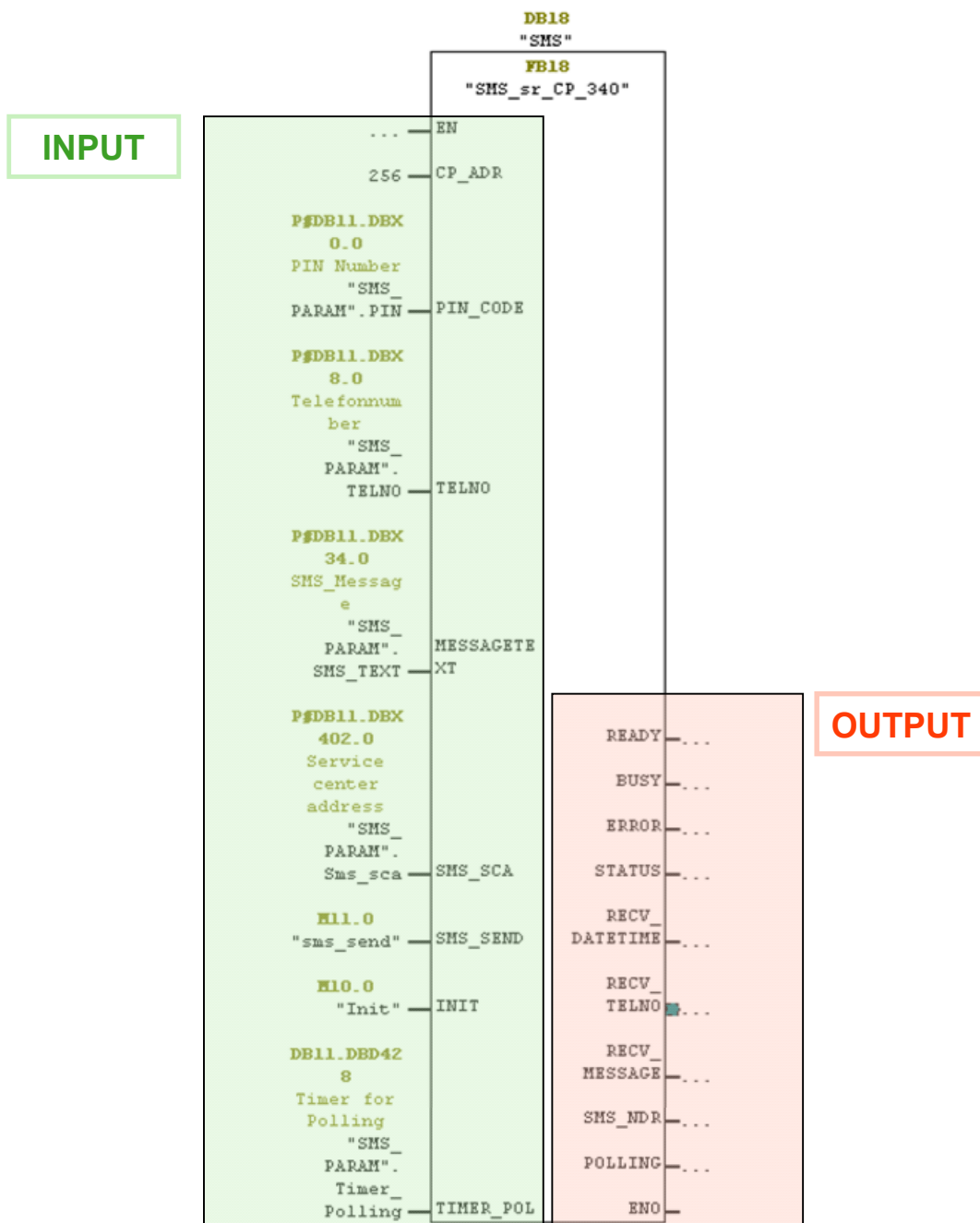
Step	Instruction
1.	<p>Execute the following steps for each element of the library.</p> <ul style="list-style-type: none"> <li>• Right-click the function or the data block and select the “Object Properties” option in the context menu.</li> <li>• In the displayed “Properties” window select the “General - Part 2” menu.</li> <li>• Compare the current version number in the “Version” output field with the latest status from the Service&amp;Support portal.</li> </ul>
2.	
3.	<p>If you wish to update the library, add the most current library now, as described under chapter 3.1.</p>

Step	Instruction
4.	<ul style="list-style-type: none"> <li>• Delete all relevant elements in the “Blocks” folder.</li> <li>• Do <u>not</u> delete the function block call in OB1.</li> </ul> 
5.	Add the new elements of the library as described in chapter 0 up to step no. 4.
6.	<p>The updated block elements have now been added. However, the original call of the “SMS_sr” function block still indicates a missing instance data block.</p> 
7.	<p>Check the accesses and update them.</p> <p>File-&gt; Check and Update Accesses</p> <p>This is where you check all operands for type compatibility and if there is an error, have them highlighted in red. All instance DBs are updated or are newly created.</p> 
8.	<p>The library update is now completed.</p> 

## 4 Interface Description of the Library

The SMS block is a configurable function block. All information that this block requires is transferred to the parameter during the call. The following picture shows the logical grouping of the block parameters.

Figure 4-1



## 4.1 Significance of the individual parameters

Table 4-1

Name	Data type	Description/note
CP_ADR	INT	Logic address of the CPs (hardware configuration).
PIN_CODE	STRING[6]	<ul style="list-style-type: none"> <li>PIN number of the SIM card inserted in the modem</li> <li>Example: 'xxxx\$R' &gt; '1234\$R'</li> </ul> Make sure that you only replace the pin number (xxxx). The "\$R" control character must not be deleted!
TELNO	STRING[24]	<ul style="list-style-type: none"> <li>Receiver's telephone number of the device to which the SMS is to be sent</li> <li>Example: ""+49xxxxxxxx"\$R', ""+49123456789"\$R'</li> <li>Make sure that you only replace the telephone number (+49xxxxxxxx). The "\$R" control character and the quotation marks must <b>not</b> be deleted!</li> <li>Permissible value: Maximum 24 characters</li> </ul>
MESSAGETEXT	STRING[160]	<ul style="list-style-type: none"> <li>Content of the SMS which is to be sent</li> <li>Maximum text length: 159 characters (without quotation marks).</li> <li>Example: "Point to Point Communication"</li> </ul>
SMS_SCA	STRING[24]	<ul style="list-style-type: none"> <li>Enter the short message center of your provider here</li> <li>Example: ""+49xxxxxxxx"\$R' &gt; ""+49123456789"\$R'</li> <li>Make sure that you only replace the telephone number (+49xxxxxxxx). The "\$R" control character and the quotation marks must <b>not</b> be deleted!</li> <li>Permissible value: Maximum 24 characters</li> <li>List (e.g. for Germany): <a href="http://www.telespiegel.de/html/sms-kurzmitteilungszentralen.html">http://www.telespiegel.de/html/sms-kurzmitteilungszentralen.html</a></li> </ul>
EN	BOOL	<ul style="list-style-type: none"> <li>CALL_FB is executed if EN = 1. (Only relevant in the FUP and KOP view)</li> </ul>
INIT	BOOL	<ul style="list-style-type: none"> <li>Enables the initialization process</li> <li>Only responses to a positive edge</li> <li>all Messages stored at the modem are deleted</li> </ul>

Name	Data type	Description/note
SMS_SEND	BOOL	<ul style="list-style-type: none"> <li>Starts the send process</li> <li>Only responses to a positive edge</li> </ul>
TIMER_POL	TIME	<ul style="list-style-type: none"> <li>Timer for receive polling</li> <li>Once this timer has elapsed, the polling of the received data is triggered</li> <li>Once this timer has elapsed, but a sending process is just active, the received SMS are collected at the next cycle</li> <li>Permissible value: You can enter any time value in S7 format, e.g.: T#1M</li> </ul>
SMS_NDR	BOOL	<ul style="list-style-type: none"> <li>Signals the receipt of an SMS</li> <li>The RECV_DATETIME, RECV_TELNO and RECV_MESSAGE parameters are only valid after setting this output. The user must provide, immediately after setting this bit to secure that data</li> <li>Only true for <b>one</b> TRUE cycle</li> </ul>
POLLING	BOOL	<ul style="list-style-type: none"> <li>Shows that the polling of the receive buffer of the modems is enabled</li> </ul>
READY	BOOL	<ul style="list-style-type: none"> <li>An SMS can only be send or received at TRUE</li> <li>If the initialization was completed successful, "READY" is set to TRUE</li> <li>Set to FALSE if the "SMS_sr_xxx" block is busy with <ul style="list-style-type: none"> <li>the initialization of the modem</li> <li>the send process</li> <li>the receive polling</li> </ul> </li> </ul>
BUSY	BOOL	<ul style="list-style-type: none"> <li>Set to TRUE if the "SMS_sr_xxx" block is busy with <ul style="list-style-type: none"> <li>the initialization of the modem</li> <li>the send process</li> <li>the polling</li> </ul> </li> <li>Takes on the FALSE state as soon as the above processes have ended</li> </ul>
ERROR	BOOL	<ul style="list-style-type: none"> <li>Gives feedback if an error occurs during the processing of a routine</li> <li>Stays TRUE until initialization is triggered again by INIT</li> <li>Default value: FALSE</li> </ul>
STATUS	WORD	<ul style="list-style-type: none"> <li>returns the status to be able to localize the cause of the error if ERROR = TRUE (See chapter 4.3)</li> </ul>
RECV_DATETIME	DATE_AND_TIME	Time stamp of the received SMS
RECV_TELNO	STRING[24]	Sender telephone number
RECV_MESSAGE	STRING[170]	Message of the receive SMS
ENO	BOOL	If the FB 18 ("SMS_sr_CPxxx") is processed correctly, ENO = 1 (Only relevant in FUP and KOP view)

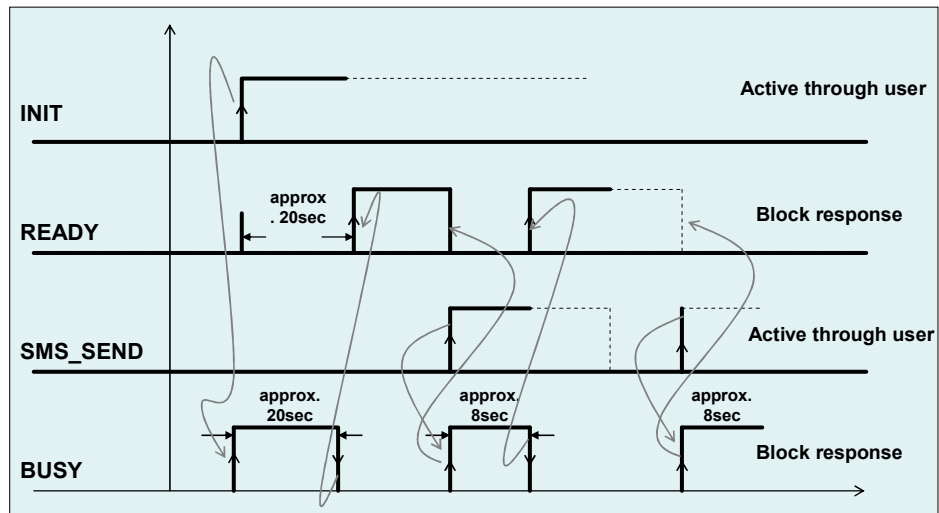


## 4.2 Functional Diagrams

The following functional diagrams show the graphic display of the functional sequence of the FB18 "SMS\_sr\_CPxxx" function block.

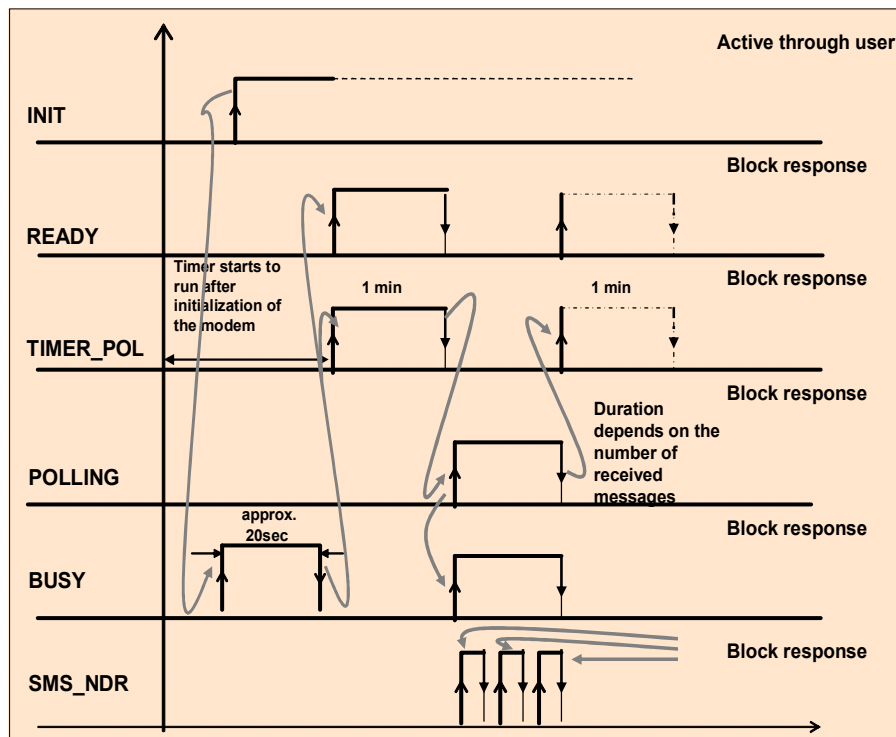
### Functional diagram of a send process

Figure 4-2



### Functional diagram of a receive process

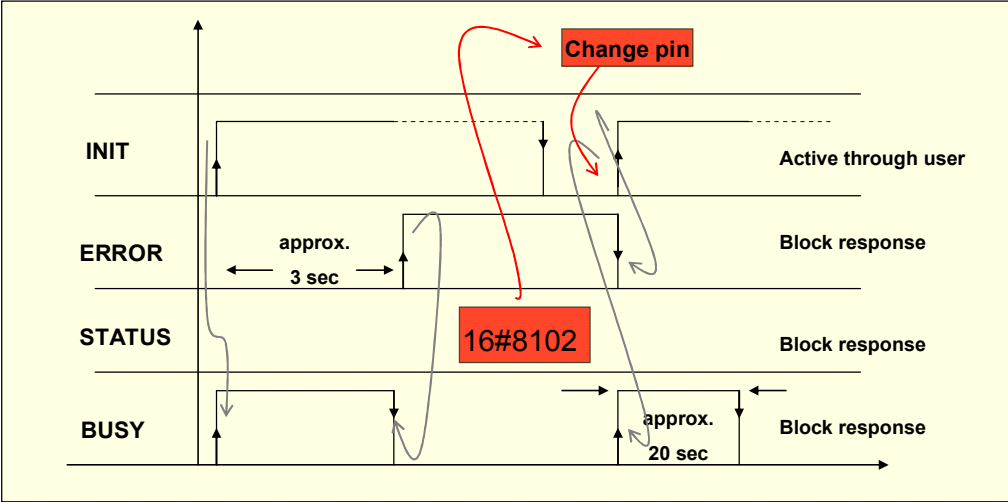
Figure 4-3



**Functional diagram of an error state**

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

Figure 4-4



### 4.3 STATUS output of the “SMS\_sr\_xxx” function block

The FB “SMS\_sr\_xxx” function block has a STATUS output for error diagnostics. By reading the STATUS output of the function block, you will receive statements to logical errors and to error messages that may occur during the transfer between communication processors and GSM modem.

Table 4-2

State	Meaning	Support/Remark
16#8101	The watchdog timer has expired during the initialization of the modem because: <ol style="list-style-type: none"> <li>the number of the short message center is incorrect</li> <li>the communication between controller and modem interrupted during initialization</li> </ol>	<ul style="list-style-type: none"> <li>Check and change the number of the short message center</li> <li>Check cable between controller and modem</li> <li>Restart initialization</li> </ul>
16#8102	Incorrect PIN	<ul style="list-style-type: none"> <li>Check and change PIN</li> <li>Restart initialization</li> </ul>
16#8103	Modem could not be switched to text mode.	<ul style="list-style-type: none"> <li>Restart initialization</li> </ul>
16#8104	The SMS indicators could not be transferred.	<ul style="list-style-type: none"> <li>Restart initialization</li> </ul>
16#8105	The storage period of the SMS could not be transferred to the modem.	<ul style="list-style-type: none"> <li>Restart initialization</li> </ul>
16#8106	The watchdog timer has elapsed during the send process because: <ol style="list-style-type: none"> <li>the telephone number of the receiver is wrong</li> <li>the communication between controller and modem interrupted during the send process</li> </ol>	<ul style="list-style-type: none"> <li>Check parameters and if necessary change them (telephone number of the receiver)</li> <li>Check cable between controller and modem</li> <li>Restart initialization</li> </ul>
16#8107	The previous job is not yet completed. (You have started a new send process, although BUSY was still active)	<ul style="list-style-type: none"> <li>Restart initialization</li> </ul>
16#8108	Error when reading the SMS message.	<ul style="list-style-type: none"> <li>Restart initialization</li> </ul>
16#8109	The modem has to be initialized. (This error occurs when the modem is not yet initialized and you have started a send process)	<ul style="list-style-type: none"> <li>Restart initialization</li> </ul>
16#8110	The watchdog timer has expired during the Polling because the communication between controller and modem interrupted.	<ul style="list-style-type: none"> <li>Check cable between controller and modem</li> <li>Restart initialization</li> </ul>

**Note** Errors that do not have a 16#81xy status are CP errors. They can be read in the appropriate CP manuals (Table 5-1).

**Note** If the support does not lead to the desired result it may be helpful to load the MD720-3 factory settings. For this purpose use a paper-clip. Press the SET button until the "C" LED lights up and then remove the paper-clip. Once booting has completed, the modem will assume the state as shown in Table 3-3 no. 1.

## 5 Links & Literature

Table 5-1

	Topic	Link details
\1\	Reference to this document	<a href="http://support.automation.siemens.com/WW/view/de/25545680">http://support.automation.siemens.com/WW/view/de/25545680</a>
\2\	Siemens Industry Customer Support	<a href="http://support.automation.siemens.com">http://support.automation.siemens.com</a>
\3\	Manual on MD720-3	Available in Product Support; Entry ID: <a href="#">523117745</a>
\4\	Manual on CP 340	Available in Product Support; Entry ID: <a href="#">1137332</a>
\5\	First steps with the CP 340	Available in Product Support; Entry ID: <a href="#">12108826</a>
\6\	Manual on CP 341	Available in Product Support; Entry ID: <a href="#">1117397</a>
\7\	First steps with the CP 341	Available in Product Support; Entry ID: <a href="#">1188622</a>
\8\	Manual on CP 441-2	Available in Product Support; Entry ID: <a href="#">1137419</a>
\9\	First steps with the CP 441-2	Available in Product Support; Entry ID: <a href="#">1188835</a>
\10\	SIMATIC ET 200S manual	Available in Product Support; Entry ID: <a href="#">9260793</a>

## 6 History

Table 6-1

Version	Date	Modification
V2.0	02.2013	Figure 3-1 has been changed
V2.0	07.2011	Complete revision of V1.0
V1.0	16.07.2007	First issue