
Sample project PGU_SMS_POLLSMS

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1. Summary

1.1 Functional description

This sample project is intended to show it is possible to

- establish an **online connection** between PG5 and a PCD,
- send SMS messages
- receive SMS messages and interpret their content by the use of the DTMF driver

All those functionalities are programmed in Fupla by the use of the Modem library. The PCD has to be equipped with a GSM terminal in order to be able to receive SMS messages.

1.2 Possible application

The main advantage of a GSM terminal is that there is no need for a landline in order to access the PCD remotely.

This sample project may be used as base for every program where remote access to a PCD is required.

The possibility of sending SMS messages may be used for alarming e.g. the maintainer of a remote installation in case there is a problem detected. This way the maintainer will most likely know about the problem before the end user will recognise the problem.

1.3 Hardware and software used

Hardware:

PCD:	PCD3.M5540	Demo model, Firmware min. 010
GSM terminal ¹ :	Siemens TC35	SIM card must support data service!

Minimal software versions:

SAIA PG5 1.3.120 with Fupla Modem library licensed (or at least in demo mode)
HyperTerminal of Windows (optional)

¹ Since the reading of SMS messages from the SIM is realised by a special command set, there is no guarantee that this functionality is supported for all GSM terminals. Therefore the use of GSM terminals tested by SAIA Burgess Controls AG is absolutely recommended.

2. Procedure before Fupla programming

2.1 Preparing the SIM card

SIM cards are protected by a PIN code by default. Therefore either the PIN code must be entered in the Initialisation string of the modem (configured in the hardware settings of the PCD) or the PIN code must be disabled.

In usual cases it is the easier way to enter the PIN code in the initialisation string of the modem. The initialisation string (init string) will be sent to the modem on start-up of the PCD and is used to configure the modem. One important setting initialized by the init string is e.g. the answer mode. This mode defines whether the modem shall answer an incoming call (which might be undesirable in some cases) or not.



In this document a virtual PIN code (1234) is used. It is absolutely necessary to adjust this code to the code of your SIM!

2.1.1 Disabling the PIN code statically

The easiest way to disable the PIN code of a SIM card it using the HyperTerminal which is standard software delivered together with Windows.

The GSM terminal has to be connected to the COM port of the PC with a non-crossed RS232 cable (communication settings: 9600 baud, 8 data bits, No parity, 1 stop bit).

```

at+cl                                     ;; enabling echo mode

at+cpin?                                 ;;Is the PIN code disabled?
+CPIN: SIM PIN                           ;;NO
OK

at+cpin="1234"                            ;;Entering PIN Code
OK

at+clck="SC",0,"1234"                     ;;Disabling PIN Code of the SIM card
OK                                         ;;OK, the PIN code is disabled
  
```

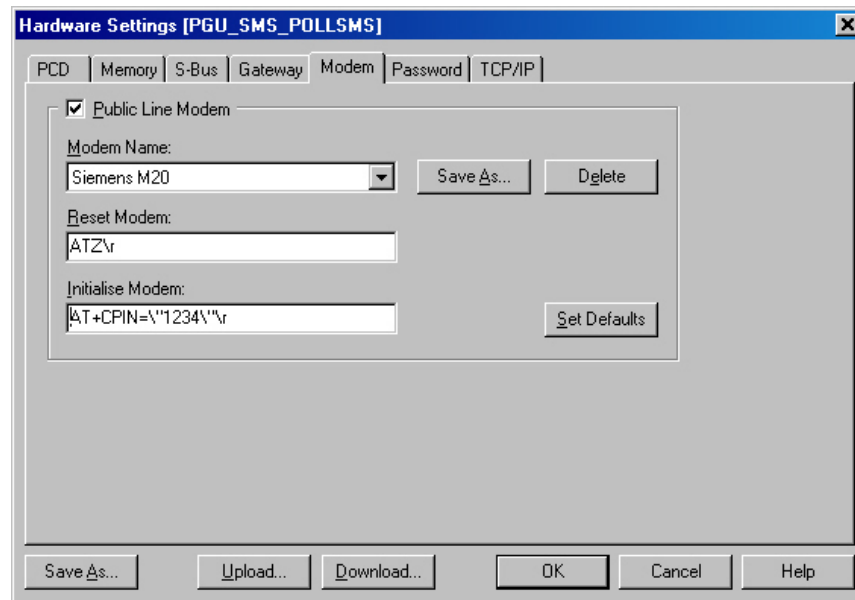
Note that it is also possible to disable the PIN code with some mobile phones. If your phone supports this functionality, this might be the easiest way for disabling the PIN code.

2.1.2 Configuring the PIN Code in the Init string

In order to disable the PIN code (only for the time until the next power down of the modem) it must be supplied in the init sting. The init string configures the modem and is sent to the modem right after its power up. It is to be found on the Modem tab of the Hardware Settings of the PCD (in the Settings folder of the PG5 Project Manager project tree).

AT+CPIN=\r1234\r

By default the init string: **AT\r** is entered in the corresponding field. This requires the PIN code to be disabled!



2.1.3 Data Service

For transmitting the telegrams of the S-Bus protocol which is used for the communication between the PG5 and the PCD the SIM card must support the „data service“. Note that this is not the same as “WAP” service or „GPRS“. Please ask your provider to enable the data service on your SIM card.

However, sending and receiving SMS messages don't require data service.

Please consider that the GSM network doesn't cover every place. Therefore make sure the network is available at the site you'll install the PCD equipped with the GSM terminal (modem).

2.2 Configuring the PCD

In case the example project will be run on another type than the HW settings are configured for, please adjust the PCD type and rebuild the whole project before downloading the hardware configuration and code.

A GSM terminal must be connected to the PCD by a RS232 full connection in order to establish a S-Bus or PGU connection. This means that it is only possible to use either a PCD7.F120 or a PCD7.F552 communication module for an online connection to the PCD. On a PCD3.M5xxx controller it is also possible using the onboard port 0.

If the port 0 of a PCD3 is used for dealing with the modem, make sure that the checkbox “Full RS232 Handshaking on port 0” in the hardware settings of the PCD is checked. This will configure full handshaking on port 0 (which implies that the PGU cable PCD8.K111 won't be detected automatically if it is plugged in!)

3. Functional description and settings in Fupla

3.1 Page 1: Standby mode for online connection

In order to establish an online connection from the PG5 to the PCD three preconditions must be fulfilled:

- The modem must be configured in the Hardware settings of the PCD
- The S-Bus mode in the hardware settings must be S-Bus Data
- If a Modem 14 is placed, the “default standby” mode must be set to “S-Bus PGU”
- The configured port (in the hardware settings and channel in the “Modem 14” FBox) must match the port to which the Modem is connected to.

If those four points are fulfilled, the PCD will answer an incoming call and tries establishing a connection to PG5. The master of this connection will PG5 be.

Over this connection it is possible to configure, reprogram and stop/start the PCD.

In this configuration the PCD will also answer if the PCD is in stop or halt mode.

Please make sure that in the hardware settings of PG5 as well as in the Modem 14 FBox the correct modem type is selected.

3.1.1 Settings of the “Modem 14 FBox” that are not default values:

The settings listed below aren’t default settings that are set as soon as the Modem 14 FBox is placed.

- Channel to which the modem is connected (with a non-crossed RS232 cable)
- Default S-Bus Mode (S-Bus PGU)
- Modem type (select the modem you use)
- Dial signal (GSM)

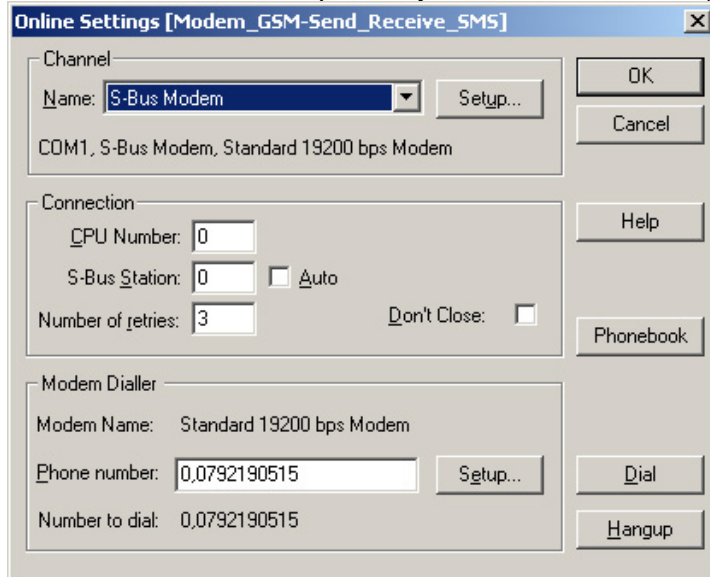
The FBox is to be found in the family “Modem” in the “App” tab of the FBox selector. If the FBox selector isn’t shown on your Fupla window, select it from the menu “View”.

3.1.2 The online settings in PG5

The type of the online connection is defined in the online settings (from the project tree of the PG5 Project Manager). These settings are applied on next launch of the communication driver (its icon is placed on the right side of the Windows task bar).

The following settings are required for a modem online connection:

- Channel name: "S-Bus Modem"
- S-Bus station number of the PCD (or the enabled checkbox "Auto")
- Phone number of the connected PCD. (A comma in the number causes a short break which is required by some switchboards.)



- In the Channel setup of the channel "S-Bus Modem", the modem of the PC is to be selected.
- Further on, the Response timeout is to be increased to about 2 seconds (because the modem connection is slower than a direct connection)

Hint:

It may take several seconds until the first telegram is transmitted over the just established modem connection. This will cause the S-Bus driver to terminate the connection (due to a "no response").

In order to avoid this termination, the modem connection can be established by the button Dial. Once the connection is established, it is possible going online with S-Bus in the Project Manager main window.

3.2 Page 2: Sending SMS messages

On the second page of the Fupla file the FBoxes for sending SMS messages are placed. This task requires at least two FBoxes:

3.2.1 FBox “Call SMS”

The first FBox organises the communication between the SMS server and the PCD. Therefore the phone number of the SMS server (you’ll get this number from you provider; it is the same number as a mobile phone uses for sending SMS messages) is to be specified here.

Please enter also the country code (beginning with a “+”).

Since the numbers entered in the parameter boxes of the FBox will be stored in a PCD register (32 bit) in “char format” (one character requires 4 bits), only 8 numbers (characters) may be hold by one register. Therefore the phone numbers will be divided in several registers.

Additionally, the destinations of the SMS messages are to be defined in this FBox. Note that the parameter “Service prefix” may only be used if all destinations do have an identical service prefix. In most cases this is not the case what causes the “service prefix” being not used at all and left empty.

The parameter “Originator” is only used if the SMS is sent by an analogue modem and has no effect if used with a GSM modem.

The input “En” of the FBox enables the FBox. SMS messages are only sent if this input has the state “1” (high).

3.2.2 Settings of the “Call SMS” FBox that are not default values:

The settings listed below aren’t default settings that are set as soon as the “Call SMS” FBox is placed.

- SMS server number (Tf number1..3); enter the SMS server of your provider
- Protocol option; select “GSM-text”
- Destinations; enter the mobile number(s) where the SMS messages are to be sent

3.2.3 FBox „Send SMS“

The second FBox on this page is used to trigger the single SMS messages to be sent. Further on destination of the SMS as well as the content of the message is specified (by providing the text address to be sent).

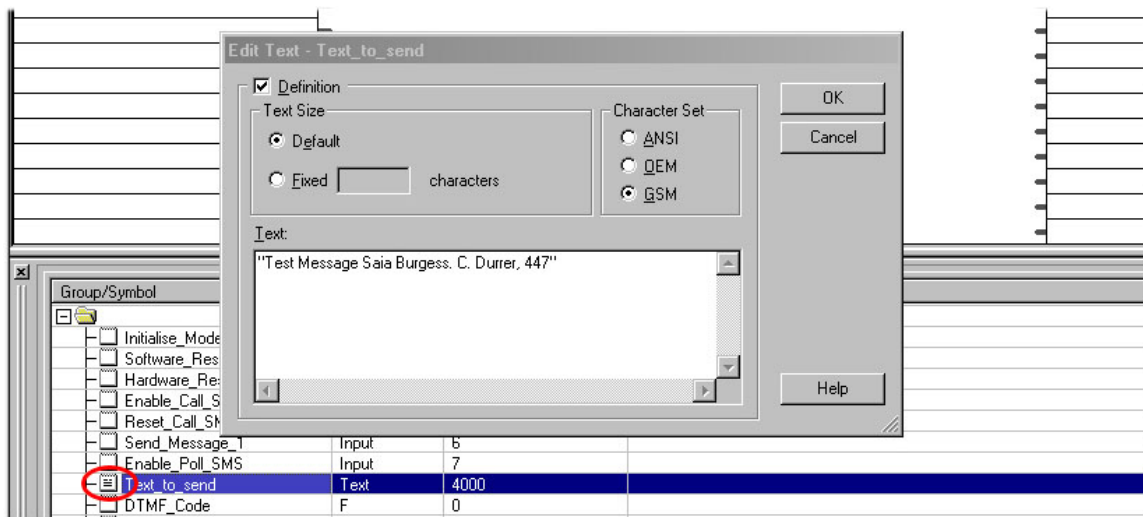
For every combination of recipient and message one “Send SMS” FBox is required.

Every time the state of the input “Cal” rises from 0 to 1, the specified message is sent to the according recipient (“1” means to “Destination 1” of the Call SMS FBox and not the phone number “1”). If the first attempt of sending the SMS message fails, it will be repeated as long as the state of input “Cal” stays high (maximal retry count is specified in the FBox “Call SMS”).

A message will be regarded as sent if the SMS server responds with an “OK” at the end of the transmission. This doesn’t mean that the message was received by the recipient.

The content of the text address entered on the face of the FBox will be sent. In the example the text does have the symbolic name “Text_to_send”. This text contains “Text Message Saia Burgess, C. Durrer, 447”. The definition for this text is done in the Edit Text window (see below) that is opened by double-clicking the small box (marked red in the screenshot below) in front of the symbol name in the Symbol editor.

Select “GSM” as Character set in the text definition window (this setting only takes effect if special character such as “@” are sent).



3.2.4 Settings of the “Send SMS” FBox that are not default values:

The settings listed below aren’t default values that are set as soon as the “Call SMS” FBox is placed.

- The destination is depending on the recipient to whom the message is to be sent.
- The Text to be sent in the message has to be defined in the Symbol Editor; its symbol name is to be entered on the face of the FBox

3.3 Page 3: receiving SMS messages

The reception of SMS messages is realised through the FBox „Poll SMS“. This FBox polls the GSM terminal in intervals. If the modem states to have received a message, this message will be read and passed to the DTMF driver (Dual Tone Multi-Frequency; in fact we don't have a frequency in this case, but the driver interprets the characters received in the SMS as if he got them from a modem supporting DTMF). The DTMF driver will then set the according flags of registers.

The DTMF driver features a functionality to respond to the sender according to the actions he has done (whether all commands were executed or not)

3.3.1 The “Poll SMS” FBox

In the adjust window of the „Poll SMS“ FBox the SMS protocol is to be set to DTMF. The other parameters may be set to default values.

Optionally the address of the confirmation message may be set to either the originator of the message or to a static number.

The interval, in which the modem is polled, may also be adjusted. In this relation it is important to keep in mind that while the modem is polled, it can't answer to incoming calls.

As soon as a message is read from the SIM card, it will be deleted.



The FBox needs some specific data that it receives every time a message is sent. Therefore at least one message has been sent before the polling mechanism works!

3.3.2 The DTMF FBoxes

The content of a message has to have the common DTMF syntax (see example below).

The access code in this example is 1234. It is the first command to be given.

1*1234#500*1*1#600*0*5678#.

Description of the DTMF code:

1*1234#	Entering the access code.
500*1*1#	Setting the second output of the FBox “DTMF USet” with the function code 500. The function code is specified in the adjust window of the according FBox.
600*0*5678#	Setting the first output value of the FBox “DTMF UPar” (Function code 600) to 5678.

The access code is to be entered as first command in every message!

4. Errors and debugging

4.1 Common errors

The list below describes some of the common problems and their reasons related with the in this document described features.

Error	Cause and resolution of error
The GSM modem is not reachable	Please check whether the modem accepts the PIN code configured. The best way to do this is with the HyperTerminal (see chapter 2.1) Make sure the GSM modem is placed in a site where the GSM network is available (check e.g. with a normal mobile phone)
No online connection to the PG5 is possible	Check whether data mode is supported by your SIM card (see chapter 2.1.3). Note that some providers sell SIM cards with several numbers; one supporting data service and one not supporting it (but e.g. Voice calls).
No SMS messages are sent	Check the number of the SMS servers and make sure you have used the „+“ as prefix for your country code. (In older versions of the modem library a „!“ instead of the „+“ was needed.)
The FBox „Modem 14“ shows a “Fatal Error” in the diagnostics	Make sure the connection from PCD to the modem is done properly. The lines mustn't be crossed!
	Check whether the hardware settings do fit the settings in the Modem 14 FBox.

4.2 Troubleshooting / debugging

When troubleshooting, it is advisable to start with an underlying function and test further functions one by one. It makes sense to start e.g. by checking whether an online connection is possible without programming the PCD (only downloading the hardware settings with the modem configuration).

The next step would be sending SMS messages, and finally the reception of the SMS messages.

The adjust window of the “Modem 14” FBox is a very helpful tool since in this window the error will be listed. Together with the online help most error code values shown on this page may be interpreted.

If in this window an error code with a value higher than 3000 is displayed, it indicates a problem with the text to be sent. In this case, have a look at the text; it probably doesn't exist at all.

4.3 Restrictions

The functionality „PGU and DTMF“ as default standby mode (see FBox „Modem 14“) is not possible because DTMF is not supported by the GSM networks.

Only a full RS232 port (all 9 pins used) allows an online connection.

4.4 Sources

(Nearly) all the information found in this document can be found in the online help of PG5.