SMS Reporter
User's Manual

SMS Reporter
GSM Communication Unit

Decode data communications
Belgrade, August 2010

Document Name: User's Manual

Device: SMS Reporter

Revision History:

Doc Ver	Date	Note
1.0	11.05.2009	Initial document
2.0	03.08.2010	Changed the document structure, added the LED description
2.0.e	04/08/10	English version
2.1	22.03.2012	Init commands moved to production procedures

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1 Notations and abbreviations used in this document

Notation	Description
!!!	Important warning
<CR>	Carriage Return character (ASCII table value 13 decimal)
<LF>	Line Feed character (ASCII table value 10 decimal)
<500ms>	Time interval longer than 500ms through which there is no communication on the serial line
->	Command or query sent from PC towards the device
<-	Response sent from the device to the PC

TABLE 1: DOCUMENT NOTATION

Abbreviation	Description
GSM	Global System for Mobile Communications
SMS	Short Message Service
ASCII	American Standard Code for Information Interchange

TABLE 2: USED ABBREVIATIONS

2 Device description

SMS Reporter is an industrial GSM communication device capable of:

- Sending reports on the state of digital/analogue inputs in the form of SMS text message. The reports can be initiated by the change in input state, input reaching the predefined threshold level, or on a periodical basis.

- Receiving the SMS messages and processing its content. Upon the receipt of the SMS, the device will process the message (with predefined syntax). The SMS command message can be used to alter the outputs of the device, change the settings of the device, or perform the reading of any of the device parameters via response SMS.

- Setting the device parameters via RS232 interface using the same syntax as with the SMS message.

The current state of the device is shown by three LED indicators.

The device is powered by 8V to 32V DC and can be mounted on a 35mm DIN rail.

The device is being manufactured in three resource options (number of inputs and outputs) shown in Table 3.

Ref.	Name	Relay Outputs	Optocoupler Inputs	Analogue Inputs
110	SMS Reporter 110	1	1	0
343	SMS Reporter 343	3	4	3
686	SMS Reporter 686	6	8	6

TABLE 3: AVAILABLE HARDWARE PLATFORMS AND THEIR RESOURCES

3 Device operation

3.1 Operation modes

The device can be found in two modes of operation: command mode and reporting mode.

3.1.1 Command mode

The command mode of the device is used to setup or change the settings of the device by sending commands to the device via serial interface. The communication with the device can be obtained by using any serial communication terminal (e.g. Hyper Terminal).

!!!
In case of initial start-up of the device, the device is in the command mode and the serial interface parameters are set to (baud rate, data bits, parity bit, stop bits):

9600,8,N,1

!!!
To enter the command mode (from the reporting mode) of the device, the following sequence should be sent to the serial interface of the device:

<500msec>+++<500msec>

To indicate entering into command mode the device will respond with the following sequence over the serial interface:

<CR><LF>COMMAND READY<CR><LF>

After the command mode has been entered, the setting of the device can be achieved by sending the command sequence to the device via the serial interface.

The formatting of the command sequence must be according to syntax:

command_1; command_2; … ; command_N<CR><LF>

More than one command can be sent in one line. Each command in the command sequence must be separated with a semi-column. The overall length of the command sequence must not exceed 150 characters.

3.1.2 Reporting mode

In order for the device to have reporting functionality, the reporting mode must be entered.

In order to switch the device back from command mode into the routing mode, you should power off and after few seconds power on the device.
After the switching into the routing mode, after initialization on GPRS network, device is sending the following message on serial interface:

<CR><LF>REPORTER READY<CR><LF>

!!!
Once in reporting mode, the device is capable of:
- setting/adjusting or reading of the parameters,
- turning on/off and reading the current state of the relay outputs, and
- readout of the current state of digital and analogue inputs.

The aforementioned features can be initiated by sending an SMS. **The content of the SMS must match the syntax of the command sequence without the terminating <CR><LF> characters.**

3.2 LED indicators

LED indicator	Colour	Description
ON	Green	Device mode indicator. In command mode, ON indicator is permanently on. In router mode, ON indicator is blinking every 1 second.
RDY	Green	After turning the power supply on, RDY indicator is on, and it marks that the device is ready to perform its functionalities.
BSY	Red	In router mode, light indication of arrived request/command is on. In command mode this LED indicator is permanently off.
GSM	Red	Light indication of GSM module functioning. If the module connection to GSM network is succesful, it blinks every 2 seconds.

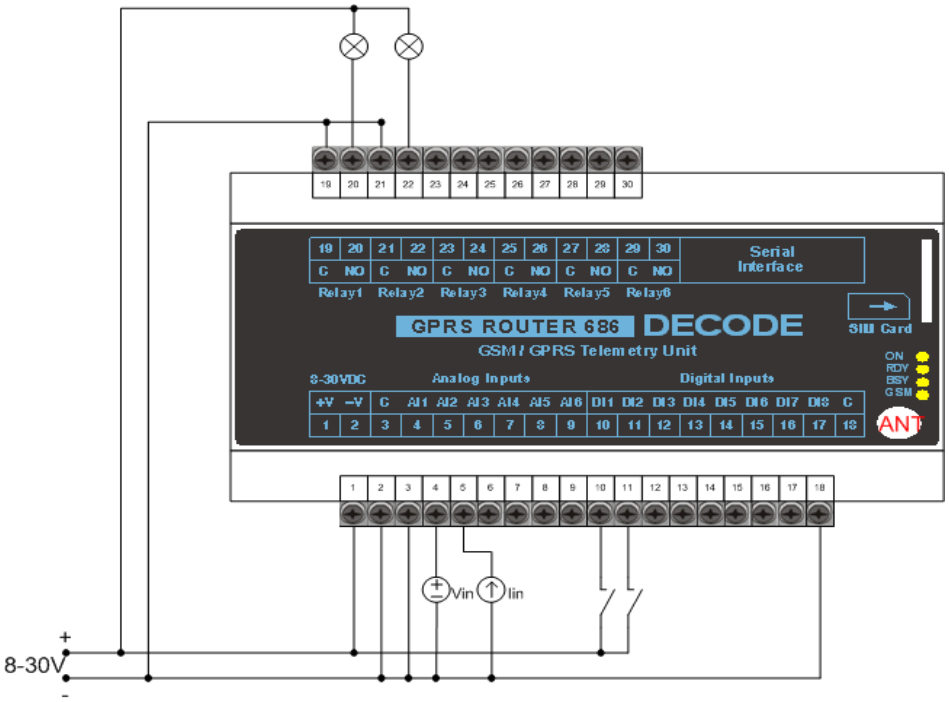
TABLE 4: LED INDICATORS DESCRIPTION

4 Device installation and wiring

!!!
To start the installation of the device, disconnect the device from the power supply and all other wiring.

Afterwards, the appropriate SIM card should be placed into the Push-Push holder, as shown in Figure 1.

Figure 2 shows the example of wiring the power lines, inputs and outputs to the terminals of SMS Reporter 686 device. Digital inputs are galvanic isolated and have separated ground contact. Digital outputs are with relays and are also galvanic isolated. Contrary to that, analogue inputs are not galvanic isolated. Figure 2 shows wiring scheme where inputs and outputs are connected to the power line which does not have to be the case.



Before turning on the device, make sure that the SMA antenna connector is connected to the appropriate GSM antenna.

!!!
The position of the antenna should be set so that the optimal signal reception is achieved. The availability and reliability of data transmission may depend on antenna position. Do not put the antenna into the metal closet.

The quality of the GSM network reception can be checked by sending the:

?CSQ<CR><LF>

command, from the command mode.

This command returns the Received Signal Strength (RSS) and Bit Error Rate (BER). The device responds with a message **+CSQ: x,y**, where *x* is RSS and *y* equals BER.

RSS (x)	***Description***
0	-113dBm or less
1	-111dBm
2..30	-109… -53dBm
31	-51dBm or greater
99	Not known or not detectable

TABLE 5: RSS VALUES AND THEIR INTERPRETATION

BER (y)	***Description***
0	0 < BER < 0.2%
1	0.2% < BER < 0.4%
2	0.4% < BER < 0.8%
3	0.8% < BER < 1.6%
4	1.6% < BER < 3.2%
5	3.2% < BER < 6.4%
6	6.4% < BER < 12.8%
7	12.8% or higher
99	Not known or not detectable

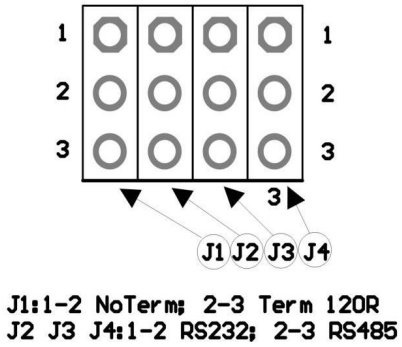
TABLE 6: BER VALUES AND THEIR INTERPRETATION

The RS232 serial interface is of DCE (Data Communication Equipment) configuration and is accessed through DB9 female connector. The pinout of the connector is given in Table 7.

No	Code	I/O	Description
1	DCD	output	Data Carrier Detect
2	RD	output	Received Data
3	TD	input	Transmitted Data
4	DTR	input	Data Terminal Ready
5	GND	-	Signal Ground
6	DSR	output	Data Set Ready
7	RTS	input	Request to Send
8	CTS	output	Clear to Send
9	RI	output	Ring Indicator

TABLE 7: DB9 PINOUT

Figure 3 shows the layout of the DB9 communication port with pin numbers and their layout.



5 Command reference

5.1 Serial interface setup

Command	Description	Value	Unit
P.BR	Baud rate	1 – 600	bit/sec
		2 – 1200	
		3 – 2400	
		4 – 4800	
		5 – 9600	
		6 – 14400	
		7 – 19200	
		8 – 28800	
		9 – 38400	
		10 – 56000	
		11 – 57600	
		12 – 115200	
P.DB	Data bits	7,8	
P.P	Parity	0-N,1-O,2-E	
P.SB	Stop bits	1,2	

Example: setting serial interface (9600,8,N,1):

->	P.BR=5;P.DB=8;P.P=0;P.SB=1
<-	P.BR=5 P.DB=8 P.P=0 P.SB=1 OK

Example: checking the settings of the serial interface:

->	?P.BR;?P.DB;?P.P;?P.SB
<-	P.BR=5 P.DB=8 P.P=0 P.SB=1 OK

5.2 SMS setup

Command	Description	Value	Unit
LN	Location name.	string	
S.SLN	Send location name in SMS.	0 – not send 1 – send name	
S.P	If this parameter is not equal to zero, the SMS containing the inputs/outputs reports is periodically sent to previously stored numbers.	0-255	min
S.SE	SMS Security Enable – If this parameter is set, the device will disregard any SMS message received from the numbers that are not in the stored list of numbers. Otherwise, the access to device is enabled from any phone number.	0 - anyone 1 – only specified	
S.SME	SMS Silent Mode Enable – If this parameter is set, the SMS response will be sent (after the SMS access) onto the number from which the initial message arrived. Otherwise, the answer will not be sent.	0 – reply 1 – no reply	
S.Sxx.N	SMS Subscriber xx Number – xx-th subscriber number (xxϵ{1,16}) to which the periodical SMS reports (inputs/outputs states) are being sent or from which the SMS commands to the device are accepted in case SE parameter is set.	valid GSM number	
S.Sxx.PME	SMS Subscriber xx Periodical Message Enabled – If this parameter is set and S.P is not equal to zero, the periodic SMS reports with the inputs/outputs states will be sent to xx-th subscriber number.	xx$\in${01-16} 0 – not send 1 - send	

Example: SMS setup (send location name enabled, periodic reports on every 30min to +381641234567 subscriber number, SMS access granted only for one subscriber number):

->	LN=”Banjica”;S.SLN=1;S.P=30;S.SE=1;S.SME=0;S.S01.N=”+381641234567”; S.S01.PME=1
<-	LN=”Banjica” S.SLN=1 S.P=30 S.SE=1 S.SME=0 S.S01.N=”+381641234567” S.S01.PME=1 OK

Example: checking the SMS setup:

->	?LN;?S.S01.N;?S.S01.PME
<-	LN=”Banjica” S.S01.N=”+381641234567” S.S01PME=1 OK

5.3 Digital inputs setup

Command	Description	Value	Unit
Ix.S	Input x State – Readout of the x-th input	0.1	
Ix.N	Input x Name	string	
Ix.C	Input x Counter		
Ix.CT	Input x Counter Threshold – The threshold value of the impulse counter that generates the alarm		
Ix.FL	Input x Filter Low – The time needed after the low signal level has been reached and maintained so that the input state could be declared to have reached low level.		10 msec
Ix.FH	Input x Filter High – The time needed after the high signal level has been reached and maintained so that the input state could be declared to have reached high level.		10 msec
Ix.MH	Input x Message High – The text of alarm SMS sent in case of the high signal level has been reached.		
Ix.ML	Input x Message Low – The text of alarm SMS sent in case of the low signal level has been reached.		
Ix.MCT	Input x Message Counter Threshold – The text of alarm SMS sent in case of the impulse counter threshold number has been reached.		
Ix.WBM	Input x Wait Between Messages – The time the device waits between sending the alarm SMS from one to next destination number. During this time, if the alarm acceptance message arrives the device cancels sending the message to the remaining numbers. The alarm acceptance is performed by calling the device from any accredited number.	0-255	min
Ix.CAE	Input x Cyclic Alarming Enable – If this parameter is set, the alarm SMS messages will be sent to destination numbers cyclically until the alarm acceptance occurs.	0,1	
Ix.Dn	Input x Destination n – Description number (nϵ{1,8})		

Note:

Hardware platform	Supported x values
SMS Reporter 686	{1,8}
SMS Reporter 110	{1}
SMS Reporter 343	{1,4}

Example: digital input 1 setup; alarms the signal transition from low to high level:

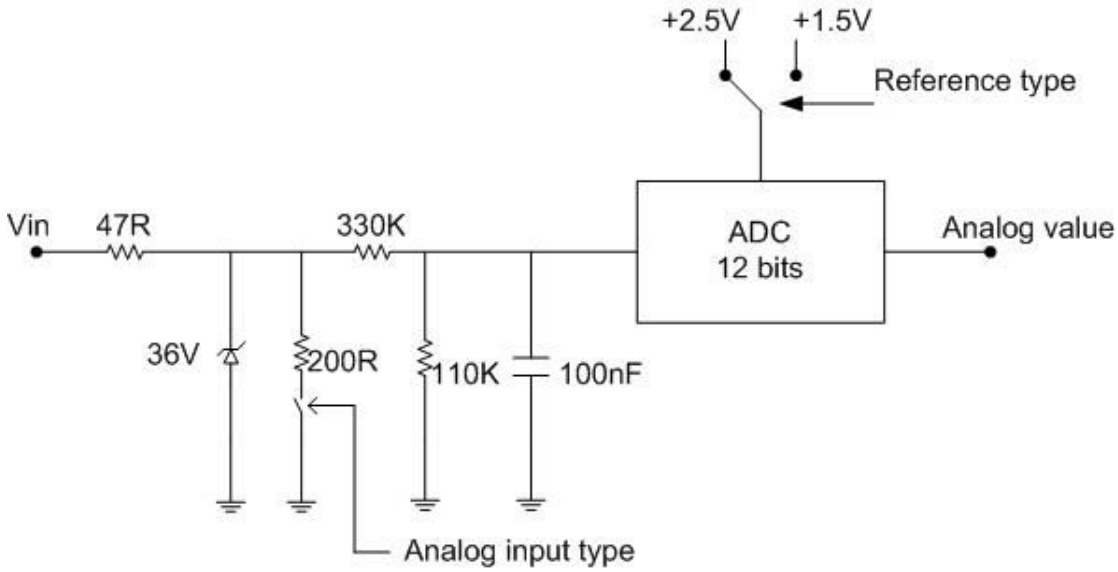
->	I1.FL=50;I1.FH=50;I1.MH=”IN 1 ON”;I1.D1=”+381641234567”
<-	I1.FL=50 I1.FH=50 I1.MH=”IN 1 ON” I1.D1=”+381641234567” OK

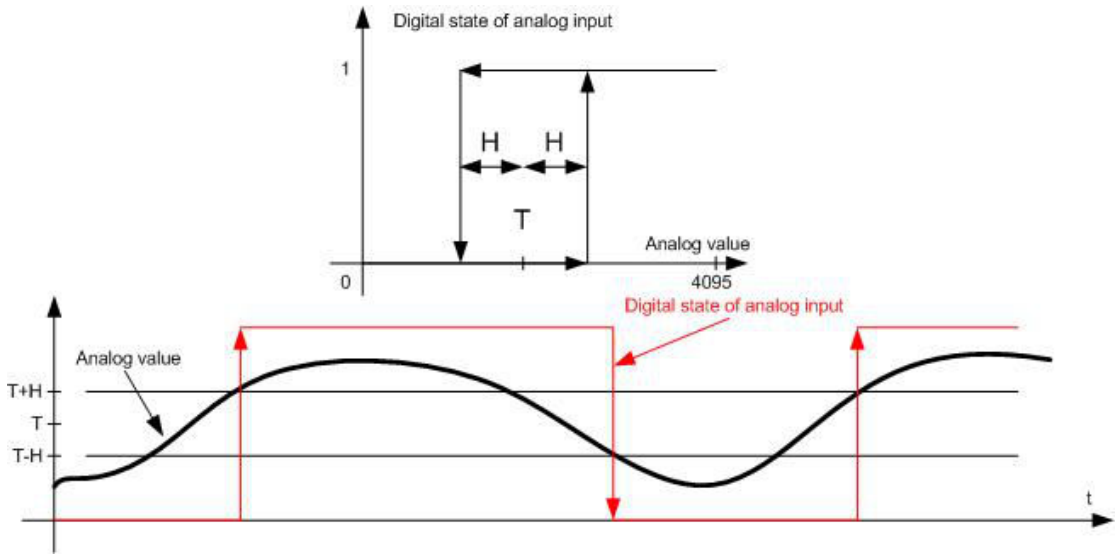
5.4 Analogue inputs setup

Command	Description	Value	Unit
AI.R	Analog Input Reference - AD convertor input reference	0 (Vref=2.5V) 1 (Vref=1.5)	
AIx.S	Analog Input x State – Digital state of the analogue input readout		
AIx.V	Analog Input x Value – Analogue value readout	0-4095	
AIx.TYPE	Analog input x Type	0-Voltage 1-Current	
AIx.VCV	Analog Input x Voltage/Current Value – Readout of the voltage/current measured on the input. The type of input (voltage/current) depends on AIx.VCV parameter.		mV/10uA
AIx.N	Analog Input x Name		
AIx.T	Analog Input x Threshold – Threshold value that determines the digital state of the input.	0-4095	
AIx.H	Analog Input x Hysteresis – Hysteresis for determining the digital state of the input.	0-500	
AIx.FL	Analog Input x Filter Low – The time needed after the low signal level has been reached and maintained so that the input state could be declared to have reached low level.		10 msec
AIx.FH	Analog Input x Filter High - The time needed after the high signal level has been reached and maintained so that the input state could be declared to have reached high level.		10 msec
AIx.MH	Analog Input x Message High – The text of alarm SMS sent in case of the high signal level has been reached.		
AIx.ML	Analog Input x Message Low – The text of alarm SMS sent in case of the low signal level has been reached.		
AIx.WBM	Analog Input x Wait Between Messages – The time the device waits between sending the alarm SMS from one to next destination number. During this time, if the alarm acceptance message arrives the device cancels sending the message to the remaining numbers. The alarm acceptance is performed by calling the device from any listed number.	0-255	min
AIx.CAE	Analog Input x Cyclic Alarming Enable – If this parameter is set, the alarm SMS messages will be sent to destination numbers cyclically until the alarm acceptance occurs.	0,1	
AIx.Dn	Analog Input x Destination – Description number (nϵ{1,8})		

Note:

Hardware platform	Supported x values
SMS Reporter 686	{1,6}
SMS Reporter 110	none
SMS Reporter 343	{1,3}





Type	Vref[V]	Min	Max
voltage	1.5V	0V	6V
voltage	2.5V	0V	10V
current	1.5V	0mA	30mA
current	2.5V	0mA	50mA

TABLE 8: VOLTAGE AND CURRENT INPUT RANGES

The calculation of the threshold T and hysteresis H values is made using the following equations:

- Voltage input

$$T = round\left\{\frac{T[V]}{4*Vref}\cdot 4095\right\} \quad H = round\left\{\frac{H[V]}{4*Vref}\cdot 4095\right\}$$

- Current input

$$T = round\left\{0.2\cdot\frac{T[mA]}{4*Vref}\cdot 4095\right\} \quad H = round\left\{0.2\cdot\frac{H[mA]}{4*Vref}\cdot 4095\right\}$$

round () – Function that coerces the real number to the closest integer value.

Example: the calculation of the threshold T and hysteresis H values for voltage input, Vref=2.5V and desired values T[V]=5V and H[V]=0.2V:

$$T = round\left\{\frac{5V}{4*Vref}\cdot 4095\right\} = 2047 \quad H = round\left\{\frac{0.2V}{4*Vref}\cdot 4095\right\} = 82$$

Example: analogue input 1 setup; alarms the signal transition over 5V

->	AI.R=0;AI1.TYPE=0;AI1.T=2047;AI1.H=82;AI1.MH=”AIN 1 >5V”; AI1.D1=”+381641234567”
<-	AI.R=0 AI1.TYPE=0 AI1.T=2047 AI1.H=82 AI1.MH=”AIN 1 >5V” AI1.D1=”+381641234567” OK

5.5 Digital outputs setup

Command	Description	Value	Unit
Ox.S	Output x State – Readout and setting of the output state.	0,1	
Ox.N	Output x Name		
Ox.PD	Output x Pulse Duration – The time interval the relay contact will remain closed after the activation. If this parameter is equal to zero, upon activation, the contact will remain on (closed) permanently.		10 msec

Note:

Hardware platform	Supported x values
SMS Reporter 686	{1,6}
SMS Reporter 110	{1}
SMS Reporter 343	{1,3}

Example: digital output 1 setup; upon activation, the contact should remain closed for 5sec interval:

->	O1.PD=500
<-	O1.PD=500 OK

Example: digital output 1 setup; setting the contact on (if following the previous example – for 5sec interval):

->	O1.S=1
<-	O1.S=1 OK

Example: digital output 1 setup; setting the contact permanently on:

->	O1.PD=0;O.S=1
<-	O1.PD=0 O1.S=1 OK