

SEA

SPADC3

version 1.18

User's manual

Version 1.22

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Basic Characteristics



Figure 1 – SPADC3

The SPADC3 is a device designed to remotely monitor and control applications and it transfers information via the GSM network using SMS messaging.

Features:

- monitors seven analogue inputs and the power remaining in the backup accumulator
- monitors eight logical inputs and reacts to any changes in their status
- controls four logical outputs (change of status or pulse)
- counts pulses on a high-speed input

The functions and names of the inputs and outputs, telephone numbers, passwords, etc. are fully user-selectable through a personal computer and the configuration cable PRGKAB (not included with the standard device). As the configuration software is included with the standard device, it is possible to change the settings at any time.

Technical Specifications

Parameter		Symbol	Conditions	Minimum	Typical	Maximum.	Unit
Dimensions	Width	w			105		mm
	Height (w/o the antenna)	h			61		mm
	Depth	d			90		mm
Power Supply	DC voltage	V_{CC}		14		30	V DC
	AC voltage	V_{CC}		12		24	V AC
	Current	I_{CC}	$V_{CCDC} = 14V$	0,01	0,2	0,3	A
Logical inputs	Number	-			8		-
	Voltage	V_{IN}		8	12	30	V
	Current	I_{IN}	$V_{IN} = 12V$		5		mA
	Speed	τ_{CHANGE}		3			ms
Logical outputs	Number	-			2+2		-
	Voltage	V_{OUT}			$V_{CC} - 2 V$		V
	Current	I_{OUT}				300	mA
Analog inputs "power" A1 to A3	Number	-			3		-
	Voltage	V		0,0		10,0	U_U
	Input resistance	$k\Omega$		40	43		R_U
Analog inputs "current" A4 and A5	Number	-			2		-
	Current	mA		0,0		20,0	I_I
	Input resistance	Ω			100		R_I
Analog inputs "temperature" A6 and A7	Number	-			2		-
	Temperature	$^{\circ}C$		0		100	v
	Sensor	Ω	KTY 81-210	1603		3392	R_C
	Voltage	V		1,5		5,0	U_C
Temperature	Short-circuit current	mA		25		50	I_C
	Storage	t_{STG}		-40		+85	$^{\circ}C$
GSM	Operation	t_A		-20		+65	$^{\circ}C$
	GSM module			Siemens TC35			-
	Transport service			SMS			-
	Type			GSM900 GSM1800			-
	Antenna impedance	Z_A			50		Ω
Output power	P				2	W	

Contents of the delivery

The delivery of the SPADC3 contains the following components:

- **1 pc SPADC3 device,**
- a connector assembly kit:
 - 1 PXH 3.96 – 04 connector (main power supply),
 - 1 PXH 3.96 – 02 connector (accumulator),
 - 1 PXH 2.54 – 09 connector (logical input),
 - 9 PXH 2.54 – 03 connectors (analogue inputs, logical outputs, ...),
 - 1 PXH 2.54 – 02 connector (AC_PWR),
 - 1 ks konektor PXH 2,00 – 02 (pulse counter),
 - 6 contacts for the PXH 3.96 connectors,
 - 38 contacts for the PXH 2.54 connectors,
 - 2 contacts for the PXH 2.00 connector,
- 1 configuration software CD,
- printed documentation,
- Certificate of Conformance.

Recommended Accessories

These accessories are not included with the standard device but they are recommended for easier operation and diagnostics.

SM2 Service module



Figure 2 – SM2

This service module provides detailed information about the processes running on the device. Diagnostics and error determination are thus easier to perform.

Magnetic GSM antenna

This is an antenna with a 3m coaxial cable for connecting to the device's antenna connector.

Device Functions

The actual status of the device is indicated by the **StatusLED** or the display on the SM2 service module where more detailed information is also provided.

After the device is started, the following statuses can occur:

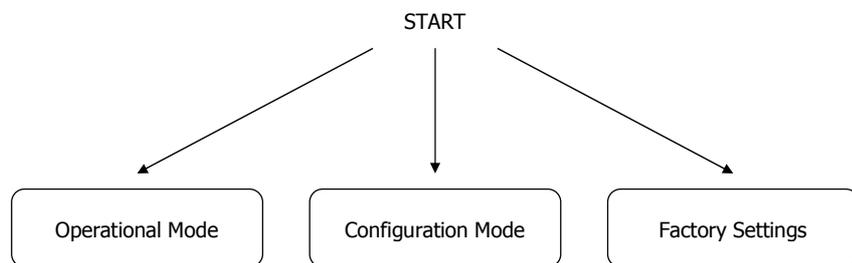


Figure 3 – Chart showing the device statuses

Operational Mode

In this state, the device is performing the functions as specified.

Figure 4 shows the statuses indicated by the **CPU LED**.

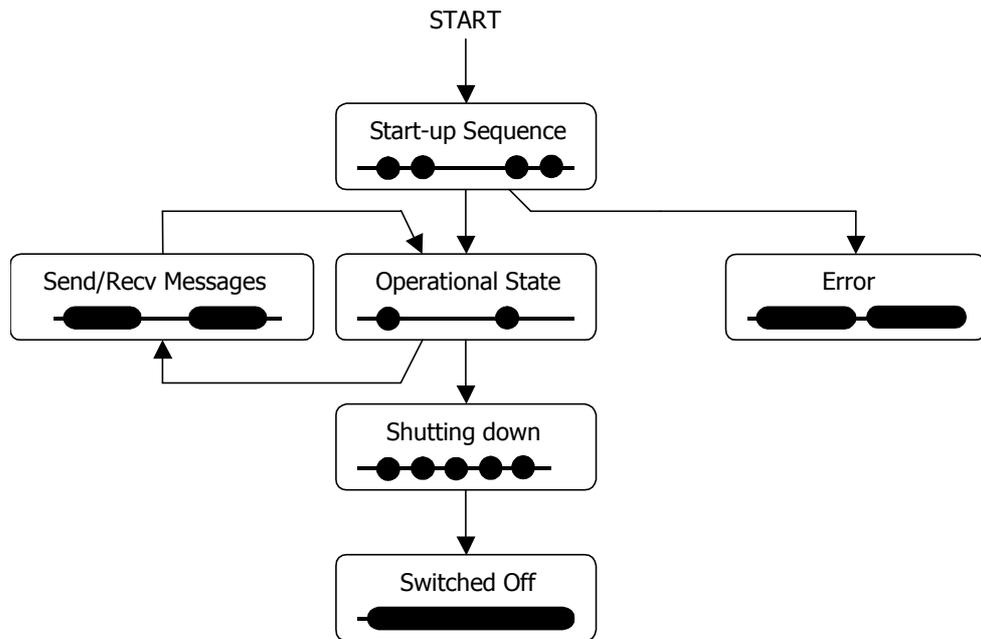


Figure 4 – Chart showing the device statuses

Start-Up Sequence

After the device is started, the *start-up sequence* runs. During this sequence, the modem is initialized and logs onto the GSM network. This status is indicated by two quick successive flashes of the **CPU LED** or on the display of the SM2 service module. After the start-up sequence is finished, the device goes into *operational mode*.

```
Initialization
Step 3 of 12
```

If an error occurs during the start-up sequence, the device goes into error mode which is indicated by long, slow flashes of the **CPU LED** and the **ERR LED** remains lit. A more detailed description of the error can be found by using the yellow LED indicators **b0** to **b4** or on the display of the SM2 service module. For example:

```
Error (01):
SIM not inserted
```

indicates that the SIM card has not been inserted. This error status remains for ten seconds before the start-up sequence is reinitiated.

The start-up sequence:

1. Equipment initialization, power-on-self-test (POST).

2. Modem initialization.
3. The modem is started.
4. Communication with the modem is initiated.
5. The GSM LED functions are set.
6. The SIM card is tested.
7. The PIN is entered. This step may be omitted if the SIM card does not request a PIN.
8. The modem is logged-in to the GSM network.
9. The SCA (service center address [telephone number]) is entered. This step may be omitted if the user has not input the SCA in the configuration software; the modem then uses the default SCA given by the SIM card.
10. Establishes the SMS message tasks.
11. Establishes the properties used for SMS messages.
12. The space for storing SMS messages in the modem is allocated.

Possible errors during the start-up sequence

1. After Step 6:

```
Error (01):
SIM not inserted
```

Front panel
signalization

The SIM card has not been inserted. Remove the top panel (which shows the device name and contains the LED indicators). The SIM card reader is located on the top circuit board (MACSB). Insert the SIM card into the reader. The device will not work without the SIM card.

b0 ●
b1 ○
b2 ○
b3 ○
b4 ○

2. After Step 6:

```
Error (02):
Test SIM
```

An error has occurred during communication with the SIM card. Ensure that the SIM card is clean and inserted properly.

b0 ○
b1 ●
b2 ○
b3 ○
b4 ○

3. After Step 6:

```
Error (03):
SIM PUK required
```

The SIM card requires that a PUK be entered. This error may occur if the incorrect SIM PIN was input in the configuration software. The device will re-try the incorrect PIN 3 times and then the SIM card will be blocked in order to prevent unauthorized use. If this occurs remove the SIM card, insert it in any mobile phone and input the PUK that was provided by the mobile operator at the time the SIM card was received.

b0 ●
b1 ●
b2 ○
b3 ○
b4 ○

4. After Step 7:

```
Error (04):  
Wrong SIM PIN
```

An incorrect SIM PIN was input. Input the correct PIN through the configuration software.

- b0
- b1
- b2
- b3
- b4

5. After Step 7:

```
Error (05):  
SIM PIN read
```

An error occurred when retrieving the PIN from the configuration memory. Re-enter the configuration information. If the problem persists, contact the vendor.

- b0
- b1
- b2
- b3
- b4

6. After Step 8:

```
Error (06):  
Can't log in GSM
```

The device cannot log in to the GSM network. This error usually occurs when the antenna is not connected or is connected improperly. Also verify that the SIM card operator provides coverage for the area where the device is being used (for example, by trying the card in a standard mobile phone). This error may also occur if the mobile operator has removed the SIM card from its active list (due to a reported theft, unpaid invoices, etc.).

- b0
- b1
- b2
- b3
- b4

7. After Step 9:

```
Error (07):  
Can't set SCA
```

The Service Center Address (telephone number) cannot be set. Most probably this information was input incorrectly into the configuration software. This information must be input using the international telephone number format (i.e. +420603000000).

- b0
- b1
- b2
- b3
- b4

8. After Step 10, 11 or 12:

```
Error (08):  
SMS properties
```

An error occurred when establishing the SMS task properties. Rerun the start-up sequence. If the problem persists, contact the vendor. After Step 9:

- b0
- b1
- b2
- b3
- b4

```
Error (09):  
SCA read
```

An error occurred when retrieving the SCA from the configuration memory. Re-enter the configuration information. If the problem persists, contact the supplier.

- b0
- b1
- b2
- b3
- b4

9. After Step 5:

```
Error (10):  
Can't set SSYNC
```

An error occurred when setting the GSM LED. Rerun the start-up sequence. If the problem persists, contact the supplier.

- b0
- b1
- b2
- b3
- b4

10. After Step ?:

```
Error (00):  
-- Unknown --
```

Unknown error. Rerun the start-up sequence. If the problem persists, contact the supplier.

- b0
- b1
- b2
- b3
- b4

Operational State

The device is in its normal operational state. The **CPU LED** flashes slowly and the service panel monitor displays “Ready”. The quality of the GSM network signal is indicated on the far right of the first line on the device’s service screen. The actual quality of the signal can be determined according to the signal bar indicator displayed – the higher the bar, the stronger the signal. If the ☒ symbol is displayed, the GSM network signal is not available (the device is outside the range of the operator’s coverage, network outage, etc.)

```
Ready
```

The device is monitoring the event queue (refer to the section on the [Event Queue](#)). If the queue is not empty, the device sends messages about the events.

Receiving SMS Messages

The device reacts to SMS messages sent to its phone number. When a message is being received, the **RECV LED** remains lit and the SM2 monitor displays:

```
Reading SMS ...
```

For any SMS message received, the telephone number from which it was sent is verified. This number must be in the device's telephone directory and messages from it must be authorized (refer to the section on [Configuration](#)). If this condition is not met, the message is not processed further and is ignored.

After the message is received, it is deleted from the SIM card (where it is temporarily stored):

```
Erasing SMS ...
```

Sending SMS messages

When an SMS message is being sent (i.e. in reaction to an event), the **SEND LED** remains lit and the SM2 monitor displays:

```
Sending SMS ...  
Phase 1 of 2
```

and

```
Sending SMS ...  
Phase 2 of 2
```

The message is prepared during the first phase; during the second phase the modem transmits the message to the GSM network and waits for confirmation that it was sent.

Shutdown

The device is switched off by the GSM OFF button located on the top panel of the device.

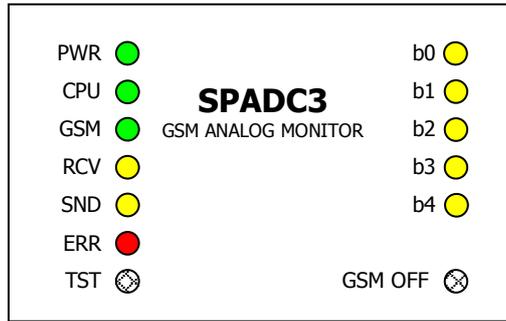


Figure 5 – GSM OFF button

After this button is pushed, the device starts its shutdown sequence. If the event queue is not empty (refer to the section on the [Event Queue](#)), the device attempts to send a message about the event that occurred. As long as the queue is not empty, the following text is displayed:

```
Ready (to off) █
```

When the queue is empty, the device prepares for the power to be disconnected. The modem logs off from the GSM network and turns off safely. Short quick flashes of the **CPU LED** indicate the device has been switched off and the service module monitor displays the text:

```
Shutting down ...
```

The end of the shutdown sequence is indicated by the **CPU LED** remaining lit and the service module monitor displays the text:

```
System off
```

Now the power source can be disconnected.

Should you decide to switch the device on again, simply press the GSM OFF button once more.

The device can be switched off immediately without waiting for the event queue to be empty by pushing the OFF button a second time.

Configuration Mode

This mode is used to configure the device. While the device is active, it serves no other purpose than to monitor the configuration PC and perform any commands issued by the PC. In this mode, two short flashes follow one long flash of the **CPU LED**.

Input

Switch the device off. The SM2 monitor will display the text:

```
System off
```

Now connect the device to the configuration PC using the configuration cable (PRGKAB) and run the configuration program (SP Init). The device will go into configuration mode after the connection is activated. While the device remains in this mode, the monitor displays the text:

```
** CFG MODE **  
Controlled by PC
```

Deactivation

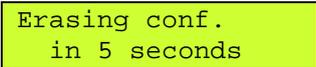
While the SPADC3 Init configuration software is running, press the “Deactivate” button. The device will restart and, if the configuration process was successful, the device will go into operational mode.

Factory Settings

By using these procedures, it is possible to erase any user configurations and restore the factory setting for the device. Warning: *Any configuration data that has been input into the device will be deleted and after the device is restarted, it will automatically go into configuration mode!*

Procedure

- Switch the device off.
- Press the GSM OFF button and keep it depressed.
- Switch the device on.
- The service module monitor will display a countdown. You have one last chance to release the OFF button and interrupt the process. Otherwise, when the countdown reaches zero, any user configuration will be erased.



Erasing conf.
in 5 seconds

Messages

The SPADC3 device is capable of receiving SMS messages from the GSM network, performing commands contained in those messages and sending its own SMS messages regarding statuses. The SMS message containing commands for the SPADC3 is called a *command message* and may include:

- commands for determining status
- commands for setting the status of the logical inputs

The SPADC3 replies to commands by reporting on device status – a *status message* (unless the user chooses otherwise).

The user may configure the SPADC3 device so that a message is sent when there is a change in certain monitored values, i.e. a change in the status of the logical input. These messages are called *event messages*.

If the entire message text is longer than 160 characters, it is split into multiple SMS messages.

Only persons who are specified in the SPADC3 telephone directory and have the field “Accept SMS messages” field checked have access to the SPADC3 through SMS messages.

Command Messages

A *command message* is an SMS message sent by the user to the equipment. The message is accepted and the command executed only if the message sender was input as an authorized sender during the configuration process on the “Phone Numbers” screen and the field “Accept commands” is checked next to the telephone number.

	Phone Number	Accept commands	Send state
T1	+420123456789	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
T2		<input type="checkbox"/>	<input type="checkbox"/>

The syntax of a command message is as follows (individual commands are separated by a space):

```
[#PIN] [command1 [command2 [command3 ...]]]
```

where:

PIN is an optional method of authorization. If, during the configuration process, the field “Require authentication by PIN” is checked on the “SMS Message” screen, each command message must include the PIN as the first field.

command_x may be:

- a keyword, or
- a command for a logical output

Commands are not case sensitive.

List of keywords

Keyword	Definition
STATE or STAV	This command results in the device sending a <i>status message</i>
NOBACK or NEZPET	If the command message contains this keyword, the device performs the commands and keywords contained in the message, but doesn't send a confirmation of status message. This keyword is applicable only to the message in which it is contained.

Commands for the logical outputs

The SPADC3 device contains 4 logical outputs to which the following commands can be sent:

- Change to status L

```
<Output Identifier> <Identifier for the status L>
```

- Change to status H

```
<Output Identifier> <Identifier for the status H>
```

- Pulse at the output

```
<Output Identifier> <Command for impulse>
```

Note: for clarity, the character “=” or “,” may be used instead of a space to separate the Output Identifier and the Status Identifier.

The identifiers for the logical outputs and the statuses are established on the “Logical Outputs” screen when configuring the device through the SPADC3 Init program:

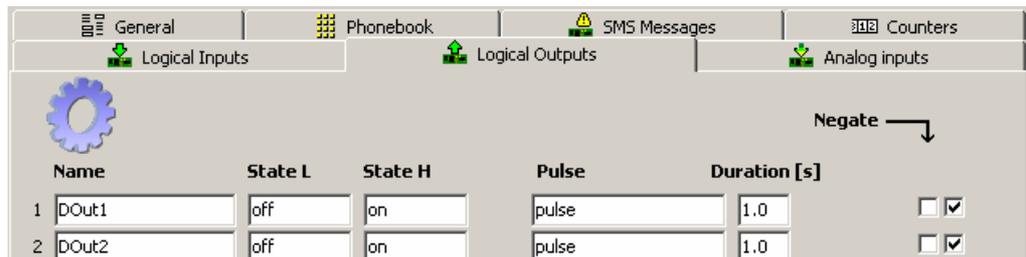


Figure 6 – Configuring the logical outputs

The output identifiers, status identifiers and the command for pulse generation can be abbreviated in the *command message*. For example, “DOO” can be used instead of “DOOR”. The abbreviated name cannot be the same as the name of another output or keyword, i.e. the abbreviation “STA” cannot be used for “STACKER”, as it is the abbreviated form of the keyword “STATE”!

Examples of command messages

Example no. 1:

```
DOOR OPEN
```

Example no. 2:

```
DOUT2 ZAP DOUT3=OFF DOUT7 ZAP
```

Example no. 3:

```
HEATING1 IMP HEATING2 IMP
```

Status Messages

The equipment provides information about its status through *status messages*. This type of message is generated either in response to a command message with the keyword “STATE” or as a reply to a command message which included a command to change the status of at least one output (unless the command also included the keyword “NOBACK”).

The general format of this message type is:

```
<Station Identifier>: <DIn0>=<StateDIn0>  
<DIn1>=<StateDIn1> ... <DOut0>=<StateDOut0>  
<DOut1>=<StateDOut1> ... <AIn0>=<ValueAIn0> <StateAIn0>  
<AIn1>=<ValueAIn1> <StateAIn1> ... <Cnt0>=<ValueCnt0>
```

where

<Station Identifier> is the name assigned during configuration in the field “Station Name” on the “General” screen.

<DInx> the logical input identifier

<StateDInx> the identifier for the status of the logical input

<DOutx> the logical output identifier

<StateDOutx> the identifier for the status of the logical output

<AInx> the analogue input identifier

<StateAInx> the identifier for the status of the analogue input

<ValueAInx> the value of the analogue input

<Cntx> the pulse counter identifier

<ValueVntx> the status of the pulse counter

During configuration, you can select which inputs and outputs will appear in a status message on the right of each input or output.



Figure 7 – Switching on the display of statuses in a status message

Example of a status message

Example no. 1:

```
STATION JIH: DIn1=OFF DIn2=ON DOut0=OFF AIn0=55.5%
BAT=13.5V
```

Event Messages

This type of message is generated as a result of:

- a change in the status of a logical output from L⇒H or H⇒L.
- a change in the status of an analogue output from LOW⇒MEDIUM, MEDIUM⇒HIGH, HIGH⇒MEDIUM or MEDIUM⇒LOW.
- the equipment being switched on or off.



Figure 8 – Authorization for event message generation

An event message is sent to all telephone numbers stored through the “Phonebook” screen in the SP Init program, which have the “Message on ...” field checked for the specific event in question.

The general format of the message is:

```
<Station Identifier>: <message string>
```

The message string is text that the user inputs for a given event through the SP Init program. The figure shows the text of the message sent during a change in the status of Logical Input 1 from L⇒H:

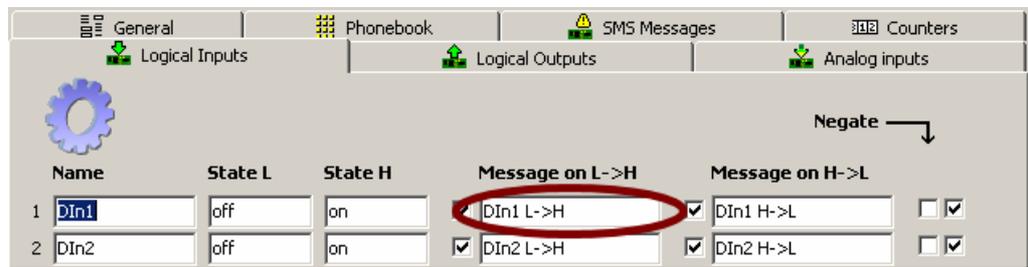


Figure 9 – Configuration of the event message text

In this case, when the status went from L⇒H on logical input 1 the following message was generated:

```
SPADC3: DIn1 L->H
```

Event Queue

The device contains a queue that stores information about any events that have occurred. The queue has the capacity for storing 16 events. The events are successively removed from the queue and event messages are sent.

If the queue overflows, the following rules are followed:

- If there is an older event in the queue from the same source (i.e. the same logical input), the older event is deleted and the new event is recorded at the end of the queue where space was freed-up.
- If there is not an older event in the queue from the same source, a search is performed for a different source that has multiple events in the queue. If such a source is found, the oldest message from this source is deleted. The new event is recorded at the end of the queue where space was freed-up by this action.
- If neither of the above is applicable, the event is lost!

Note: A message regarding the switch-off event is generated when the OFF button is pushed. It is stored in the queue and the device is sent the switch-off command. However, since the queue is not empty (it contains at least the message regarding the switch-off), the device tries to send the event message(s). By pushing the OFF button one more time, it is possible to switch the device off immediately without waiting for the queue to empty.

Configuration

General

Configuration is defined as the setting of the SPADC3 device options according to user requirements. A personal computer and the SPADC3 Init program are required for configuration.

Communication between the PC and the SPADC3 device takes place through the PRGKAB cable connected to the PC either through the serial or the USB port (dependent upon the type) and connected to the SPADC3 by a JP2 connector. This cable is not included with the device and must be ordered separately. The SPADC3 program serves as a means of simplifying the work associated with the configuration data. The program is delivered to work on a PC with a 486 or higher processor, running Windows 95 or higher or Windows NT and higher.

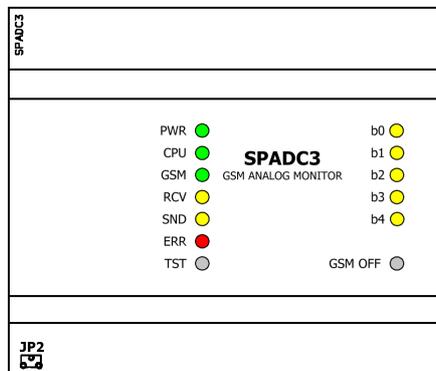


Figure 10 – Connecting the configuration cable

Preparations for configuration

Connect the SPADC3 device to the personal computer using the PRGKAB cable.

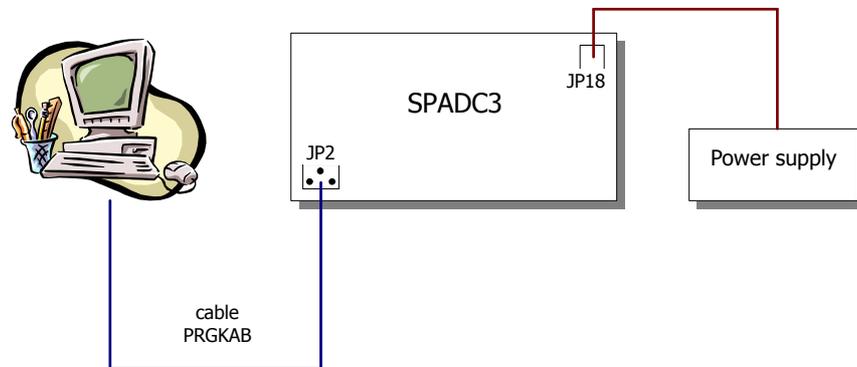


Figure 11 – Connection required for configuration

Entry into configuration mode

The device goes into configuration mode:

- by switching the device off (by pushing the GSM OFF button), starting the configuration program on the PC, pushing the “Activate” button and connecting the device to the PC with the cable,
- the first time the device is connected after delivery,
- after performing the procedures for restoring factory settings.

Successful entry into configuration mode is indicated by the following text on the SM2 monitor:

```
** CFG MODE **  
Controlled by PC
```

or by the **LED CPU** (●●●●●).

While in configuration mode, the device does not perform any of its functions. It solely communicates with the PC.

Note: When the device is first delivered (without any configuration) it goes into configuration mode immediately after it is connected to the power supply.

Installing the SP Init program

This program can be found on the CD provided with the device. After inserting the CD into the computer, follow the instructions that appear on the monitor.

The SP Init program

The SP Init is used for customizing the configuration. This program allows the user to easily set all the device attributes.

Run the program from the Start menu: **Start ► Programs ► SEA ► SP Init version X.X.X** (where X.X.X is the Init program version).



Figure 12 – The SP Init Program

The program can be used either:

- *off-line* – without the device connected in order to make preparations or to review the configuration, or
- *on-line* – with the device connected.

Communicating with the device

The bottom portion of the window contains a section with communication settings between the PC and the device. Select the serial port being used for communication.



Figure 13 – Communicating with the device (inactive)



Figure 14 – Communicating with the device (active)

Serial port	Select the serial port that will be used for connecting the device: Only COM1 through COM4 can be used.
Activate button	After selecting the correct serial port, establish a connection with the device by pressing the Activate button.
Deactivate button	Pressing the deactivate button will end the connection with the device. The device will restart and go into operational mode.

Information about the connected device

The upper portion of the window includes a box showing “Information about the connected device”. This information includes the type of device, its version and other useful data.



Figure 15 – Information about the device

An important factor is the amount of free space available in the device configuration memory. All data strings are limited to 255 characters, but only the used part of the string is stored in the memory. It can however occur that, if very long strings are used, there will not be enough memory left for storing subsequent messages.

The “General” screen

This screen is used to set the overall attributes of the device:

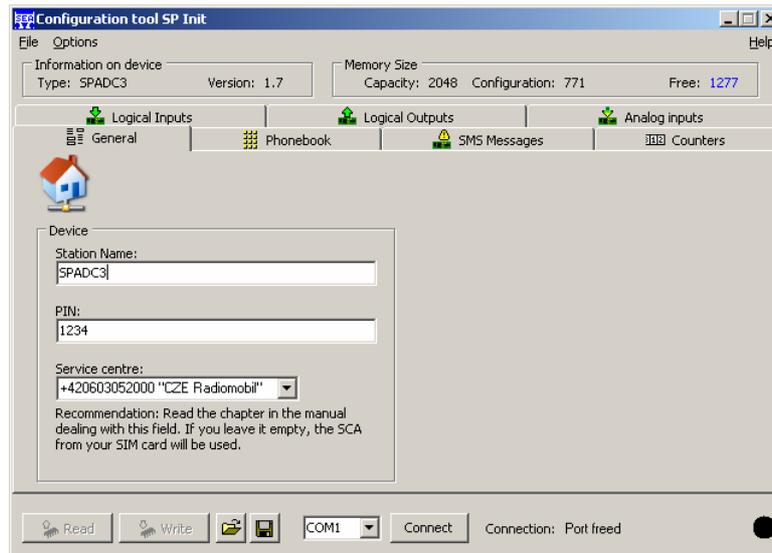


Figure 16 – The “General” screen

- Station Name** This data string identifies the device. The device attaches this information at the beginning of each SMS message it sends.
- PIN** The PIN of the SIM card inserted in the device (4 to 8 characters in length)
- Service Centre** In order to send messages within the GSM network, the telephone number of the service center (SCA) must be known. The operator of the SIM card used provides this number. If this information is not input, the SCA from the SIM card will be used.

The “Phonebook” screen

This screen is used to set-up the telephone numbers and their authorization levels in relation to the device.

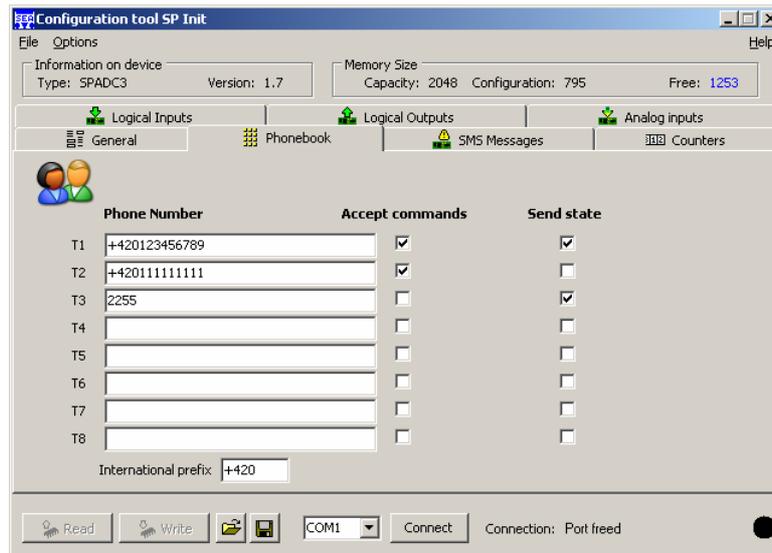


Figure 17 – The “Phonebook” screen

- Phone Number** This number must be input in international format (+420...). If the field labeled “International prefix” checked at the bottom of the screen contains the international prefix, the telephone number may be input in local format. The program then automatically changes the number to the correct international format.
- Accept commands** Checking this field allows the acceptance of command messages from this telephone number.
- Send state** Should an event occur at the equipment, which generates an SMS message, the message is sent to all the telephone numbers that have this field checked.

The “SMS Messages” screen

This screen is used to set the general settings for SMS messages and general events during switching the device on and off.

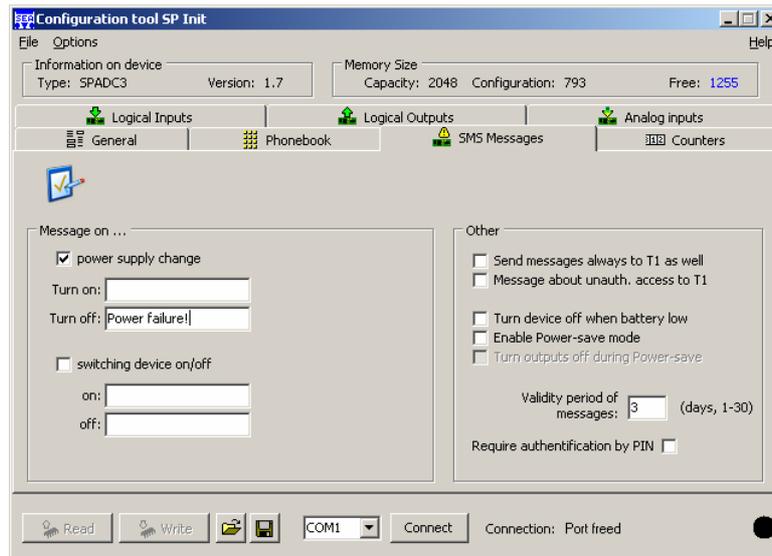


Figure 18 – The “SMS Messages” Screen

- | | |
|--|---|
| Message on power supply change | If this field is checked, messages are sent in case of main power failure or restoration. |
| Message on switching on/off | If this field is checked, messages are sent in case of device power on or device shutting down. |
| Require authentication by PIN | If this field is checked, any command messages must include the PIN in front of any command message strings in the format of #PIN (i.e. #2525). |
| Send message always to T1 as well | This field serves for the proper monitoring for a network of equipment through one central location and multiple controlled locations. The device responds to a command message with a status message. If this field is checked, this status message is also sent to the T1 telephone number. |
| Turn device-off when battery low | This field serves to switch the device off in emergency situations. If the power decreased below the limit CL1 at the BAT input (which measures this level), the device switches off automatically in order to avoid destruction of the battery. |

The “Logical Inputs” Screen

This screen is used to set the attributes for the device’s logical inputs.

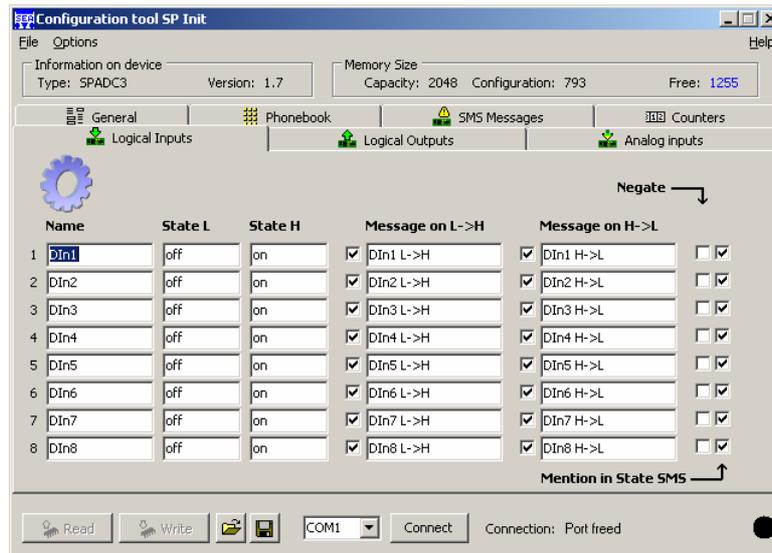


Figure 19 – The “Logical Inputs” Screen

Name	The identifier of the input which is included in a status message.
Status L	The identifier for the L (off) status that is included in a status message.
Status H	The identifier for the H (on) status that is included in a status message.
Message on L⇒H	If this field is checked for the given input and the text is filled in, then during a change in status from L ⇒ H on this input an event is triggered and an event message is sent.
Message on H⇒L	If this field is checked for the given input and the text is filled in, then during a change in status from H ⇒ L on this input an event is triggered and an event message is sent.
Negate	The statuses of “Off” and “On” are switched on this input. (When the value of the input is “Off”, the device will report “On” and vice versa.)
Mention in State SMS	The status of the specified input (specifically the input identifier and the name of its status) are included in a status message only if this field is checked.

The “Logical Outputs” Screen

This screen is used to set the attributes for the device’s logical outputs.

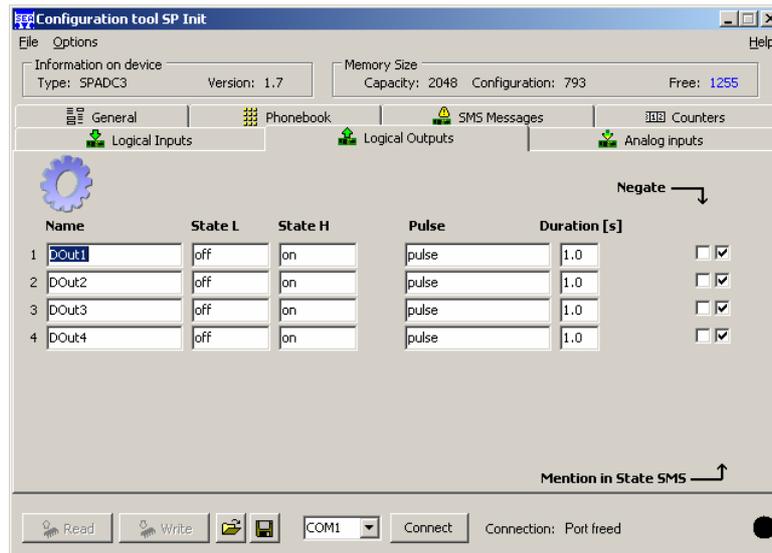


Figure 20 – The “Logical Outputs“ Screen

Name	The identifier of the output which is included in a status message or is used in a command message.
Status L	The identifier for the L (off) status which is included in a status message or is used in a command message.
Status H	The identifier for the H (on) status which is included in a status message or is used in a command message.
Neage	The statuses of L and H are switched on this output. (When the value of the output is L, the device will report H and vice versa.)
Pulse	The identifier used in a command message for generating a pulse at the output.
Duration	The pulse length in seconds (from 0.1 to 25.5).
Mention in State SMS	The status of the specified output (specifically the output identifier and the name of its status) are included in a status message only if this field is checked.

The “Analogue Inputs” Screen

This screen is used for setting the attributes of the analogue inputs. The first screen serves more as an overview. Due to the amount of details, it is recommended that these inputs be defined through the “Options” screen, which also explains each of the entries.

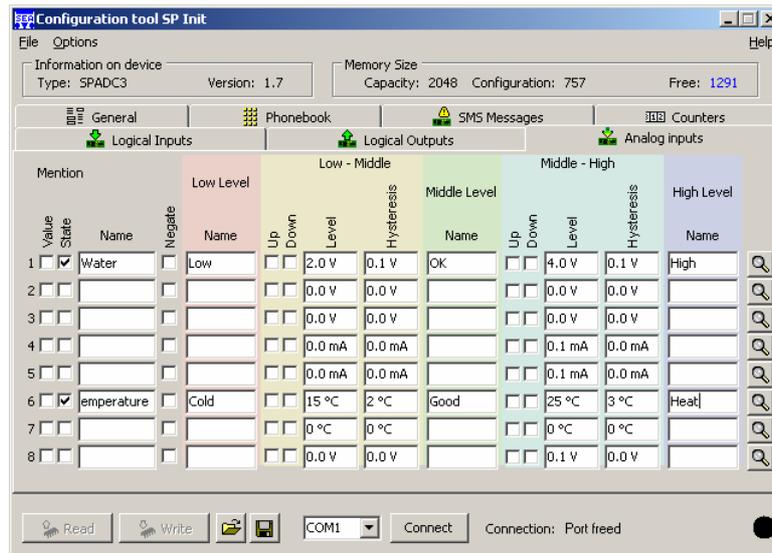


Figure 21 – The “Analog Inputs” screen

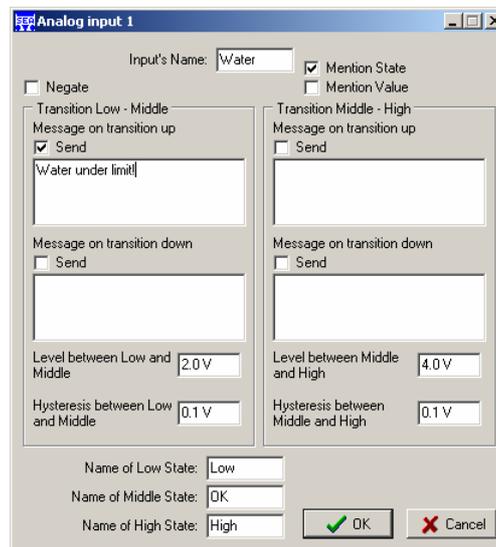


Figure 22 – The options for the analogue inputs

- Name** The identifier of the input, which is included in status, messages.
- Mention Value** If this field is checked, the status message will include the identifier of the input as well as the actual measured value.
- Mention State** If this field is checked, the status message will include the status identifier and the actual status (LOW, MEDIUM or HIGH) for this input

Note: If neither of the above two fields is checked, the status message will not contain any information about this input.

Negate	The statuses of L and H are switched on this input. (When the value of the output is L, the device will report H and vice versa.)
Low Level Name	The identifier of LOW state, which will appear in the status message.
Low-Middle Level	Select a numerical value for the limit CL1 – the level between the LOW and MEDIUM statuses. After this value is input it may be modified slightly in order to correspond to the A/D code of the encoder.
Low-Middle Hysteresis	The hysteresis in units of the input according to the previous level.
Middle Level Name	The identifier of MIDDLE state, which will appear in the status message.
Middle-High Level	Select a numerical value for the limit CL2 – the level between the MEDIUM and HIGH statuses. After this value is input it may be modified slightly in order to correspond to the A/D code of the encoder.
Middle-High Hysteresis	The hysteresis in units of the input according to the previous level.
High Level Name	The identifier of HIGH state, which will appear in the status message.
	Detailed properties of the input.

Notification about transitions between states can be set in detailed window.

The “Counter” Screen

This screen is used to select the options for the high-speed inputs.

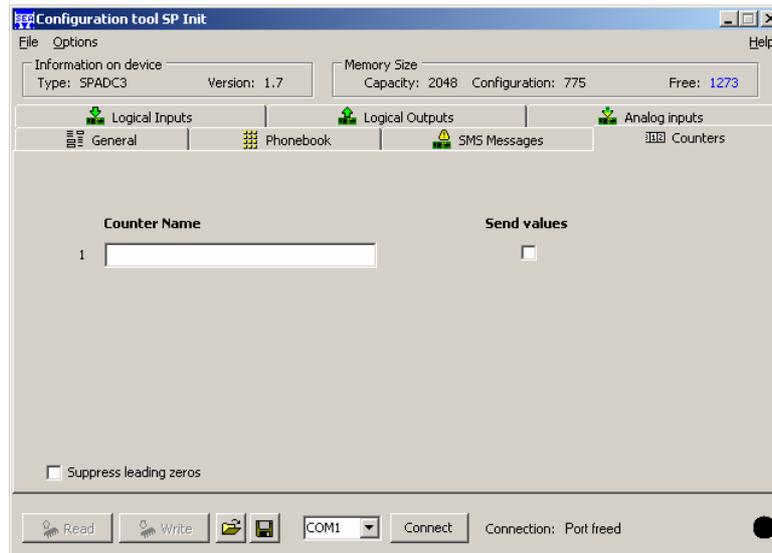


Figure 23 – The “Counters” Screen

- | | |
|---------------------|--|
| Counter Name | The identifier of the counter, which is included in a status, message. |
| Send values | The state of this counter is included in a status message only if this field is checked. |

Working with the configuration

There are two buttons for reading the configuration from the device and writing the configuration to the device file located in the bottom portion of the window in the section titled “Settings”. These buttons are not activated unless the program is actively connected to the device.



Figure 24 – Buttons for configuring the device

Read the settings from EEPROM (left) – Read the actual configuration from the device to the PC.

Save the settings to EEPROM (right) – Writes the actual configuration settings into the device’s memory.

Saving the configuration to a file

There are two buttons for reading the configuration from a file and saving the configuration to a file located in the bottom portion of the window in the section titled “Settings”.



Figure 25 – The buttons for working with files

Read the setting from a file (left) – Reads the actual configuration information from a file to a form.

Save the settings to a file (right) – Writes the actual configuration information to a file.

Hardware

Main Power Supply

A 14-30V DC source or a 12-24V AC source can be used to provide power for the SPADC3 device. The power source is connected by way of a JP18 connector:

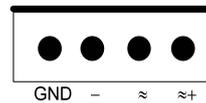


Figure 26 – Connection of the JP18 connector (Main power source)

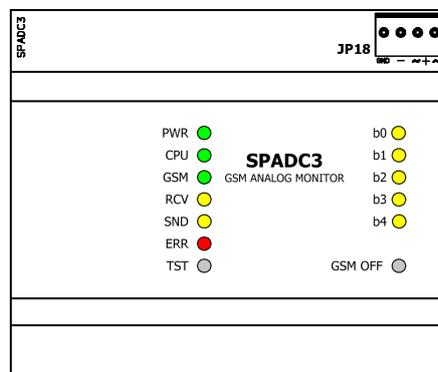


Figure 27 – Location of the JP18 connector (Main power source)

Note: The average current from the source is 0.5A but the source must be capable of providing a source of up to 2A during peak operating times when the modem is transmitting. If a back-up accumulator is connected, this peak usage power requirement can be supplemented through it.

Several recommended methods for connecting power sources are shown below.

Power from an alternating current source – single-coil

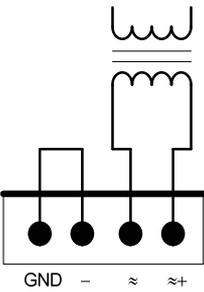


Figure 28 – The recommended method for connecting an AC power source

Power from an alternating current source – double-coil

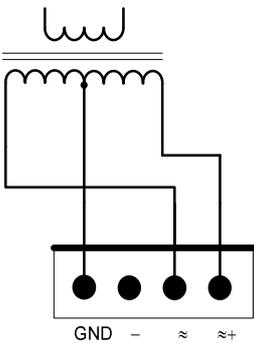


Figure 29 – The recommended method for connecting an AC power source

Power from a direct current source

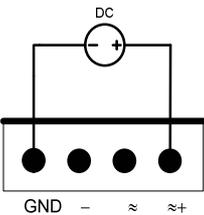


Figure 30 – The recommended method for connecting a DC power source

Accumulator

An accumulator can be connected to the SPADC3 device as a back-up power source, which provides power to the device in the event that the main power

source fails. This accumulator is also charged when the main power source is connected.

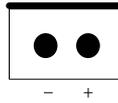


Figure 31 – Connecting the JP8 connector (Accumulator)

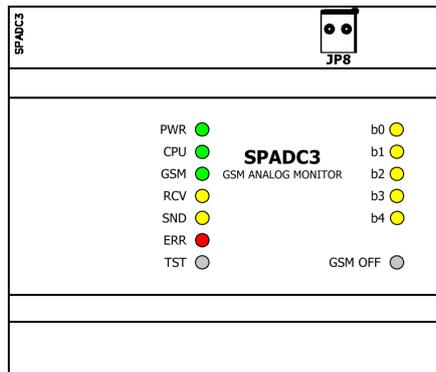


Figure 32 – Location of the JP8 connector (Accumulator)

Digital Inputs

The SPADC3 device contains 8 digital inputs. These inputs are delivered by way of JP6 connectors:

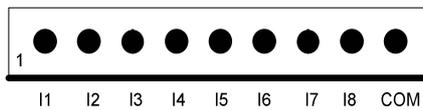


Figure 33 – Connecting the JP6 connectors (Digital inputs)

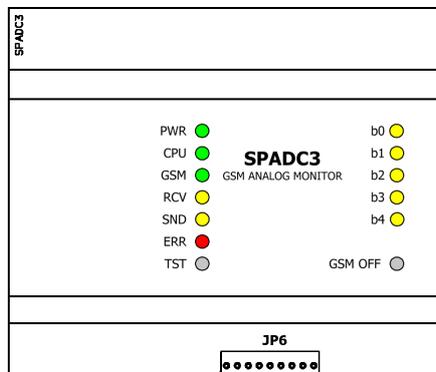


Figure 34 – Location of the JP6 connector (Digital inputs)

The connectors are connected according to the following table:

Identifier	Connector	
I1	JP6.1	digital input 1
I2	JP6.2	digital input 2
I3	JP6.3	digital input 3
I4	JP6.4	digital input 4
I5	JP6.5	digital input 5
I6	JP6.6	digital input 6
I7	JP6.7	digital input 7
I8	JP6.8	digital input 8
	JP6.9	Joint conductor

The connectors are connected according to the following figure:

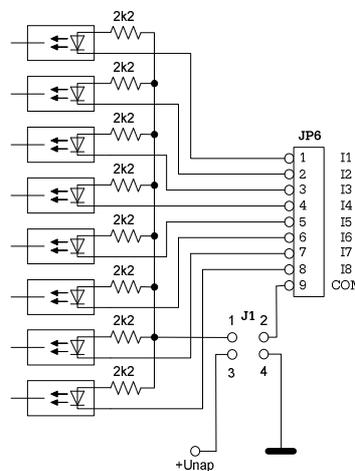


Figure 35 – Connecting the digital inputs

The way of logical signals interconnection between monitored system and GSM device has essential influence at the reliability of the system like whole. Improper way of connection (usually the simplest and cheapest one) diminish the ability of the GSM device to work in “electromagnetic noisy environment“ near contactors and other power elements, that may radiate strong electromagnetic noise (sparking at the contacts). Read please this part of manual carefully and if you are not sure it is 100% understandable, consult the project of connection by e-mail with the GSM device maker.

There are 2 modes available (jumper selectable).

Input Activation With A Contact (not recommended)

Internal +5V power (the same like used for CPU) is used to activate LED in inputs optocouplers and so insulation ability of the optocouplers is zero in this mode and CPU of the GSM device used to go out of program while sparking at

any power contact near the device. This mode can be used for testing only or in simple applications that cannot interfere with other electrical installations (e. g. simple magnetic door open contact without any other installations nearby). **Do not use this mode for industrial applications if the GSM device is connected with any electrical system using contact devices to control power.** Generally do not use this mode without consulting the project with GSM device maker.

Input Activation With External Power 8...30V DC (production default mode)

There must be a power source of DC voltage (must be filtered, not only transformer and bridge rectifier) to be connected in the circuit of a contact, that should activate an input while contact is ON. There is 5...15mA current necessary for each active input. Positive terminal is common for all the input optocouplers. It is good, when GSM device has separate power supply used exclusively for this purpose and the power supply for logical inputs is fully separated from GSM device power. A power supply, that is already used in original system (24V DC) is suitable to be used for inputs, it is not necessary to have a power supply exclusively for logical inputs.

Input Mode Selection

The inputs may be galvanically separated from the rest of the device in relation to the configuration of jumper J1.

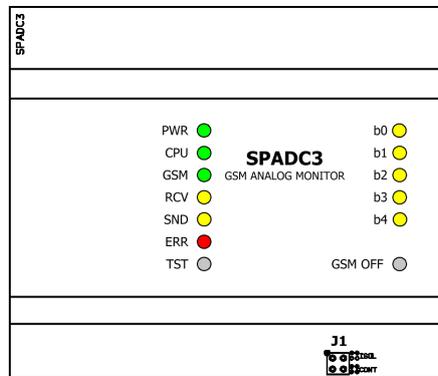
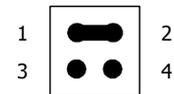
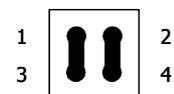


Figure 37 – The location of switch J1

If pins 1 – 2 are joined, the inputs work in a mode of galvanic separation. The input is inactive (L) if there is no power source connected between the pins *In* and COM. The input is active (H) if there is power between the pins *In* and COM. Warning: Pins 3 and 4 **must not** be connected.



If pins 1 – 3 and pins 2 – 4 are connected, the inputs are not galvanically separated. The inputs are inactive if the pins *In*



and COM are not joined. The inputs are active (H) if pins *In* and COM are joined.

At the time the device is delivered, pins 1 – 2 are joined and the inputs work in a mode that is galvanically separated.

Analogue Inputs

The device contains 8 analogue inputs. Seven are accessible to the user; the eighth monitors the charge of the back-up accumulator. The first 3 inputs (A1-A3) are designated for measuring voltage; the next 2 inputs (A4-A5) are designated for measuring current, and the last 2 (A6-A7) measure temperature.

Identifier	Connector	Description
A1	JP9	voltage 0 – 10 V
A2	JP10	voltage 0 – 10 V
A3	JP11	voltage 0 – 10 V
A4	JP12	current 0 – 20 mA
A5	JP13	current 0 – 20 mA
A6	JP14	temperature
A7	JP15	temperature

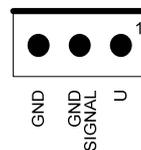


Figure 36 – Connecting inputs A1 to A3 (JP9 to JP11)

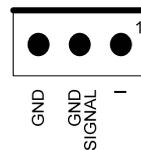


Figure 37 – Connecting inputs A4 and A5 (JP12 and JP13)

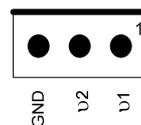


Figure 38 – Connecting inputs A6 and A7 (JP14 and JP15)

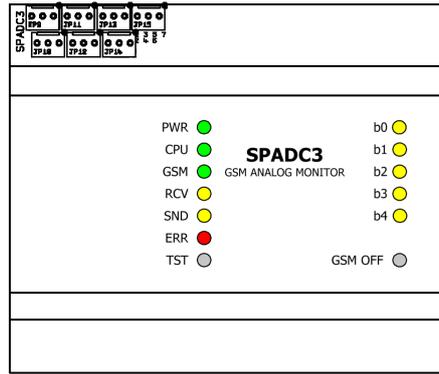


Figure 39 – Location of the JP9 to JP15 connectors (analogue inputs)

If shielded cable is used for any analogue input, all the shielding should be connected to a grounding (PE terminal) **outside** of GSM device.

Digital Outputs

The SPADC3 device contains 4 digital outputs.

Logical outputs are designed to control the coil of a relay to be placed near the GSM device, if the output is used. GSM device power source is used to operate the relay by default and so the relay must be placed as near as possible to the GSM device. **It is not allowed to install the relay far from the device (more than 20 cm) and connect it by long cables, that work like aerial for electromagnetic noise and such system will never be reliable.**

Outputs O1 and O2 are delivered by way of JP5 connectors and are activated by switching on a field effect (FET) transistor to GND (ground) connection. Each output can handle a maximum load of 300mA.

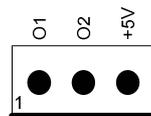


Figure 40 – Connecting the JP5 connectors (digital outputs O1 and O2)

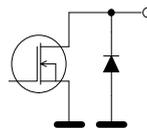


Figure 41 – Internal connection of digital outputs O1 and O2

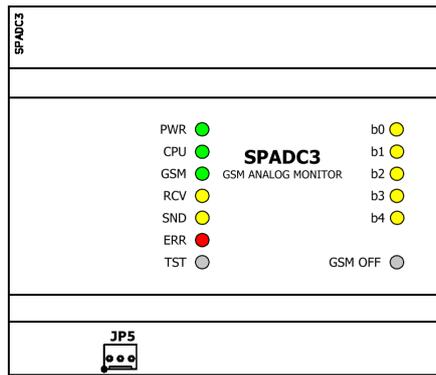


Figure 42 – Placement of the JP5 connectors (digital outputs O1 and O2)

The connectors are connected according to the following table:

Identifier	Connector	Description
O1	JP5.1	digital output 1
O2	JP5.2	digital output 2
	JP5.3	+5V

Outputs O3 and O4 are delivered by way of JP17 connectors and are activated by switching on a field effect (FET) transistor connected from the power source to the input line. Each output can handle a maximum load of 500mA.

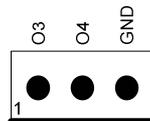


Figure 43 – Connecting the JP17 connectors (digital outputs O3 and O4)

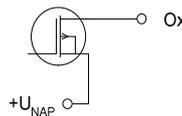


Figure 44 – Internal connection of digital outputs O3 and O4

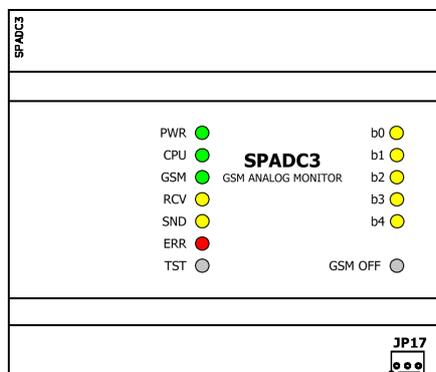


Figure 45 – Placement of the JP17 connectors (digital outputs O3 and O4)

The connectors are connected according to the following table:

Identifier	Connector	Description
O3	JP17.1	digital output 3
O4	JP17.2	digital output 4
	JP17.3	GND

GSM modem

The GSM modem is a device used for communicating with the GSM network. It is located above the bottom board connectors.



Figure 46 – GSM modem and the location of the antenna connector

In order for this device to function properly, an antenna must be connected with the antenna cable provided. The location of the antenna connector is indicated in the figure by an arrow.

SIM Card

In order for the device to function properly, a SIM card that allows working in the GSM network is also required. A SIM card can be obtained from the GSM network operator that is selected for the operation of the device.

The SIM card reader is located beneath the top cover. Lift the top panel (there are openings for a screwdriver in the middle of the side panels) and the reader is in the middle of this board.

Service Module

It is advisable to connect the SM2 service module to the device in order to simplify diagnostic procedures. This portion is not required for the device to function normally.

The SM2 service module is connected by means of a flat cable to the JP1 connector (the flat cable is included with the SM2 device):

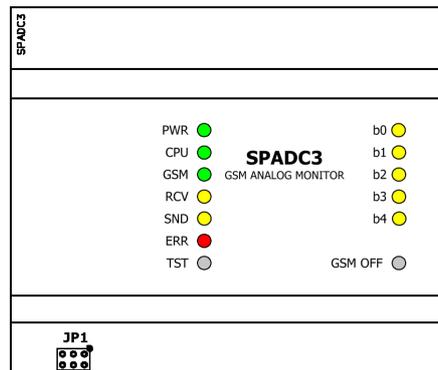


Figure 47 – Location of the JP1 connector (SM2)

The SM2 module contains a two-line matrix display that provides detailed information about the device status (signal quality, errors, etc.)

Connecting with the Configuration PC

A JP2 connector is used for connecting the device to the configuration PC by a PRGKAB cable, which is not included with the device and must be ordered separately.

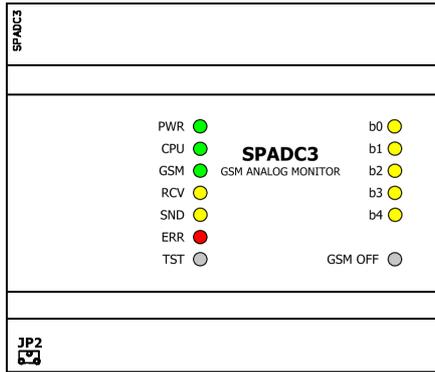


Figure 48 – Location of the JP2 connector (configuration)

High-Speed Input

The device includes an input that counts pulses. The status of this sensor can be included in a message about the device status. This input counts pulses longer than 90ns. The maximum pulse frequency is 10 kHz.

The nominal input voltage is 12V, the input is galvanically separated and the placed on JP7 connector.

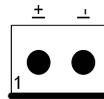


Figure 49 – Connecting the JP7 connector (FAST PULSE COUNTER)

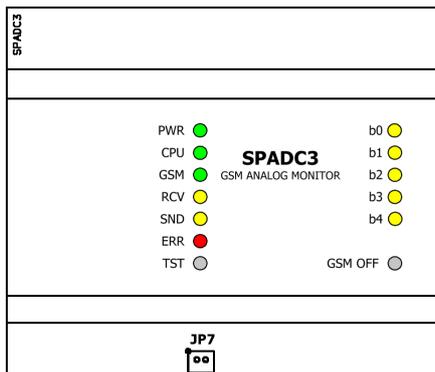


Figure 50 – Location of the JP7 connector (FAST PULSE COUNTER)

Diagnostics

The top cover of the device contains a series of LED diodes and two buttons for indicating and managing the device status.

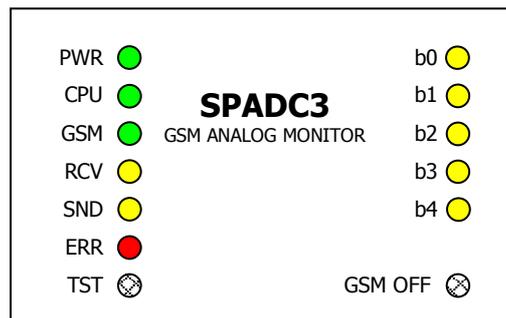


Figure 53 – The top panel of the device

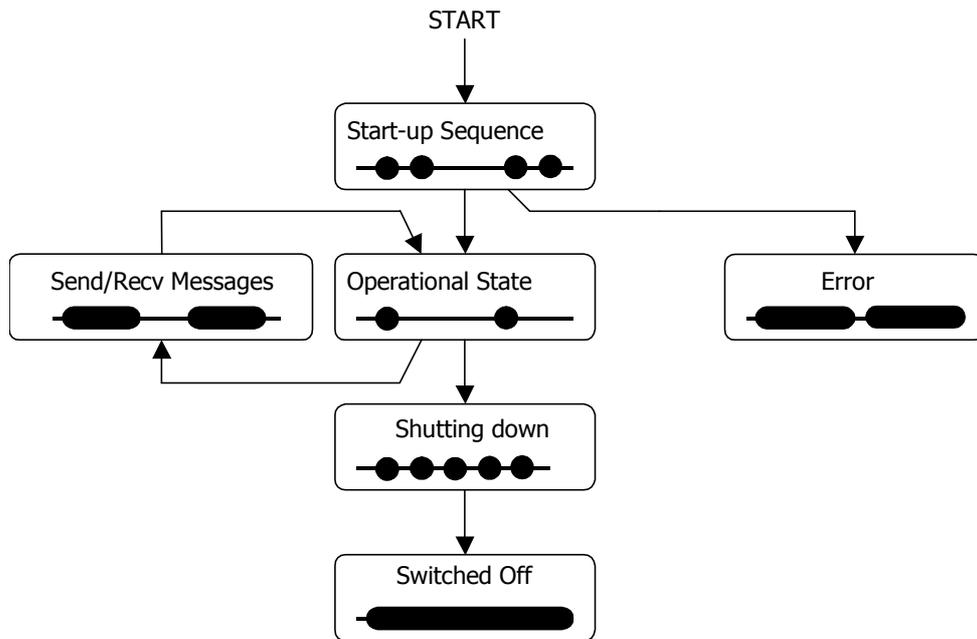
PWR LED

This LED indicates the power status of the device. As long as it remains lit, the power is in order and is not dependent on the main processor and modem.

CPU LED

It is possible to use the **StatusLED** located on the top panel of the device for basic diagnostics.

This LED indicates the following statuses:



LED status	Description	Definition
• • • •	Two quick flashes in succession	Start-up sequence
• • • •	Slow flashing	Normal status
• • • •	Quick flashing	The device is preparing to be switched off
▬▬▬▬	Lit continuously	Switched off
▬ • •	One long flash followed by two short flashes	Configuration mode

GSM LED

Indicates modem status.

LED Status	Definition
▬▬▬▬	Modem start
• •	Logged into the network – no activity
▬▬▬▬	Active connection

RCV LED

This LED indicator remains lit while an SMS message is being received from the GSM network.

SND LED

This LED indicator remains lit while an SMS message is being sent to the GSM network.

ERR LED

If any errors occur during the device's operations, this LED remains lit and the LEDs **b0** to **b4** provide more details about what type of error occurred.

TEST Button

Not currently used.

GSM OFF Button

Used to switch the device off. Refer to the section on Device Functions – [Shutdown](#).

Using SM2

You can use SM2 for checking SPADC3 connection to monitored control system. You can see on LCD display the analog inputs actual values and status of logical inputs. You can simulate activation and deactivation of logical outputs and test so, if they have adequate effect on monitored system.



Figure 54 – SM2

How to use

- Connect SM2 do device at any time. On display of the device will be shown login status a signal quality (on right side).

	Signal cannot be detected
	0% – very poor signal
	25% –
	50% – good signal
	75% –
	100% – excellent signal

- Press button **MENU** on SM2. Information about device will be displayed. Now you are displaying Monitor. The first step is device identification and version.
- By pressing button **ITEM** on SM2 you will browse states of device according to figure 55.
- Pressing of button **MENU** on SM2 will return you to display login information.

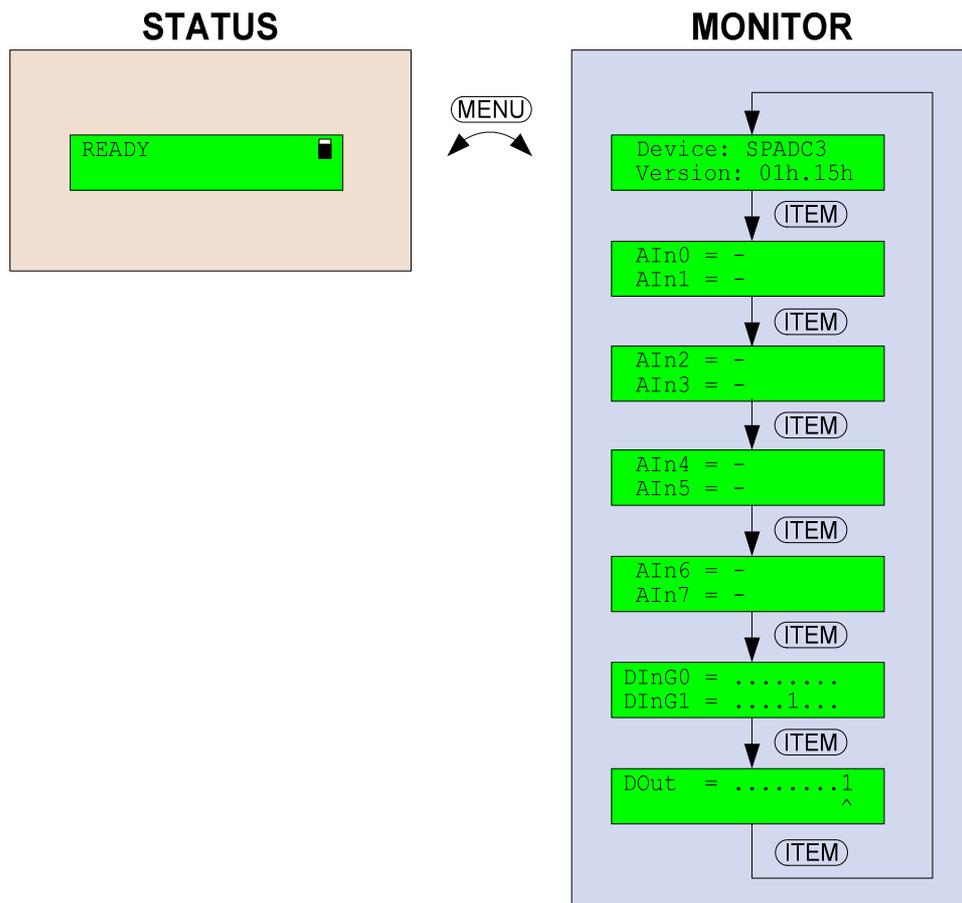


Figure 55 – Monitor map

Diagnostic Steps

- *Device identification* ... device name and version are displayed.
- *AIn* ... analogue inputs. States of two analogue inputs are displayed in each step.
- *DInG0, DInG1* ... states of logical inputs, group 0 and 1. Group 0 shows real inputs of the device. The rightmost is the first. In group 1 only rightmost bit is used and it displays state of main power.
- *DOut* ... states of logical outputs. You can change states of outputs, as shown on following figure.

If you are displaying DOut you can simulate output activation and deactivation. Move cursor ^ under bits by pressing + button and select so output bit you wish to test. After this selection the auto bit will go to active state (1) after pressing buttons ↑ a to inactive (0) after pressing button ↓.

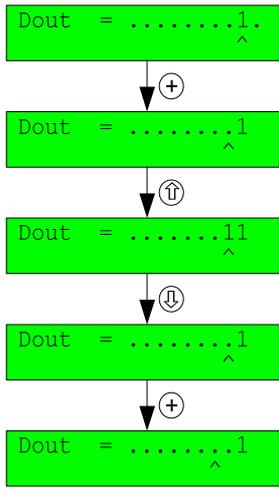


Figure 56 – Changing DOut state

Guarantee

Warranty for software in GSM device microprocessor and programming PC software

The software in the microprocessors of the offered devices and the programming PC software is offered as is. It was developed by our software experts and carefully tested in our laboratory and in operation by our customers. Despite all this care, the software may reveal errors or problems in relation to a specific property of GSM of given GSM provider at the place of using the device may occur. Should you encounter any such errors, we shall remove these errors for free provided that you deliver the device with detailed error description to our company and then will take the device back. **Our company as the producer SHALL NOT BE LIABLE for any damage, costs or any other detriments** (either expressed or implied) on the user's side or to any other legal or physical persons to whom these errors occurred or might occur. **Our company as the producer SHALL NOT BE LIABLE for any damage, costs or any other detriments** (either expressed or implied) occurred by non-transmitting any SMS message or non-establishing connection with GSM network.

In case of a software error and description thereof delivered to our company, best by e-mail with attached configuration files or recorded messages, we can provide the customer with a new processor with the software or CD with installation of PC software for free. The customer shall replace the processor at his own expense and the customer shall be required to return the original processor at his own expense to our company within 14 days to avoid voiding warranty for the delivered devices.

Until full payment, the delivered device remains the property of SEA s.r.o., which reserves the right, in case of non-payment within 10 days of the first notice, to take the device out of service. In this case, the customer and end user have no right to compensation for any damages or costs occurred and associated with commissioning of the device.

Conformance Assessment Declaration



Company For Electronic Applications

We,

SEA spol. s r. o.
Dolnoměcholupská 21/96
102 00 Praha 10
IČO: 47117931

declare, that **Conformance Assessment** was issued for following products:

GSM sets:

TC35-SEA-BOX	TC35-SEA-SET
MC35-SEA-BOX	MC35-SEA-SET

GSM devices:

MPI-1A	MPI-2A	
SP-4	SP4-BOX	
SP-5	SP5-BOX	
SPA-5	SPA5-BOX	SPA5-MINIBOX
SPADC-2	SPADC2-BOX	
SPADC-3	SPADC3-BOX	

In Prague, 5.5.2003

ing. Vladimír Rosůlek
general director SEA spol. s r.o.

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History

12.05.2003 version 1.15	<ul style="list-style-type: none">• Added „Conformance Assessment Declaration“.
12.05.2003 version 1.21	<ul style="list-style-type: none">• Synchronization with Czech version 1.21
18.05.2004 version 1.22	<ul style="list-style-type: none">• Many small changes• New configuration software• Added SM2 monitor description

End of document
