NOKIA 12 GSM MODULE
REMOTE I/O CONTROL GUIDE

NOKIA

Contents

Legal Notice

ACRONYMS AND TERMS

Acronym/term	Description
ASCII	American Standard Code for Information Interchange
AT	Attention
CORBA	Common Object Request Broker Architecture
CSD	Circuit Switched Data
GPRS	General Packet Radio Service
GPS	Global Positioning System
GSM	Global System for Mobile Communications
I/O	Input/Output
M2M	Machine-to-Machine, Mobile-to-Machine, Machine-to-Mobile
NITZ	Network Indication and Time zone
SMS	Short Message Service
SW	Software

1.   ABOUT THIS DOCUMENT

This document describes how the Nokia 12 GSM module can be used in Remote I/O control mode. The methods for controlling a module in this operation mode are described, as well as how to increase security.

Before using the product, it is important to read the safety instructions and notifications at the end of this document, see chapter 10.

For more information about the Nokia 12, other Nokia M2M products, and application development for M2M, please visit Forum Nokia and M2M links at http://www.forum.nokia.com or http://www.americas.forum.nokia.com.

2. INTRODUCTION

2.1 GENERAL

The Nokia 12 GSM Module provides wireless connectivity and remote management possibilities for machine-to-machine (M2M) applications and other wireless solutions. The Nokia 12 GSM Module has two variants:

- RX-2 is dual band EGSM900/GSM1800 product

- RX-9 dual band GSM850/GSM1900 product.

The Nokia 12 GSM Module supports EGPRS, GPRS, HSCSD (not supported in RX-9), CSD, and SMS.

Simple I/O applications can be easily implemented using the Nokia 12 GSM Module in the Remote I/O control, which offers message personalising, secure messaging, and timing functionality for SMS controlled I/O applications.

Additional intelligence for I/O applications can easily be implemented with Java. Java technology enables upgrading the application software, IMlet, also remotely.

The Nokia 12 GSM Module enables also location service in the Remote I/O control. Location coordinates can be easily queried by SMS.

The Remote I/O control is explained in this document.

> **Note:** Some services described or mentioned in this document, such as GPRS, are network dependent. Please contact your network service provider for details.

2.2 REMOTE I/O CONTROL

In the Remote I/O control the Nokia 12 GSM Module is controlled with, for example, a compatible mobile phone. Control messages are sent as text messages from the mobile phone to the Nokia 12 GSM Module. Based on the information in the text message, the Nokia 12 GSM Module in turn controls a device or machine attached to it through the M2M system connector.

Table 1. Functions in the Remote I/O control

Function	Details
Control a device	Switch devices on or off
	Switch devices on or off for a period of time

Monitor a device	Find out if a device is already on or off
	Receive alarm messages if a device has been switched on or off
	Receive alarm messages if a specified alarm limit has been crossed
Personalize	Define your own device commands (aliases)
	Disable acknowledgements for device commands
	Select the frequency of alarm messages (alarm once/continuously)
	Identify the calling party and give permissions for device control
Position	Get position information through the Nokia 12 GSM Module when connected to a GPS device

The Nokia 12 GSM Module processes the control message it receives, and sends the response as a text message back to the originator. Received and recognised control messages are not stored in the Nokia 12 GSM Module memory. If a text message is not recognised as a control message, it is stored on the SIM card or Nokia 12 GSM Module memory as a normal text message.

Before you can send control messages to the Nokia 12 GSM Module in order to control or monitor the device attached to it, you must configure the Nokia 12 GSM Module. Use the Nokia 12 Configurator software, which can be downloaded at http://www.forum.nokia.com or http://www.americas.forum.Nokia.com. Some configurations are also possible with control messages; others require that Configurator is used.

Note: To use Configurator, you need the Nokia 12 GSM Module and a test board. The Nokia 12 GSM Module is connected to a compatible PC and Configurator with the test board. A power supply, data cable, antenna adapter, antenna, and SIM card are also needed. All these items are included in the Nokia 12 GSM Module test board sales package.

Attach the device to be controlled or monitored with control messages to the general-purpose inputs and outputs of the M2M system connector of the Nokia 12 GSM Module. There are 11 inputs of which the first three (1-3) are analog and the rest (4-11) are digital. The Nokia 12 GSM Module has also 9 digital output pins on the M2M system connector. If the information available from the device is continuous, select one of the three analog input pins. If the information is on/off information, use the inputs 4-11. The nine outputs can be used in digital mode only (set something on/off).

3.   SECURITY

There are different levels of access control for the Remote I/O control: message identifier, password, and authorised numbers. Also the aliases defined for commands increase security.

You must use a message identifier, which means that you must name the Nokia 12 GSM Module to be able to use the Remote I/O control. Each control message begins with an identifier, which enables the Nokia 12 GSM Module recognise it as a Remote I/O control message. Enter the identifier with the Nokia 12 Configurator software when using the Nokia 12 GSM Module for the first time (see chapter 4.5). Only users who know the correct message identifier can control and monitor the device attached to the Nokia 12 GSM Module. The message identifier is case sensitive.

You can use a password to further secure the communication between the mobile phone and the Nokia 12 GSM Module. You must enter the password when sending a control message to the Nokia 12 GSM Module. Set the password with Configurator or with a control message (see chapter 5.2). Only users who know the correct password can control and monitor the device attached to the Nokia 12 GSM Module. The password is case sensitive.

You can also determine a closed user group of up to 16 authorised phone numbers. The Nokia 12 GSM Module only accepts control messages from these phone numbers. Specify the numbers with Configurator. The first number on the authorised phone number list is in bold and it identifies the main user of the Nokia 12 GSM Module. The main user is notified of any unauthorised control attempts.

You can use user-defined commands (aliases) instead of the default commands of the Nokia 12 GSM Module (see chapter 5.3). If an alias has been defined, the default command can no longer be used and is not accepted as part of a control message. While default commands are generally known, an alias is only known by the one who defined it. Only users who know the correct alias can control and monitor the device attached to the Nokia 12 GSM Module.

Note: The message identifier and password are case sensitive, whereas commands and aliases are not.

4. GETTING STARTED

4.1 SETTING UP THE CONFIGURATOR ENVIRONMENT

To use Configurator, the following tools are needed:

- Nokia 12 GSM Module (RX-2 or RX-9)
- Nokia 12 test board
- Power supply ACW-6
- Data cable AXS-3
- Antenna adapter cable
- Antenna
- SIM card

All items listed above, except the SIM card, are included in Test board sales package. Configurator can be used with a SIM card inserted to the test board SIM card holder. To use Configurator:

1. Mount the Nokia 12 GSM Module on the 60-pin connector of the test board.
2. Insert the SIM card into the test board SIM card holder.
3. Connect the antenna to the Nokia 12 GSM Module with the antenna adapter cable.
4. Connect the data cable AXS-3 to a compatible PC and to the test board. Use the D9 connector port 2 in the test board. To enable the connection, select the M2M system protocol in the preferences dialog (*File -> Preferences*) as the communication type.
5. Turn the switch on the test board in the following way:
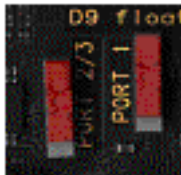
6. Connect the power supply ACW-6 to the test board and to an AC wall outlet.

	Note: The connection settings in the preferences dialog must be correct.

For more information on the Nokia 12 test board, refer to the *Nokia 12 Test Board Specification*.

When you have completed the above steps, Configurator automatically establishes a connection between the PC and the Nokia 12 GSM Module when Configurator is started.

4.2 CONNECTING A DEVICE OR A MACHINE

Connect the device to be controlled with the Remote I/O control to the Nokia 12 GSM Module through the M2M system interface. The general-purpose inputs and outputs of the M2M system connector that are described in Chapter 6 are connected to the device.

More information about how to connect a device electrically to the Nokia 12 GSM Module and about the recommended connector types is provided in *Nokia 12 GSM Module HW Integration Manual*.

4.3 MANDATORY SETTINGS

To use the Remote I/O control of the Nokia 12 GSM Module, you have to configure these settings:

- Message identifier

- SMS centre address

- You can also configure the following optional settings (described in Chapter 5):

- Disabling acknowledgements

- Security settings

- Input settings

- Defining aliases for text messages

- Initial output value settings

- GPS port settings

Use Nokia 12 Configurator to configure the settings of the Nokia 12 GSM Module. Download Configurator at http://www.forum.nokia.com or http://www.americas.forum.nokia.com. You can also use a control message (short message) for the optional settings.

The following sections describe the process of getting started with the Remote I/O control.

Note: To use Configurator, you need the Nokia 12 GSM Module and a test board. The Nokia 12 GSM Module is connected to a compatible PC and Configurator with the test board. A power supply, data cable, antenna adapter, antenna, and SIM card are also needed. All these items are included in the Nokia 12 GSM Module test board sales package.

4.4 READING AND WRITING PARAMETERS

To read parameter values from the Nokia 12 GSM Module and write parameter values to it, use Configurator. Each Configurator dialog has "Read parameters" and "Write parameters" button for this purpose. Data is transferred between Configurator and the Nokia 12 GSM Module only after you have clicked either of these buttons.

| | **Note:** To apply the configured settings, click either the Read parameters or Write parameters button. |

Some of the settings require that you reset the Nokia 12 GSM Module before they take effect. Either click the Reset button on the test board or remove and plug in the power cord on the test board. You can also use Configurator to reset the Nokia 12 GSM Module (*File -> Reboot Module*).

| | **Note:** The Nokia 12 GSM Module should be reset after you have configured all parameter values. |

After a parameter value has been successfully configured to the Nokia 12 GSM Module, the dialog in Figure 1 appears.
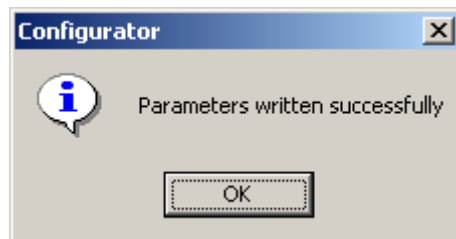
Figure 1. Dialog for successful parameter configuration

4.5 DEFINING THE MESSAGE IDENTIFIER

The message identifier is a mandatory setting that must be configured in order to use the Remote I/O control. Figure 2 shows a dialog (*User Control Mode -> Settings -> Initialize*) where you can set the identifier in Configurator. To define the message identifier, press Change. See Figure 2.

| | **Note:** Press the Write parameters button to activate the new identifier. |

After you have set the message identifier, more parameters become available. If a message identifier has been previously defined to the Nokia 12 GSM Module, press the Read parameters button to enable the additional parameters.

Characters accepted for the message identifier are defined in Chapter 7, except the space characters.

![i]	**Note:** You cannot use the Remote I/O control if there is no message identifier defined. In this case, all received short messages will be handled as normal messages and the inputs/outputs cannot be controlled in the Remote I/O control.
![i]	**Note:** The message identifier is 1-8 characters long and case sensitive.
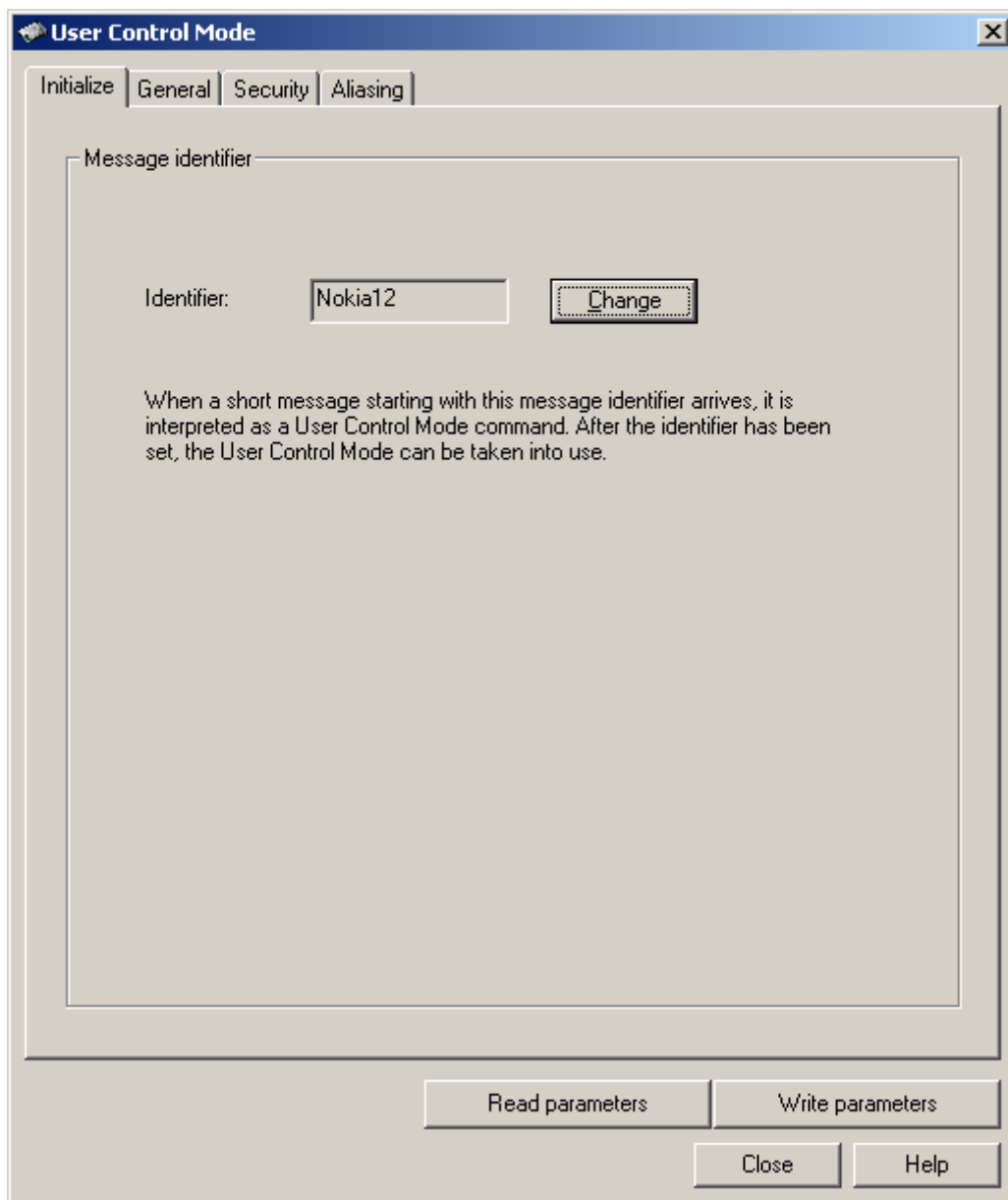
Figure 2. User Control Mode dialog

4.6 SETTING THE SMS CENTRE ADDRESS

A dialog for setting the SMS centre address with the Nokia 12 Configurator (*GSM Settings -> Advanced -> Short Messages)* is shown in Figure 3.

To check whether the SMS centre address is available on the network service provider SIM card, press the Read parameters button shown in Figure 3. If the SMS centre address is not available, specify it in the Short Messages dialog in order to be able to use the Remote I/O control.

	Note: Contact your network service provider for the SMS centre address.
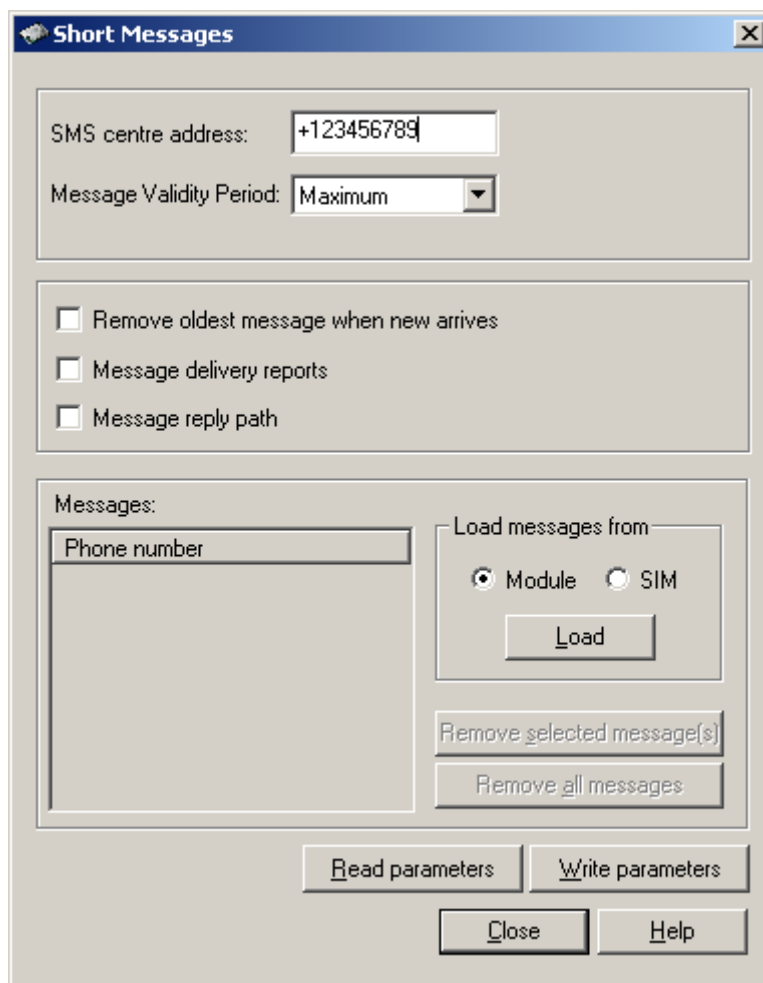
Figure 3. Short Messages dialog

Short messages can be stored in the SIM card or the Nokia 12 GSM Module memory. If both of these short message storages are full, new messages cannot reach the Nokia 12 GSM Module. If the "Remove oldest message" option is selected in the short message dialog, the oldest message will be removed from the SIM card memory when a new message arrives, if both the

SIM card and the Nokia 12 GSM Module memory are full. It is recommended to select the option "Remove oldest message when new arrives" for the Remote I/O control, because then the control messages have a better chance of reaching their destination and fulfilling their purpose.

5. OPTIONAL CONFIGURATIONS

5.1 DISABLING ACKNOWLEDGEMENTS

The Nokia 12 GSM Module acknowledges whether or not a text message has successfully commanded a device. The Nokia 12 GSM Module sends a response as a text message back to the phone number that sent the control message. It is also possible to disable this feature to decrease the amount of communication with the device, for example.

Figure 4 displays a dialog (*User Control Mode -> Settings -> General*) for configuring acknowledgement messages.
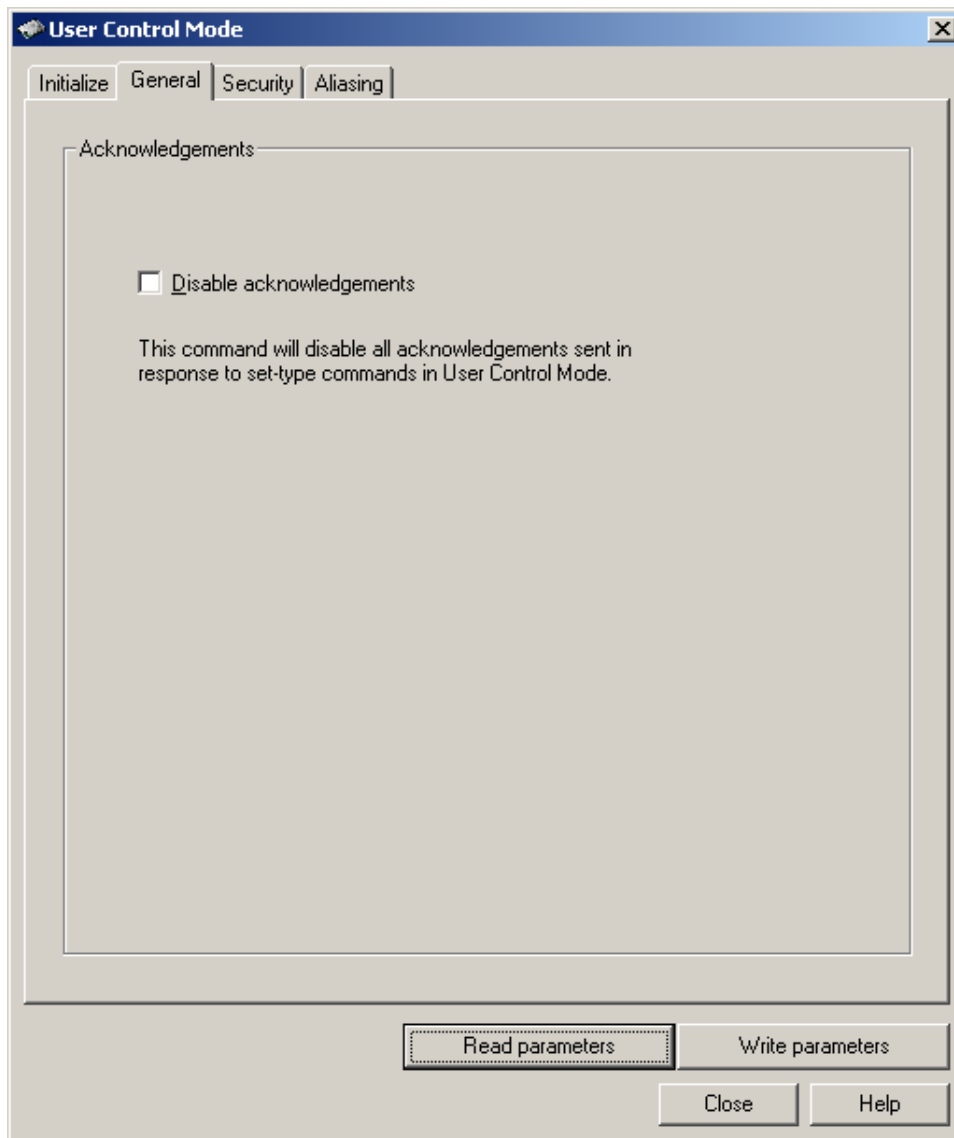
Figure 4. General settings

If you select the Disable acknowledgements option, only response messages to acknowledgement messages are disabled. The following will not be disabled:

- Status messages; responses to input state or value queries

- Indication messages, for example, responses to timed commands (see Chapter 9.3.7)

- Alarm messages; responses to alarm subscriptions (see Chapters 5.4 and 9.3.3)

- Error messages that are sent, for example, in response to a control message with the correct message identifier and password, but with the wrong command

- Response messages to password change messages (see Chapter 9.3.1)

- Response messages to pulse cancel messages (see Chapter 9.3.8)

5.2 SECURITY SETTINGS

Figure 5 shows a dialog (*User Control Mode -> Settings -> Security*) where security settings can be configured with Nokia 12 Configurator.

5.2.1 Authorised numbers

Authorised number selection limits the access to specific phone numbers only in the Remote I/O control. Only control messages originating from an authorised number are allowed to control the Nokia 12 GSM Module and the device attached to it.

It is possible to define up to 16 authorised numbers. The first number on the authorised phone number list is in bold (see Figure 5) and is the phone number of the main user. The main user will be notified of any unauthorised control attempts.

The following message will be sent to the main user if there is an unauthorised control attempt:

Unauthorized Number:

Number: X

Command: Y

X is the phone number of the originator of the control message, and Y is the command that was attempted. If the length of a command or alias is too long to be shown in one message (more than 160 characters), it will be sent as several messages.

The phone numbers in the authorised number list may contain digits 0-9 and the "+" character (ASCII range 0x30-0x39 and 0x2B), for example, +1234567890, for a maximum length of 32 characters.

> **Note:** The phone numbers in the authorised number list should be defined in international format with a plus sign, country codes, etc. Note that the Nokia 12 GSM Module needs to receive and identify the number to recognise it as authorised. Contact your network service provider for details.
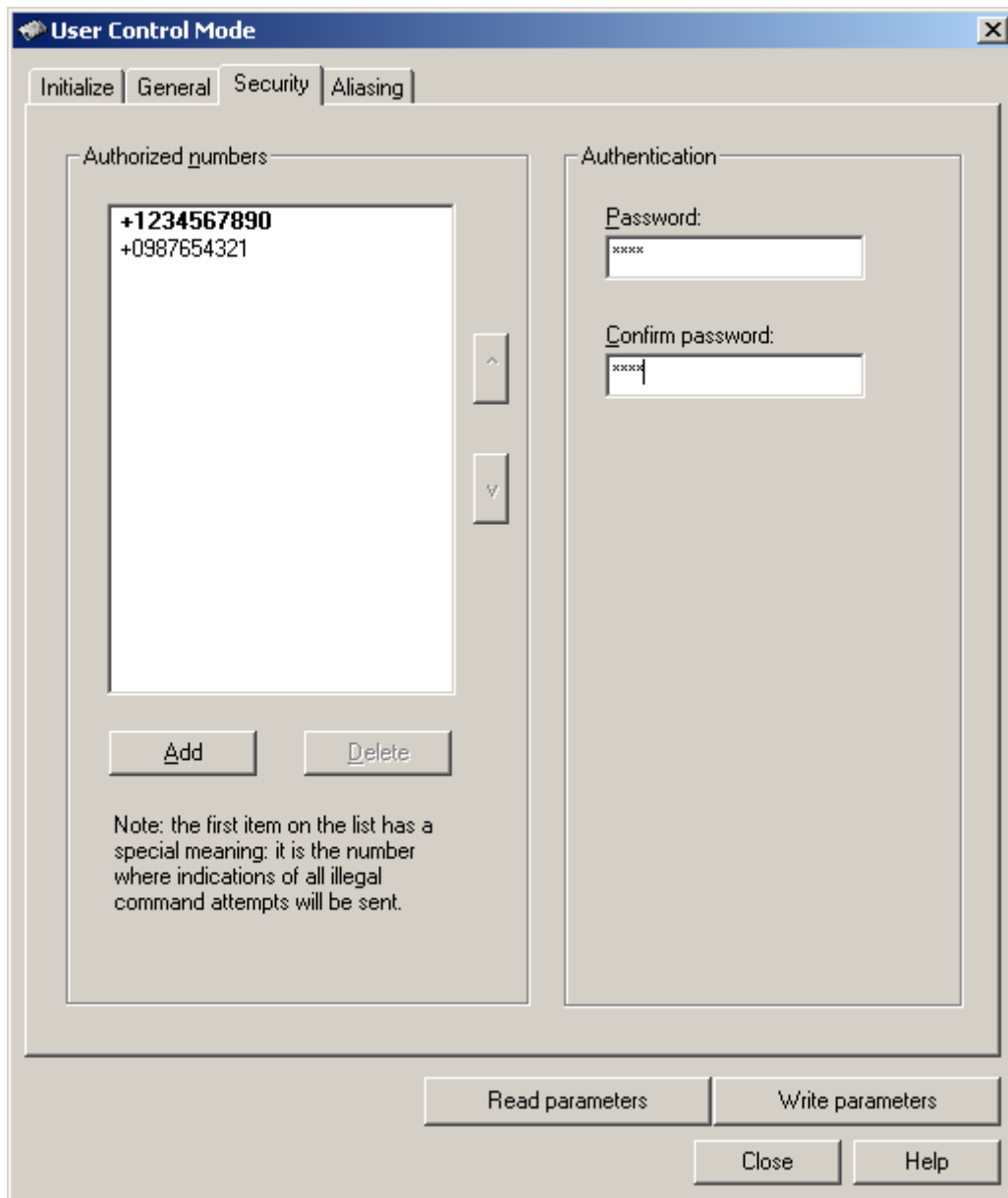
Figure 5. Security settings

Authentication

A user-specified password can further secure the communication between a mobile handset and the Nokia 12 GSM Module. The password must be entered when a control message is sent to the Nokia 12 GSM Module. When this feature has been set on, but the password is missing or incorrect, the message received is discarded. Activate or change the password with Configurator or with a control message (see Chapter 9.3.1).

The length of the password is 1- 8 characters, and it is case sensitive. It accepts characters defined in Chapter 7, except space characters. The password is case sensitive.

	Note: If the password is changed, an indication message is only sent to the phone number that requested the change.

5.3   ALIASING

Figure 6 shows a dialog (*User Control Mode -> Settings -> Aliasing*) where aliases can be defined for commands with the Nokia 12 Configurator.
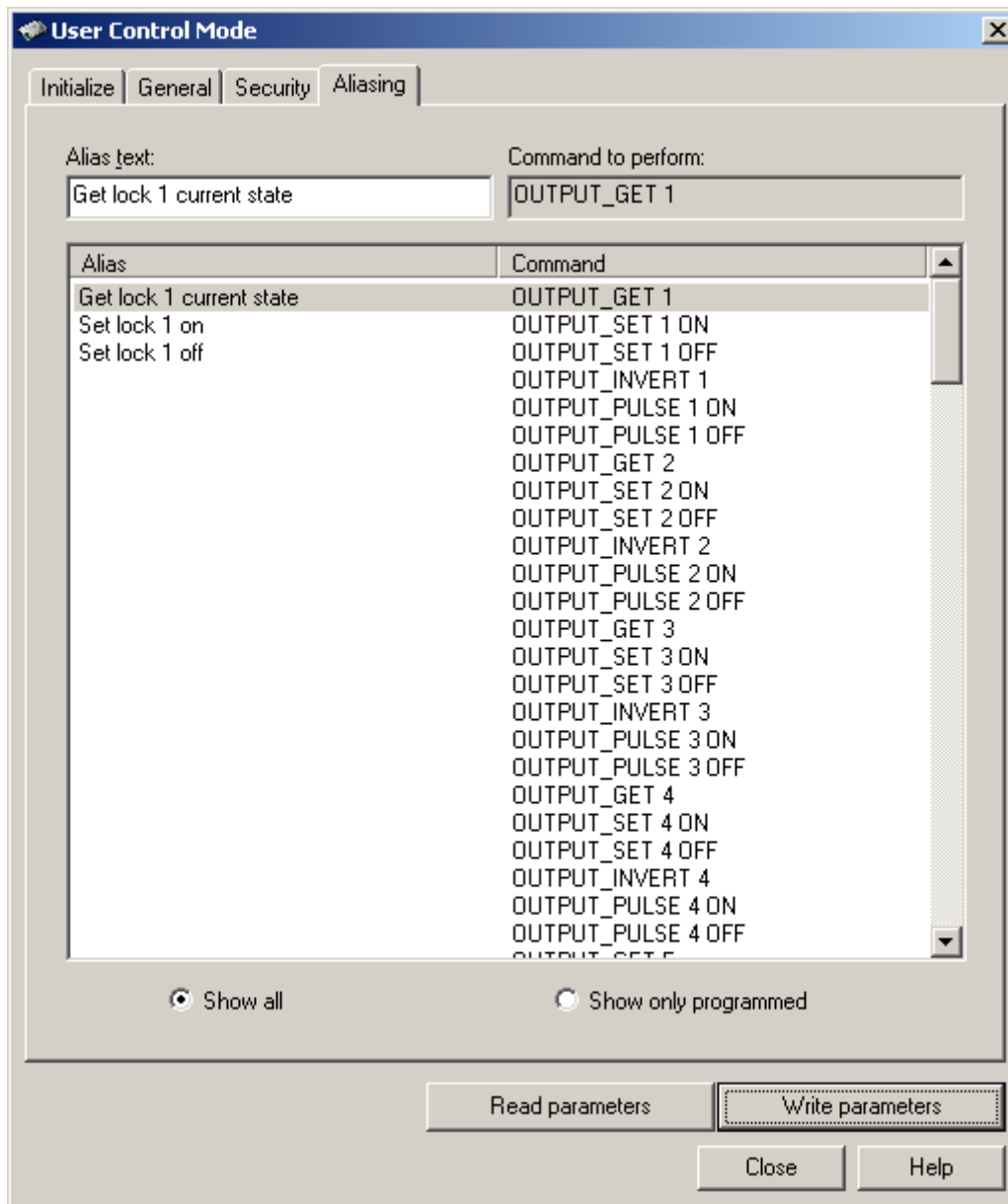
Figure 6. Setting aliases for device commands

In the Aliasing dialog, you can replace the predefined commands with user-specified commands (aliases). The defined alias replaces the initial command or previous alias configured for the command. If an alias has been configured, the original command is no longer accepted. Defining an empty alias for a command can restore the original command. Duplicate aliases are not allowed.

Aliases can also be defined for status messages sent in response to status queries. Thus, an alias can be defined for a command for controlling the device, querying the status of the device (see chapter 9.1), and for the message received in response to the query (see chapter 9.2).

Characters accepted in aliases are defined in chapter 7.

ℹ️	**Note:** If an alias is defined, the default command will be disabled. There can be only one effective command or alias for each function at a time. An alias must not be equal to a default command. Empty aliases cannot be used. If an empty alias is set, the default command will remain effective.
ℹ️	**Note:** The alias string must be unique and the maximum length is 24 characters. Neither commands nor aliases are case sensitive. However, the message identifier and password are.

5.4 INPUT SETTINGS

Figure 7 shows a dialog (*File -> Module* Configuration *-> Input Settings*) where you can configure analog input settings with Configurator.

The Nokia 12 GSM Module has separate digital and analog inputs. You can set high and low limits to the analog input pins. The pin can be in the normal or alarm mode. If the information is continuous, use inputs 1-3.

The input sampling interval indicates the period for which the Nokia 12 GSM Module polls the input state. The sampling interval value ranges from 1 to 60 seconds.

For control messages querying input states or values, see Chapter 9.3.2.

You can subscribe to text message alarms as response messages. This is done using control messages described in Chapter 9.3.3.

As a default, the alarm message is sent once to the number where the alarm was subscribed. Alternatively, the alarm can be sent continuously. In this case, alarm messages are sent when alarm conditions are met, until the alarm subscription is cancelled (see Chapter 9.3.3). To configure the alarm sequence, select "Continuously" or "Once" in the Input Settings dialog.

In analog input, or if device data is continuous, an alarm can be set to be triggered when a limit is crossed. Configurator requires the high and low limits as millivolts (0 … 2800 mV) and the sampling interval as seconds (1-60 s).

Control messages for subscribing an alarm or alarms are described in chapter 9.3.3.

ℹ️	**Note:** It is mandatory to set input high and low limit values in the analog mode.
ℹ️	**Note:** The number to which alarm messages are sent can only be defined by subscribing to an alarm. After the subscription, the alarm will be sent as a response to the number where the alarm was subscribed. Thus, the number cannot be defined with Configurator.

> **Note:** In digital input, an alarm can be triggered when the state of the digital input changes. See chapter 9.3.3 for more information.

Figure 7. Input settings

> **Note:** In Figure 7 the Input 1 and 3 cannot be used for alarming because they are configured as Normal.

5.5   DEFAULT OUTPUT VALUE SETTING

Set the initial state of each output pin and the device being controlled with Configurator (*File -> Module Configuration -> Default Output Values*). The

values set here will take effect the next time the Nokia 12 GSM Module is powered up.

Check the box in the Default Output Settings window to set the output to 1. If you leave the box empty, the output is 0.

Note: The number of available digital outputs depends on the port configurations.

6. INPUT/OUTPUT PIN DESCRIPTIONS

The Nokia 12 GSM Module has input and output pins on the M2M system connector, which can be controlled using the services of the Remote I/O control. Pin descriptions are shown in Table 2.

Table 2. PIN descriptions

Name	Analog/Digital	R/W	Pin Number (*)
Input 1	Analog	Read	36
Input 2	Analog	Read	20
Input 3	Analog	Read	19
Input 4	Digital	Read	54
Input 5	Digital	Read	35
Input 6	Digital	Read	34
Input 7	Digital	Read	56
Input 8	Digital	Read	43
Input 9	Digital	Read	59
Input 10	Digital	Read	55
Input 11	Digital	Read	46
Output 1	Digital	Read/Write	53
Output 2	Digital	Read/Write	30
Output 3	Digital	Read/Write	31
Output 4	Digital	Read/Write	32
Output 5	Digital	Read/Write	33
Output 6	Digital	Read/Write	57
Output 7	Digital	Read/Write	58
Output 8	Digital	Read/Write	42
Output 9	Digital	Read/Write	44
(*) Pin number on M2M System Connector			

For more information on the electrical characteristics of the M2M system connector, see *Nokia 12 GSM Module Hardware Integration Manual*.

Note: Depending on the Nokia 12 GSM Module configuration, some pins are used as serial ports (TxD, RxD, CTS and so on). GPS support can be configured to some pins. See Figure 8.
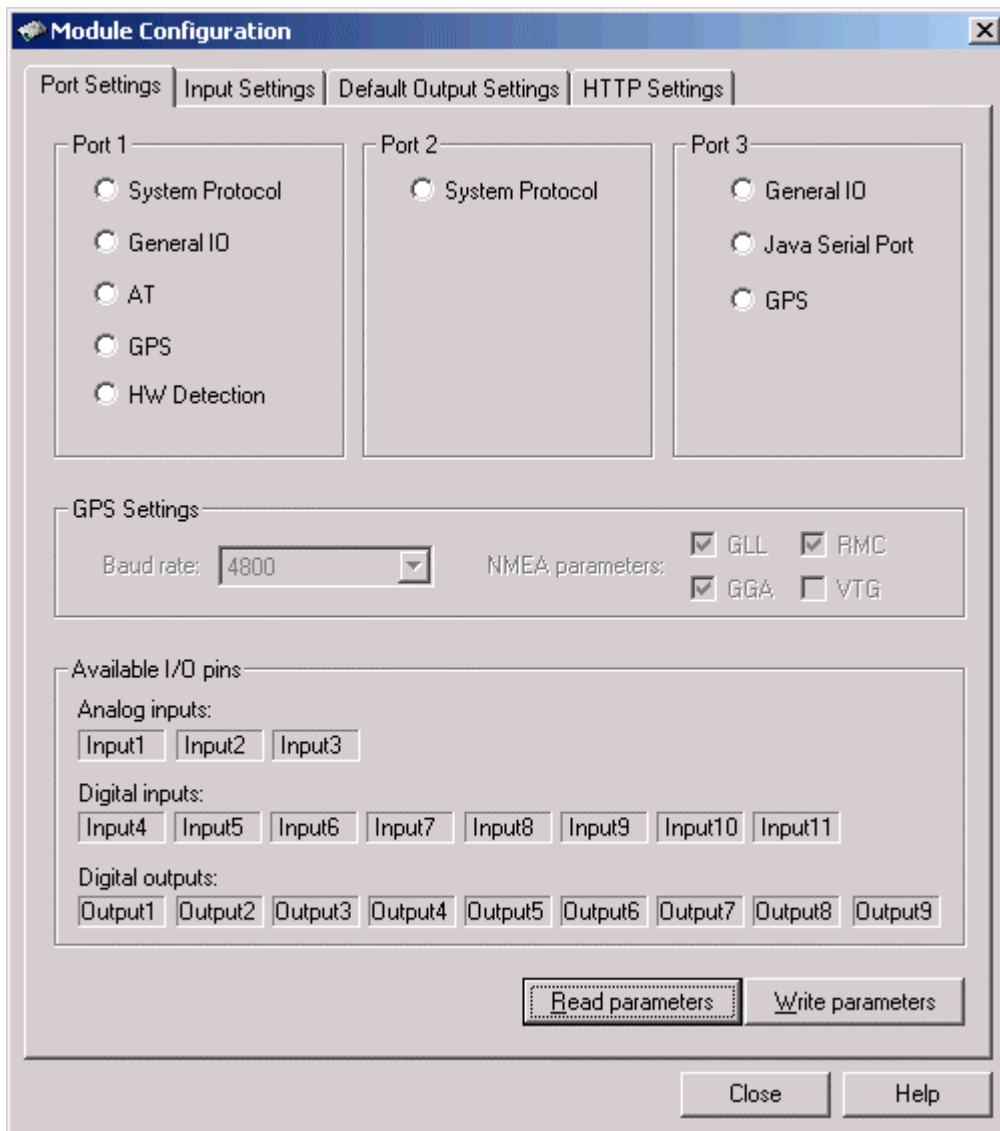
Figure 8. Port settings in Configurator

> ℹ️ **Note:** You can see the available I/O pins in the Module Configuration dialog when you change the settings. See Figure 8.

7. SUPPORTED CHARACTERS

The characters listed in Table 4 are supported for:

- Message identifier
- Password
- Aliasing

The list is derived from the Default Alphabet table of a GSM technical specification (see Digital cellular telecommunications system (Phase 2+); Alphabets and language-specific information (GSM 03.38)). CR, LF and Escape characters are not supported.

> **Note:** You cannot use a space in the message identifier or password. However, you can use it in aliases defined for commands.

Table 3. Characters supported by Configurator for Remote I/O control

@	Δ	SP	0	¡	P	¿	p
£	_	!	1	A	Q	a	q
$	Φ	"	2	B	R	b	r
¥	Γ	#	3	C	S	c	s
è	Λ	¤	4	D	T	d	t
é	Ω	%	5	E	U	e	u
ù	Π	&	6	F	V	f	v
ì	Ψ	'	7	G	W	g	w
ò	Σ	(	8	H	X	h	x
Ç	Θ	)	9	I	Y	i	y
SP	Ξ	*	:	J	Z	j	z
Ø	SP	+	;	K	Ä	k	ä
ø	Æ	,	<	L	Ö	l	ö
SP	æ	-	=	M	Ñ	m	ñ
Å	ß	.	>	N	Ü	n	ü
å	É	/	?	O	§	o	à

8. COMMAND SYNTAX

The command syntax of control messages varies according to the activated options. There may also be spaces in aliases defined for commands as seen in the example below. However, only one space character is accepted between words. The message identifier and password are case sensitive.

> **Note:** A control message always begins with a message identifier. Otherwise the message is not interpreted as a Remote I/O control message, and is stored in the SIM card or the Nokia 12 GSM Module memory.

Control message without a password:

```
<message identifier> <command / alias>

term123 Output_Set All On
```

Control message without a password with an alias defined:

```
<message identifier> <command / alias> <parameter>

term123 Output_Pulse All On 1h30m
```

Control message with a password:

```
<message identifier> <password> <command / alias>

term123 password Output_Set All On
```

Control message with a password with an alias defined:

```
<message identifier> <password> <command / alias>
<parameter>

term123 password Output_Pulse All On 1h30m
```

9. REMOTE I/O CONTROL SMS COMMANDS

The following chapter describes the commands and status messages available in the Remote I/O control. Status messages are sent in response to device status queries. You can define an alias for each of the commands and status messages described here with Configurator.

The first part of the chapter lists commands that are sent to the Remote I/O control as part of a control message; the second part provides a list of status messages for which an alias can be defined.

9.1 COMMANDS

The Nokia 12 GSM Module supports the SMS commands listed in Table 4. These commands are for controlling or monitoring purposes (to query the state of a device attached to the Nokia 12 GSM Module). An alias can be defined for each of the commands.

ℹ️	**Note:** If an alias is defined, the default command will be disabled. There can be only one effective command or alias for each function at a time. An alias must not be equal to a default command. Empty aliases cannot be used. If an empty alias is set, the default command will remain effective.
ℹ️	**Note:** The alias string must be unique and the maximum length is 24 characters. Neither commands nor aliases are case sensitive. However, the message identifier and password are.

Table 4. List of commands.

Command	Description
`OUTPUT_GET x`	Return a state of output x, x = pin number 1-9
`OUTPUT_SET x ON`	Set output x ON, x = pin number 1-9
`OUTPUT_SET x OFF`	Set output x OFF, x = pin number 1-9
`OUTPUT_INVERT x`	Inverts output x, x = pin number 1-9
`OUTPUT_PULSE x ON *`	Output x pulse ON *, x = pin number 1-9
`OUTPUT_PULSE x OFF *`	Output x pulse OFF *, x = pin number 1-9
`OUTPUT_GET ALL`	Return a state of all outputs
`OUTPUT_SET ALL ON`	Set all outputs ON

OUTPUT_SET ALL OFF	Set all outputs OFF	
OUTPUT_INVERT ALL	Inverts all outputs	
OUTPUT_PULSE ALL ON *	All outputs pulse ON *	
OUTPUT_PULSE ALL OFF *	All outputs pulse OFF *	
INPUT_GET x	Return a voltage of input x, x = pin number 1-11	
INPUT_GET ALL	Return states of all inputs	
INPUT_GET_CHANGE x	Subscribe a voltage limit alarm of input x, x = pin number 1-11	
INPUT_GET_CHANGE ALL	Subscribe a input state change of all inputs	
INPUT CHANGE CANCEL x	Cancel input x subscription, x = pin number 1-11	
INPUT CHANGE CANCEL ALL	Cancel all input subscriptions	
CHANGE_PWORD	Change password	
OUTPUT PULSE CANCEL x	Cancel output x pulse, x = pin number 1-9	
OUTPUT PULSE CANCEL ALL	Cancel all outputs	
LOCATION_GET	Get location information **	

* The duration of the pulse will be added to the control message after the corresponding command. The format is the following:

Output_Pulse 1 On <days>d<hours>h<minutes>m<seconds>s

for example *Output_Pulse 1 On 5m30s*

For more information about pulse commands, see Chapter 9.3.7.

** The location support needs external GPS device to be connected to the Nokia 12 GSM Module. The Nokia 12 GSM Module supports NMEA-0183 protocol.

9.2 STATUS MESSAGES

The Nokia 12 GSM Module supports the status messages listed in

Table 5. You can define an alias for each of them. The messages will be sent as responses to device query control messages according to the current command and device state.

	Note: If an alias is defined, the default command will be disabled. There can be only one effective command or alias for each function at a time. An alias must not be equal to a default command.
	Empty aliases cannot be used. If an empty alias is set, the default command will remain effective.
	Note: The alias string must be unique and the maximum length is 24 characters. Neither commands nor aliases are case sensitive. However, the message identifier and password are.

Table 5. List of response messages

Response Message	Description
OUTPUT x: ON	Alias for output x on state, x = pin number 1-9
OUTPUT x: OFF	Alias for output x off state, x = pin number 1-9
INPUT x: *	Alias for input x voltage *, x = pin number 1-3
INPUT x: ON	Alias for input x on state, x = pin number 4-11
INPUT x: OFF	Alias for input x off state, x = pin number 4-11

* The value of the sampled voltage will be added to the end of the response. The value of the sampled voltage is between 0 – 2800 mV, for example:

> *INPUT 1: 10mV*

9.3 DETAILED COMMAND INFORMATION AND RESPONSES

All example commands in this chapter use the "term123" identifier string, and the password property is set off in all of the subsequent chapters.

	Note: If a command or the alias defined for it is not identified, but the identifier and the optional password are correct, the Nokia 12 GSM Module will send an error message as a response to the command originator, for example:
	Control message: term123 passWORD ResetAll
	Response: ERROR (Unknown Command)

9.3.1 Changing the Password

Use the Change_Pword command to control the password. Note that all example commands in this chapter use the "term123" identifier string (see Table 6).

Table 6. Commands for the password control.

Command Type	Command	Comments

Changing Password	`term123 passWORD`
	`Change_PWord wordPASS`
	
	OK Response:
	
	`CHANGE_PWORD wordPASS: OK`
	
	Fail Response:
	
	`CHANGE_PWORD: FAILED`
		The example changes the password from 'passWORD' to 'wordPASS'

Activating Password Property	`term123 Change_PWord`
	`wordPASS`
	
	OK Response:
	
	`CHANGE_PWORD wordPASS: OK`
	
	Fail Response:
	
	`CHANGE_PWORD: FAILED`
		The example changes an empty password to 'wordPASS'

Deactivating Password Property	`term123 wordPASS`
	`Change_PWord`
	
	OK Response:
	
	`CHANGE_PWORD: OK`
	
	Fail Response:
	
	`CHANGE_PWORD: FAILED`
		The example changes the password from 'wordPASS' to an empty password

Note: An indication of a password change is only sent to the phone number where the change was requested.

9.3.2 Reading Inputs

Use the *Input_Get X* commands for reading inputs, that is the state or value of a device. Note that all example control messages in this chapter use the "term123" identifier string and the password property is set off (see Table 7)

A response depends on the pin. There are three analog inputs (1-3) and nine digital inputs (4-11) in the Nokia 12 GSM Module M2M system interface. You can also specify an alias for the response (see chapter 9.2).

Table 7. The Input_Get X commands

Command Type	Command	Comments

Input_Get All	`term123 Input_Get All`
	
	Response:
	
	`INPUT_GET ALL: OK`
	
	`INPUT1: Y`
	
	`INPUT2: Y`
	
	`INPUT3: Y`
	
	`INPUT4: Y`
	
	`INPUT5: Y`
	
	`INPUT6: Y`
	
	`INPUT7: Y`
	
	`INPUT8: Y`
	
	`INPUT9: Y`
	
	`INPUT10: Y`
	
	`INPUT11: Y`
	
	The Y varies according to the input pin state and it can be:
	
	xxxx mV if the input analog (pins 1-3), xxxx = value between 0-2800
	
	ON or OFF if the input is digital (pins 4 -11)
		The command reads all inputs and the response returns the value and state

Input_Get X	`term123 Input_Get X`
	
	Response:
	
	`INPUT_GET X: OK`
	
	`INPUT X: Y`
	
	The X refers to input pin number, X=1,2,3,4,5,6,7,8,9,10,11.
	
	The Y varies according to the input pin state and it can be:
	
	xxxx mV if the input is analog (pins 1-3), xxxx = value between 0-2800
	
	ON or OFF if the input is digital (pins 4-11)
		The command reads input pin X and the response returns the value or state of it according to queried input pin

9.3.3   Subscribing to Input Alarms

To subscribe to input state changes, that is, alarms, use the `Input_Get_Change X` commands. All example control messages in this chapter use the "term123" identifier string and the password property is set off (see Table 9).

When you subscribe to this service, and an input state changes, you will receive an alarm message. You can also subscribe to alarms on a continuous basis, so that each time the state changes, you receive an alarm message until you cancel the subscription with the `Input_Change_Cancel` command.

You can subscribe to alarms for all input state changes at once, or to each input separately. Note that an input must be configured properly in order to get the alarms. For more information about alarm configurations, see Chapter 5.4.

There are two ways to configure an analog input to operate with alarm sending (see Chapter 5.4 for configurations):

- Alarming + Input High Limit + Input Low Limit + Sampling Interval
- Once/Continuously

An alarm from the analog pin is sent if the value is equal to or higher than the high limit, or equal to or lower than the low limit. Define the frequency of the state of the input polling in the sampling interval box (see Figure 7).

An alarm from the digital pin is sent if the digital pin state is changed and the input state change is subscribed to that pin by the `Input_Get_Change X` command.

> **Important:** The latest subscription overrides any previous alarm subscription. The alarm will only be sent as a response to the latest subscription; the originator of the previous subscription will not be notified.

Table 8. Input_Get_Change commands for alarm functionality

Command Type	Command	Comments

Input_Get_Change All	`Term123 Input Get Change All`
	
	Response:
	
	`INPUT_GET_CHANGE ALL:`
	
	`INPUT 1: Y`
	
	`INPUT 2: Y`
	
	`INPUT 3: Y`
	
	`INPUT 4: Y`
	
	`INPUT 5: Y`
	
	`INPUT 6: Y`
	
	`INPUT 7: Y`
	
	`INPUT 8: Y`
	
	`INPUT 9: Y`
	
	`INPUT 10: Y`
	
	`INPUT 11: Y`
	
	The Y refers to success state and it can be:
	
	OK or *CHECK CONFIG*
	
	Alarm message, when input state has changed, contains the following information:
	
	`INPUT 1: Y`
	
	`INPUT 2: Y`
	
	`INPUT 3: Y`
	
	`INPUT 4: Y`
	
	`INPUT 5: Y`
	
	`INPUT 6: Y`
	
	`INPUT 7: Y`
	
	`INPUT 8: Y`
	
	`INPUT 9: Y`
	
	`INPUT 10: Y`
		The command subscribes alarms for all inputs at once

	INPUT 11: Y The Y varies according to the input pin state and it can be: xxxx mV if the input is in analog mode (pins 1-3) (xxxx=value between 0-2800) ON or OFF if the input is in digital mode (pins 4-11)	
Input_Get_Change X	term123 Input Get Change X Response: INPUT_GET_CHANGE Z: INPUT X: Y The X refers to input pin number, X=1,2,3,4,5,6,7,8,9,10,11. The Y refers to success state and it can be: OK or CHECK CONFIG Event data, when input state has changed, contains the following information: INPUT X: Y The X refers to input pin number, X=1,2,3,4,5,6,7,8,9,10,11. The Y varies according to the input pin state and it can be: ON or OFF if the input is digital (4-11) xxxx mV if the input is analog (1-3) (xxxx=value between 0-2800)	The command subscribes an alarm for input pin X and the response returns the state of it according to input pin configuration
Input_Change_Cancel	term123 Input_Change_Cancel X OK Response: INPUT_CHANGE_CANCEL X: OK The X refers to input pin number, X=1,2,3,4,5,6,7,8,9,10,11,all.	The command cancels an alarm subscription for input pin X

9.3.4   Reading Outputs

Use the *Output_Get X* commands for reading digital output states. Note that all example control messages in this chapter use the "term123" identifier string and the password property is set off (see Table 9).

Table 9. Output_Get X commands

Command Type	Command	Comments

Output_Get All	`term123 Output_Get All`
	
	Response:
	
	`OUTPUT_GET ALL: OK`
	
	`OUTPUT 1: Y`
	
	`OUTPUT 2: Y`
	
	`OUTPUT 3: Y`
	
	`OUTPUT 4: Y`
	
	`OUTPUT 5: Y`
	
	`OUTPUT 6: Y`
	
	`OUTPUT 7: Y`
	
	`OUTPUT 8: Y`
	
	`OUTPUT 9: Y`
	
	The Y refers to either ON or OFF
		The command reads all outputs and the response returns the state of them

Output_Get X	`term123 Output_Get X`
	
	Response:
	`OUTPUT_GET X: OK`
	
	`OUTPUT X: Y`
	
	The X refers to output pin number, X=1,2,3,4,5,6,7,8,9.
	
	The Y refers to either ON or OFF
		The command reads output pin X and the response returns the state of it

9.3.5 Writing Outputs

Use the `Output_Set X` commands to set digital output states. Note that all example control messages in this chapter use the "term123" identifier string and the password property is set off (see Table 10).

Table 10. Output_Set X commands

Command Type	Command	Comments
Output_Set X On	term123 Output_Set X On Response: OUTPUT_SET Z ON: OK OUTPUT Z: ON The X refers to output pin number, X=1,2,3,4,5,6,7,8,9.	The command sets output pin X to ON state and the response returns the state of it
Output_Set X Off	term123 Output_Set X Off Response: OUTPUT_SET X OFF: OK OUTPUT X: OFF The X refers to output pin number, X=1,2,3,4,5,6,7,8,9.	The command sets output pin X to OFF state and the response returns the state of it
Output_Set All On	term123 Output_Set All On Response: OUTPUT_SET ALL ON: OK OUTPUT 1: ON OUTPUT 2: ON OUTPUT 3: ON OUTPUT 4: ON OUTPUT 5: ON OUTPUT 6: ON OUTPUT 7: ON OUTPUT 8: ON OUTPUT 9: ON	The command sets all outputs to ON state and the response returns the state of all outputs
Output_Set All Off	term123 Output_Set All Off Response: OUTPUT_SET ALL OFF: OK OUTPUT 1: OFF OUTPUT 2: OFF	The command sets all outputs to OFF state and the response returns the state of all outputs

	OUTPUT 3: OFF	
	OUTPUT 4: OFF	
	OUTPUT 5: OFF	
	OUTPUT 6: OFF	
	OUTPUT 7: OFF	
	OUTPUT 8: OFF	
	OUTPUT 9: OFF	

9.3.6 Inverting Outputs

Use the `Output_Invert X` commands to invert digital output states. The state of an output can be changed without knowing its previous state. Note that all example control messages in this chapter use the "`term123`" identifier string and the password property is set off (see Table 11).

Table 11. Output_Invert X commands

Command Type	Command	Comments

Output_Invert X	`term123 Output_Invert X`
	
	Response:
	
	`OUTPUT_INVERT X: OK`
	
	`OUTPUT X: Y`
	
	The X refers to output pin number, X=1,2,3,4,5,6,7,8,9.
	
	The Y refers to either ON or OFF
		The command inverts output pin X to opposite state.

Output_Invert All	`term123 Output_Invert All`
	
	Response:
	
	`OUTPUT_INVERT ALL: OK`
	
	`OUTPUT 1: X`
	
	`OUTPUT 2: X`
	
	`OUTPUT 3: X`
	
	`OUTPUT 4: X`
	
	`OUTPUT 5: X`
	
	`OUTPUT 6: X`
		The command inverts all output pins to opposite state.

	OUTPUT 7: X	
	OUTPUT 8: X	
	OUTPUT 9: X	
	The X refers to either ON or OFF	

9.3.7 Output Pulses

Use the `Output_Pulse X Y` commands to set digital output states to requested state for a specified time. Note that all example control messages in this chapter use the "`term123`" identifier string and the password property is set off (see Table 12).

While the pulse is active, the pin state remains as requested and is locked. You can cancel the pulse with the `Output_Pulse_Cancel` command described in Chapter 9.3.8. After the requested time has passed, the output state is returned to the opposite value of that requested. The final state of the output is independent of the initial state of the output.

The behavior of the output pins when the `Output_pulse X` command is used is depicted in Figure 9.
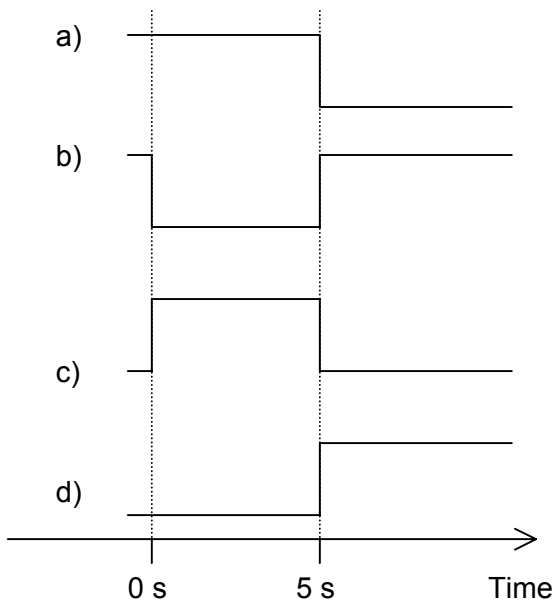
Case	Initial state	Control message to be sent
a)	ON	term123 Output_pulse 1 ON 5s
b)	ON	term123 Output_pulse 1 OFF 5s
c)	OFF	term123 Output_pulse 1 ON 5s
d)	OFF	term123 Output_pulse 1 OFF 5s

Figure 9. Output pulses in different initial stages and for different commands

Table 12. Output_Pulse X commands

Command Type	Command	Comments

Output_Pulse X On	`term123 Output_Pulse X On <time>`
	
	Response:
	
	`OUTPUT_PULSE X ON <time>: OK`
	
	Response, when pulse time expires:
	
	`OUTPUT X: Y`
	
	The X refers to output pin number, X= 1,2,3,4,5,6,7,8,9,all.
	
	The Y refers to either ON or OFF.
	
	Response, if another pulse command has already been issued:
	
	`OUTPUT_PULSE X ON <time>:`
	
	`OUTPUT X LOCKED`
	
	Fail response, if invalid <time> value:
	
	`ERROR( Unknown Command )`
	
	Fail response, if NITZ network service is not supported and <time> value was more than 23 hours 59 minutes and 59 seconds:
	
	`OUTPUT_PULSE ON <time>: ERROR( Network Time Missing )`
		The command sets to output pin X on for a requested time interval, that is, pulse

Output_Pulse X Off	`term123 Output_Pulse X Off <time>`
	
	Response:
	
	`OUTPUT_PULSE X OFF <time>: OK`
	
	Response, when pulse time expires:
	
	`OUTPUT X:Y`
	
	Response, if another pulse command has already been issued:
	
	`OUTPUT_PULSE X OFF <time>:`
	
	`OUTPUT X LOCKED`
	
	Fail response, if invalid <time> value:
		The command sets to output pin X off for a requested time interval, that is, pulse

| | ERROR(Unknown Command)

Fail response, if NITZ network service is not supported and <time> value was more than 23 hours 59 minutes and 59 seconds:

    OUTPUT PULSE OFF <time>:
    ERROR(Network Time
    Missing)

The X refers to output pin number, X=1,2,3,4,5,6,7,8,9,all.

The Y refers to either ON or OFF | |

Command syntax for <time> parameter:

`<days>d<hours>h<minutes>m<seconds>s`

for example, `Output_Pulse 1 On 5m30s`
Value ranges for <time> parameter:

`<time>`   If Network Indication and Time Zone (NITZ) network service is supported, the range is from 1 second to 7 days.

If NITZ network service is not supported, the range is from 1 second to 23 hours 59 minutes and 59 seconds.

`<days>`   If NITZ network service is supported, the range is from 1 … 7 days.

`<hours>`   1…23

`<minutes>` 1…59

`<seconds>` 1…59

Value examples for valid `<time>`:

`7d, 6d23h59m59s, 45m, 59s, 4h25s, 30m45s,` etc.
Value examples for invalid <time>:

`7d1s`	Maximum time (7 days) exceeded
`3m3m`	There cannot be two unit fields of the same
`100s`	Maximum second and minute value is 59. Use 1m40s instead
`24h`	Maximum hour value is 23. Use 1d instead of 24h

9.3.8 Cancelling Output Pulses

It is possible to cancel pulses before the <time> parameter defined in the pulse control message has passed. This is done with the "`Output_Pulse_Cancel`

X" command. Note that all example control messages in this chapter use the "term123" identifier string and the password property is set off (see Table 13).

The command cancels the timing of the pulse operation and informs the original pulse originator about it. The state of the cancelled output remains the same, as was set with `Output_Pulse X` command. Thus, it is the timing of the pulse that is cancelled, not the pulse itself.

Table 13. Output_Pulse_Cancel X commands

Command Type	Command	Comments

Output_Pulse_Cancel X	`term123`
	`Output_Pulse_Cancel X`
	
	Response:
	
	`OUTPUT_PULSE_CANCEL X:`
	`OK`
	
	Indication to original pulse originator:
	`OUTPUT X  PULSE`
	`CANCELLED`
	
	The X refers to output pin number,
	X=1,2,3,4,5,6,7,8,9,all.
		The command cancels the pulse of output pin X

Note: When canceling a pulse, the state of the output does not revert to the same as it was before the `Output_Pulse X` command. The `Output_Pulse_Cancel X` command cancels the timing on the pulse, not the pulse itself, as can be seen in Figure 10 (the pulse without cancelling can be seen dashed in the figure).
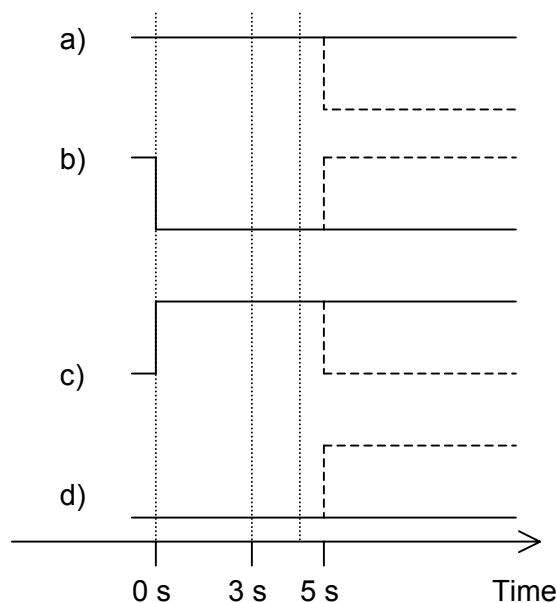
Case	Initial state	Control message	Control message sent when 3s passed
a)	ON	Term123 Output_pulse 1 ON 5s	Term123 Output_Pulse_Cancel 1
b)	ON	Term123 Output_pulse 1 OFF 5s	
c)	OFF	Term123 Output_pulse 1 ON 5s	
d)	OFF	Term123 Output_pulse 1 OFF 5s	

Figure 10. Effects of cancelling an output pulse in different initial stages and for different commands

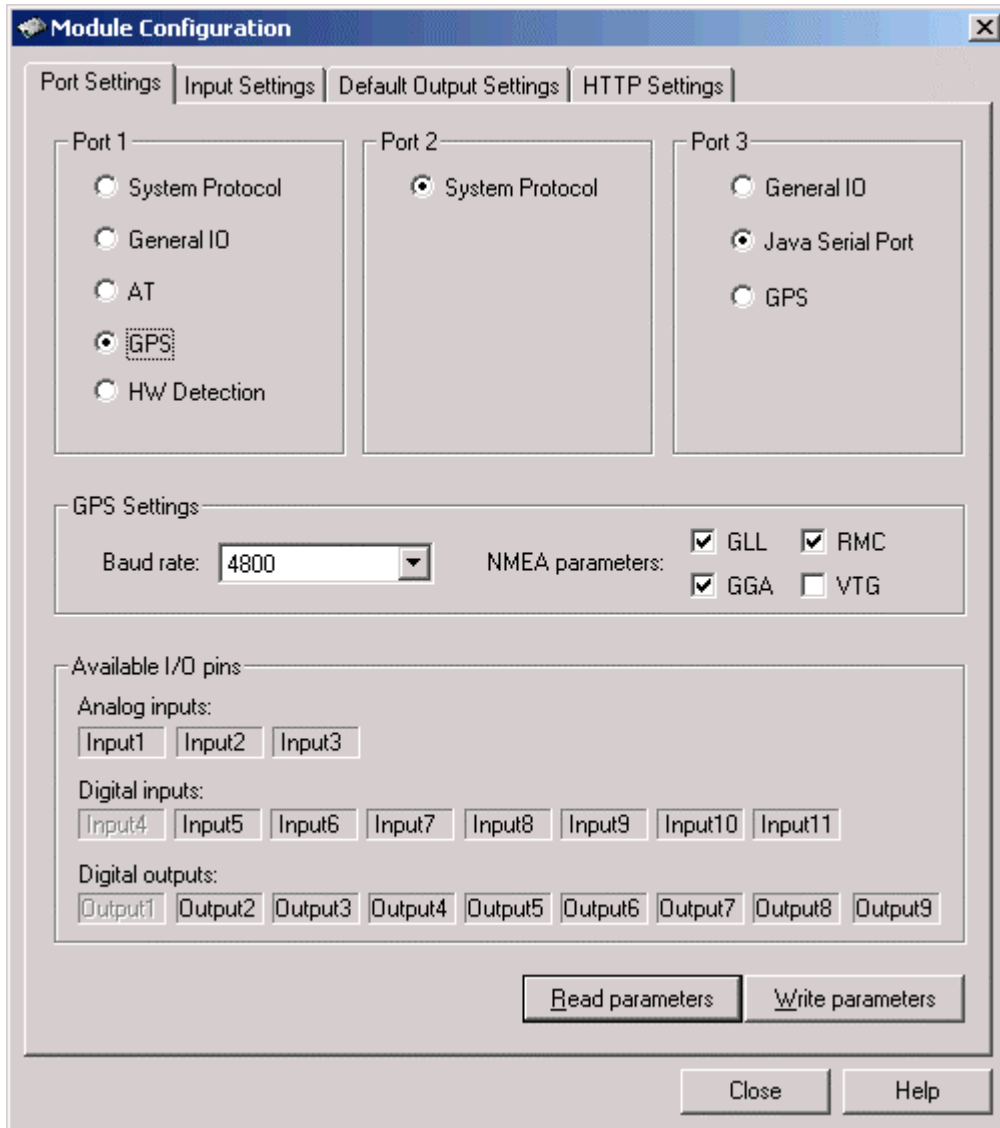## 9.3.9   Location information

Figure 11. GPS support configured to serial port 1

You can query location information from the Nokia 12 GSM Module if an external GPS device is connected to either the serial port 1 or 3. The serial port used has to be configured with Nokia 12 Configurator, see Figure 11.

> **Note:** If you have selected serial port 3 for GPS support, Java cannot use the serial port.

	Note: You cannot connect a GPS device to serial port 2. It is always in the M2M system protocol use.
	Note: You can connect only one GPS device to the Nokia 12 GSM Module (PORT1 or PORT3).

To use GPS support, configure the GPS settings (baud rate and used NMEA parameters). See your GPS device manual for information about parameters used.

Query the location information with the `Location_get` command. Note that all example control messages in this chapter use the "term123" identifier string and the password property is set off (see Table 14).

Response parameters of `Location_get` command are:

- AA   Latitude, degrees [0 – 90]
- BBBBBBBB   Latitude, minutes [0 – 59.999999]
- C   Latitude, type [N or S]
- DDD   Longitude, degrees [0 – 180]
- EEEEEEEEE   Longitude, minutes [0 – 59.999999]
- F   Longitude, type [E or W]
- GGGG   Angle (geological) [0 – 359,9]
- HHHH   Speed in knots [0 – 999,9]
- II   Number of visible satellites [0 – 99]
- JJJJJJJJ   Altitude [-99999.9 - +99999.9]
- K   Altitude unit [M]
- LL   UTC Time hours [00 – 23]
- MM   UTC Time minuts [00 – 59]
- NNNN   UTC Time seconds [00 – 59.99]
- OO   UTC Date day [01 – 31]
- PP   UTC Date month [01 – 12]
- QQQQ   UTC Date year [0000 - 9999]

Table 14. Location_get

Command Type	Command	Comments

Location_get	`term123 Location_get`
	
	Response:
	
	`LOCATION:`
	
	`LATITUDE: AA, BBBBBBBBB, C`
	
	`LONGITUDE: DDD, EEEEEEEEE, F`
	
	`SPEED: GGGG, HHHH`
	
	`SATELLITES: II`
	
	`ALTITUDE: JJJJJJJJ, K`
	
	`TIME: LL, MM, NNNN`
	
	`DATE: OO, PP, QQQQ`
	
	Example response:
	
	`LOCATION:`
	
	`LATITUDE:`
	
	`66,12.2907,N`
	
	`LONGITUDE:`
	
	`025,30.7094,E`
	
	`SPEED:173.3,21.7`
	
	`SATELLITES: 04`
	
	`ALTITUDE:`
	
	`-0022,M`
	
	`TIME:13,36,15.44`
	
	`DATE:15,09,2003`
		Response is packed to one reply message.

10. SAFETY INFORMATION

Read these simple guidelines as they contain important safety information. Breaking the rules may be dangerous or illegal and may also invalidate the service terms that may apply to this device. Read the complete documentation for further information.

The device should only be installed to places where it does not cause interference or danger. Do not use or install where the use of wireless phones is prohibited.

Do not install or use in hospitals, airports or planes, potentially explosive atmospheres. Obey all signs and regulations concerning the use of wireless phones.

Obey all laws, regulations and safety standards when using this device.

All wireless devices are susceptible to interference, which could affect performance.

Only qualified personnel may install or repair this device.

To protect the power supply cables and meet the fire safety requirements, it is recommended that the electrical circuits are supplied with a power regulator. The power regulator should be placed as close to the terminals of the power supply as possible.

Do not connect to incompatible products or components.

The device and antenna may be damaged if either come into contact with ground potentials other than the one in your applications.

10.1 NETWORK SUPPORT

The wireless device described in this guide is approved for use on the EGSM 900/GSM 1800 network (RX-2) or on the GSM 850/GSM 1900 network (RX-9). Contact your service provider for more information about networks.

This device requires a separate SIM card reader. Always switch off the device before handling the SIM cards. Design your application to enable easy access to the SIM card reader. Keep all miniature SIM cards out of the reach of small children. For availability and information on using SIM card services, contact your SIM card vendor. This may be the service provider, network operator, or other vendor.

To use the device you must have service from a wireless service provider. Many of the features in this device depend on features in the wireless network to function. These Network Services may not be available on all networks or you may have to make specific arrangements with your service provider before

you can utilize Network Services. Your service provider may need to give you additional instructions for their use and explain what charges will apply. Some networks may have limitations that affect how you can use Network Services.

This device operates using radio signals, wireless networks, landline networks, and user-programmed functions. Because of this, connections in all conditions cannot be guaranteed. You should never rely solely on any wireless device for essential communications.

10.2 ANTENNA

This device requires a separate antenna. If the antenna is to be mounted outside, consider the risk of lightning. Follow the instructions provided by the antenna manufacturer. Never connect more than one device to a single antenna. The device can be damaged by radio frequency energy from the transmitter of another module.

Like any mobile station, the antenna of the device emits radio frequency energy. To avoid EMI (electromagnetic interference), you must determine whether the application itself, or equipment in the application's proximity, need further protection against radio emission and the disturbances it might cause.

In any event, you should contact your local antenna manufacturer for additional information concerning antenna types, cables, connectors, antenna placement, and the surrounding area. You should also determine whether the antenna needs to be grounded or not. Your local antenna manufacturer might be able to design a special antenna suitable for the application.

In order to comply with RF exposure guidelines, install the external antenna so that a minimum distance of 20 cm (8 inches) can be maintained between the external antenna and all persons, with external antenna gain not exceeding 3 dBi. Note that you may be required to provide SAR measurement test report and declaration.

10.3 MEDICAL DEVICES

Operation of any radio transmitting equipment, including this device, may interfere with the functionality of inadequately protected medical devices. Hospitals or health care facilities may be using equipment that could be sensitive to external RF energy.

10.4 VEHICLES

RF signals may affect improperly installed or inadequately shielded electronic systems in motor vehicles such as electronic fuel injection systems, electronic antiskid (antilock) braking systems, electronic speed control systems, air bag

systems. For more information, check with the manufacturer or it's representative of your vehicle or any equipment that has been added.

Only qualified personnel should service the device, or install the device in a vehicle. Faulty installation or service may be dangerous and may invalidate any warranty that may apply to the device. Check regularly that all wireless device equipment in your vehicle is mounted and operating properly. Do not store or carry flammable liquids, gases, or explosive materials in the same compartment as the device, its parts, or enhancements. For vehicles equipped with an air bag, remember that air bags inflate with great force. Do not place objects, including installed or portable wireless equipment in the area over the air bag or in the air bag deployment area. If in-vehicle wireless equipment is improperly installed and the air bag inflates, serious injury could result.

10.5   POTENTIALLY EXPLOSIVE ENVIRONMENTS

Do not use the device when in any area with a potentially explosive atmosphere and obey all signs and instructions. Potentially explosive atmospheres include areas where you would normally be advised to turn off your vehicle engine.

Sparks in such areas could cause an explosion or fire resulting in bodily injury or even death. Observe restrictions on the use of radio equipment in fuel depots, storage, and distribution areas, chemical plants or where blasting operations are in progress. Areas with a potentially explosive atmosphere are often but not always clearly marked. They include below deck on boats, chemical transfer or storage facilities, vehicles using liquefied petroleum gas (such as propane or butane), and areas where the air contains chemicals or particles such as grain, dust or metal powders.

10.6   CARE AND MAINTENANCE

Your device is a product of superior design and craftsmanship and should be treated with care. The suggestions below will help you protect your warranty coverage.

- Keep the device dry. Precipitation, humidity and all types of liquids or moisture can contain minerals that will corrode electronic circuits.

- Do not use or install the device in dusty, dirty areas. Its moving parts and electronic components can be damaged.

- Do not store the device in hot areas. High temperatures can shorten the life of electronic devices and warp or melt certain plastics.

- Do not store the device in cold areas. When the device returns to its normal temperature, moisture can form inside the device and damage electronic circuit boards.

- Do not attempt to open the device.

- Do not drop, knock, or shake the device. Rough handling can break internal circuit boards and fine mechanics.

- Do not use harsh chemicals, cleaning solvents, or strong detergents to clean the device.

- Do not paint the device.

- Use only with properly authorized antennas. Unauthorised antennas, modifications, or attachments could damage the device and may violate regulations governing radio devices.

If the device is not working properly, take it to the nearest authorized service facility for service.

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