

FEATURES

- Direct connection to the GPRS/GSM network with industry standard Hays AT Commands
- Measurement and Control by low cost SMS messages or Email
- Serial Data Tunnelling using low cost SMS Messaging
- Remote Configuration by SMS Messages.
- Simulator to test the configuration without expensive call time.
- Sleep Mode for low power operation
- 8 Digital Inputs.
- 4 Pulse Counter Inputs, 32 Bit.
- 8 Digital Outputs.
- 4 Analogue Inputs .
- 1 Analogue Outputs (Option)
- PC Programming Interface.
- 128K FRAM Memory.
- DIN Rail Mounted or Spacers
- PC Monitoring and Logging Software.
- Photographs can be emailed in response to a local alarms or SMS messages. (Option)
- Size: 68mm by 77mm by 25mm
- Power supply 6V to 16V.
- 12V Battery Charger Output (Option)



INTRODUCTION

The X9100-GSM Telemetry Engine is a low cost, universal GSM/GPRS module, which can transmit and receive analogue, digital and pulse counter data to and from any device that is connected to the worldwide mobile phone network such as mobile phones, PC's and other X9100-GSM Telemetry Engines. The unit is supplied with free PC based Configuration Software.

Monitoring and Control

The X9100-GSM can send and receive digital and analogue alarm conditions and pulse counter data using low cost SMS messaging or the GPRS data network. Both negative and positive edges from digital inputs can trigger unique messages. Multiple analogue thresholds can be set on each input to trigger different text messages.

Energy Metering .

Four digital inputs can be configured to four 32bit pulse counter inputs. The current value of each counter can be transmitted using SMS Messages, GPRS data network or emails at pre-set times or when a pre-set value has been exceeded.

Serial Data Tunnelling

The X9100-GSM can be used as a transparent bi-directional serial data link. Serial data is read from the serial input port placed in a SMS message and then send to another X9100-GSM. It is then decoded and presented on the serial output port.

Data Logging.

The X9100-GSM-L can be configured to store values from the analogue inputs at preset times or when the value changes by a pre-set amount.

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HARDWARE

The X9100-GSM Engine has the following screw terminal connections:

PIN	FUNCTION	DESCRIPTION	NOTES
1	6 -16V	6V to 16V Supply	
2	0V	0 Volt Supply	
3	BAT	Battery Charger (Option)	
4	I7	Digital Input 7	
5	I6	Digital Input 6	
6	I5	Digital Input 5	
7	I4	Digital Input 4	
8	I3	Digital Input / Pulse Counter 3	
9	I2	Digital Input / Pulse Counter 2	
10	I1	Digital Input / Pulse Counter 1	
11	I0	Digital Input / Pulse Counter 0	
12	D0	Digital Output 0 (Open Collector)	
13	D1	Digital Output 1 (Open Collector)	
14	D2	Digital Output 2 (Open Collector)	
15	D3	Digital Output 3 (Open Collector)	
16	D4	Digital Output 4 (Open Collector)	
17	D5	Digital Output 5 (Open Collector)	
18	D6	Digital Output 6 (Open Collector)	
19	D7	Digital Output 7 (Open Collector)	
20	ADC0	Analogue Input 0	
21	ADC1	Analogue Input 1	
22	ADC2	Analogue Input 2	
23	ADC3	Analogue Input 3 (Supply Voltage Monitor)	
24	DAC0	Analogue Output 0 (Option)	

Power Supply (0V Pin 2, 6 - 16V Pin 1)

The X9100-GSM operates from a regulated supply of 6V to 16V

At 6V the Transmit current : 60mA to 1.5A

Receiving current : 36mA

Battery Charger (BAT Pin 3)

A charging voltage of 13.5V for sealed Lead Acid Batteries is provided. A supply voltage of greater than 15V is required on Pin 1 for this feature. When the supply voltage is not present the Battery will supply the X9100-GSM. Analogue Input 3 is used to monitor the battery voltage and send SMS messages at user set levels.

Digital Inputs (Pin 4 to Pin 11)

A voltage between 5V to 16V will energise each Digital Input.

Pulse Counter Inputs (Pin 8 to Pin11)

A voltage between 5V to 16V will energise each Pulse Counter Input.

Digital Outputs (Pin 12 to Pin 19)

The Digital Outputs are open collector. The load, such as a relay coil, is connected between the output terminal and the dc power supply of 5V to 16V. The maximum current is 50mA

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Note: Inductive loads such as Relay Coils should have a diode connected in parallel to prevent damage by transient voltages.

Analogue Inputs (Pin 20 to Pin 23)

The Analogue Inputs are set to a range 0V to 5V.

Connecting a 250 ohm resistor between each input and 0V will convert them to a 0-20mA current input.

The scaling potentiometer can be adjusted to alter the range.

Any of the Analogue Inputs can be used to monitor both the supply voltage and the battery voltage by connecting a potential divider across the power input.

GETTING STARTED

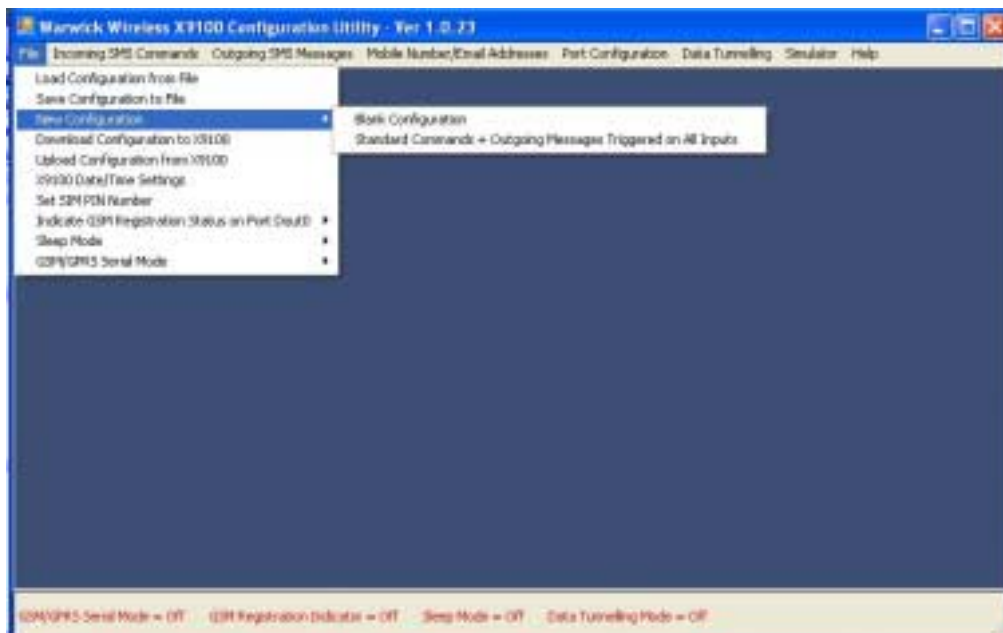
RS232 Serial Port

The X9100-GSM is configured using PC running the configuration software. Use the PC cable or USB to Serial converter to connect the PC to the X9100-GSM.

X9100 Configuration Software

Install the X9100 Configuration Software. This can be downloaded from:

<http://www.radiotelemetry.co.uk/gsmtelemetry.htm>



Click on **File**:

Click on **New Configuration**.

Click on **Standard Commands**.

Enter the destination phone number for the SMS Messages triggered by the analogue and digital inputs.

This has to be with the Country Code first (+44 for the UK).

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X9100 GSM/GPRS
TELEMETRY ENGINE
DATA SHEET 183-5

Click on **Simulator** and **Open Simulator**.

Tick and un-tick the digital input boxes. The SMS Messages associated with each input will be displayed at bottom of the simulator box. The pulse count will also be shown in the Counter Box

Analogue values can be set using the four sliders. The SMS Messages associated with the trigger points will be displayed. Digital Outputs can be activated by typing the required SMS Message in the Received Text Message Box and then pressing the Receive button. Such as: D0HI

Connect the X9100 to the PC using the Serial Cable.
Connect the power to the X9100-GSM and switch on.
The Red LED will light

Load the settings into the X9100-GSM by clicking on **File** then **Down Load Configuration to X9100**



X9100-GSM Telemetry Engine

Insert a SIM Card. This can be on any network, contract or pre-paid.
Connect the Antenna. .

The Green Status LED will flash for a quarter of a second and then off for two seconds. After approximately 2 seconds it will change to flash one second on and then one second off. This will indicate that it is searching for a network. When a network has been found the status LED will change again to one second on and two seconds off. The X9100-GSM can be dialled directly to test the telephone number. The Rx LED will remain on during the call.

Connect an excitation voltage between 5V to 16V to a Digital Input. The green Tx LED will light when a message is sent. The following factory default text Messages will be sent from the X9100-GSM when the digital inputs are energised.

Digital Input 0 High	DIN 0 = HI	Digital Input 5 High	DIN 0 = HI
Digital Input 0 Low	DIN 0 = LO	Digital Input 5 Low	DIN 0 = LO
Digital Input 1 High	DIN 1 = HI	Digital Input 6 High	DIN 1 = HI
Digital Input 1 Low	DIN 1 = LO	Digital Input 6 Low	DIN 1 = LO
Digital Input 2 High	DIN 2 = HI	Digital Input 7 High	DIN 2 = HI
Digital Input 2 Low	DIN 2 = LO	Digital Input 7 Low	DIN 2 = LO
Digital Input 3 High	DIN 3 = HI	Digital Input 4 High	DIN 4 = HI
Digital Input 3 Low	DIN 3 = LO	Digital Input 4 Low	DIN 4 = LO

When the following factory default messages are text to the phone number of the X9100-GSM the respective digital outputs will change. The Rx LED will light when a text message is received.

Port	Text	Port	Text
Set Digital Output 0 high	D0HI	Set Digital Output 0 high	D0HI
Set Digital Output 0 low	D0LO	Set Digital Output 0 low	D0LO
Set Digital Output 1 high	D1HI	Set Digital Output 1 high	D1HI
Set Digital Output 1 low	D1LO	Set Digital Output 1 low	D1LO
Set Digital Output 2 high	D2HI	Set Digital Output 2 high	D2HI
Set Digital Output 2 low	D2LO	Set Digital Output 2 low	D2LO
Set Digital Output 3 high	D3HI	Set Digital Output 3 high	D3HI
Set Digital Output 3 low	D3LO	Set Digital Output 3 low	D3LO

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Status Report

If the word STATUS is sent to the X9100-GSM then the current state of the digital inputs, the current value of the analogue inputs and current values of the counter inputs will be automatically sent to the listed telephone numbers.

The Status message can be changed in the **Outgoing SMS Messages/Add New Message** section.

CONFIGURATION

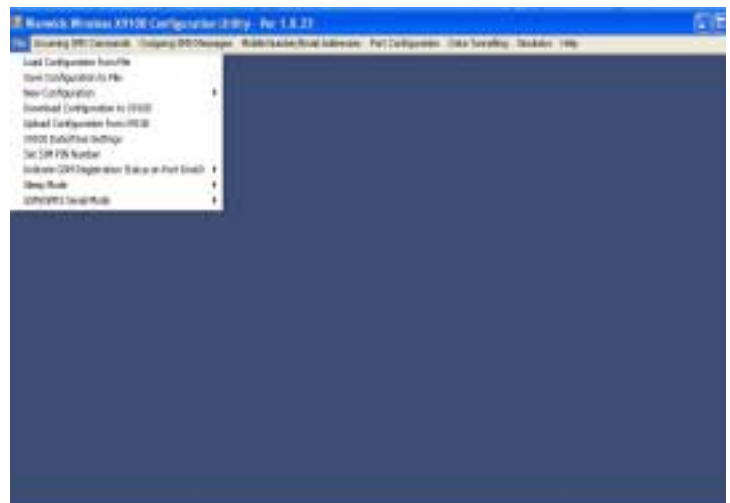
The top command bar will display:

File **Incoming** **SMS Commands** **Outgoing** **SMS Messages**
Mobile Number/Email Address **Port Configuration** **Sleep Mode** **Simulator Help**

File

The following options are available:

- Load Configuration from File
- Save Configuration to File
- New Configuration
- Down Load New Configuration to X9100
- Up Load New Configuration from X9100
- X9100 Time and Date Settings. (These parameters will be lost if a battery back up is not connected)
- Set SIM PIN Number
- Indicate GSM Registration Status on Port DOUT 0
- Sleep Mode
- GSM/GPRS Modem Mode



Load Configuration from File

A stored configuration can be loaded from the PC

Save Configuration to File

The current configuration can be saved as a PC file.

New Configuration

A standard configuration can be loaded and then customized or a totally new configuration can be generated.

Down Load New Configuration to X9100

The current configuration is loaded into the X9100-GSM via the PC connecting cable.

Up Load New Configuration from X9100

A configuration can be uploaded from the X9100-GSM.

X9100 Time and Date Settings.

The Time and Date is set on the X9100-GSM. These parameters will be lost if a battery backup is not connected.

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Set SIM PIN Number

A SIM PIN number can be entered and then either enabled or disabled.

Indicate GSM Registration Status on Port Dout 0

Output port D0 on pin 12 will energise when the X9100-GSM has established a GSM Network Connection

Sleep Mode

The X9100-GSM will switch off all peripheral devices and monitor the first 4 Digital Inputs I0 to I3 on pin 11 to pin 7. If one of the inputs change then the X9100 will switch to normal mode and send the appropriate SMS message. It will then switch back to Sleep Mode.

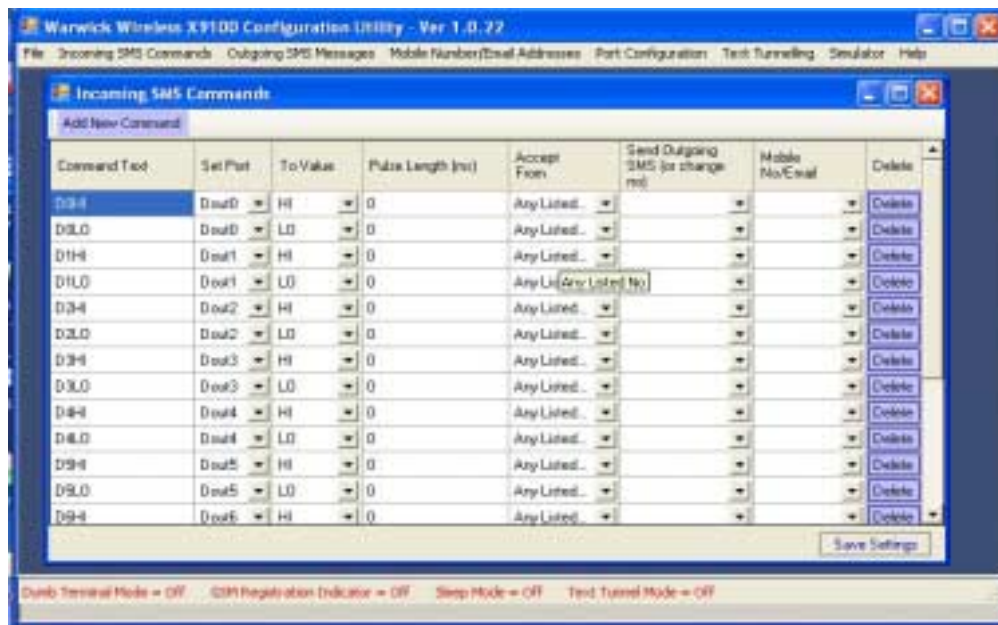
The current drawn in sleep mode will be approximately 800uA

GSM/GPRS Modem Mode

AT Commands can be used to connect directly to the GSM and GPRS networks. A brief summary of standard AT Commands are shown below. A full set of AT commands is available in DS188 which can be downloaded from:

<http://www.radiotelemetry.co.uk/gsmtelemetry.htm>

Incoming SMS Commands



If the unit receives a message which is exactly the same as the characters set in the **Command Text** then the digital output specified in **Set Port** will change to the state set in **To Value**. This can be a permanent state or a pulse depending on the value set in **Pulse Length**.

The command can be limited to mobile numbers set in **Accept From**.

A message, entered in **Send Outgoing SMS**, can be sent automatically to confirm that the action has taken place to a mobile number or email set in the **Mobile Number / Email**.

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Remote Configuration and Status

Command Port	Port Pin	To Value	Pin Length (ms)	Accept Pin	Send Outgoing SMS to (Phone No)	Mobile No/Email
0088	Dout0	HI	0	Any Linked No		
0080	Dout0	LO	0	Any Linked No		
0118	Dout1	HI	0	Any Linked No		
0110	Dout1	LO	0	Any Linked No		
0298	Dout2	HI	0	Any Linked No		
0210	Dout2	LO	0	Any Linked No		
0398	Dout3	HI	0	Any Linked No		
0310	Dout3	LO	0	Any Linked No		
0498	Dout4	HI	0	Any Linked No		
0410	Dout4	LO	0	Any Linked No		
0598	Dout5	HI	0	Any Linked No		
0510	Dout5	LO	0	Any Linked No		
0698	Dout6	HI	0	Any Linked No		
0610	Dout6	LO	0	Any Linked No		
0798	Dout7	HI	0	Any Linked No		
0710	Dout7	LO	0	Any Linked No		
40	dOut0	MULTI	0	Any Linked No		
41	dOut1	MULTI	0	Any Linked No		
STATUS			0	Any Linked No	STATUS	Delete/No
CHGNO1			0	Any Linked No	'Change No'	Delete/No

A destination telephone numbers can be change by setting the following message in the **Incoming SMS Commands:CHGNO1** and setting **Send Outgoing SMS Messages to Change No.** If the following SMS Message is sent: **CHGNO1=+44771234567** Then the Default Number will be changed to +44771234567

The Status of all the inputs can be displayed by entering **STATUS** in the **Incoming Commands** and **STATUS** in the **Send Outgoing SMS Messages.** The Status message is made up of the inputs set in **Outgoing SMS Messages, Message Names.**

Outgoing SMS Messages / Emails

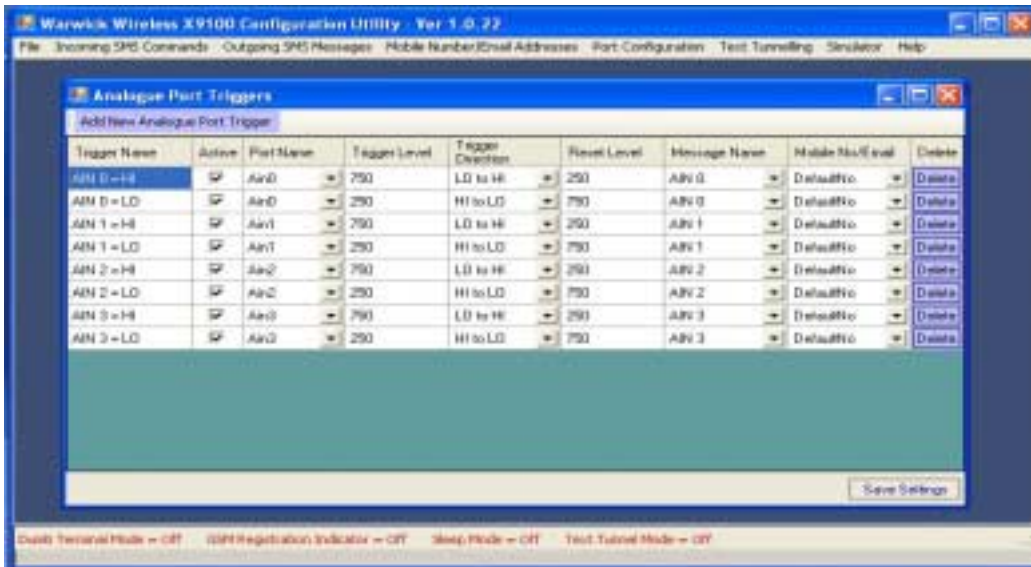
Add New Digital Port Trigger	Port Name	Trigger Direction	Message Name	Mobile No/Email	Delete
DIN 0 = HI	Din0	LO to HI	DIN 0	DefaultNo	Delete
DIN 0 = LO	Din0	HI to LO	DIN 0	DefaultNo	Delete
DIN 1 = HI	Din1	LO to HI	DIN 1	DefaultNo	Delete
DIN 1 = LO	Din1	HI to LO	DIN 1	DefaultNo	Delete
DIN 2 = HI	Din2	LO to HI	DIN 2	DefaultNo	Delete
DIN 2 = LO	Din2	HI to LO	DIN 2	DefaultNo	Delete
DIN 3 = HI	Din3	LO to HI	DIN 3	DefaultNo	Delete
DIN 3 = LO	Din3	HI to LO	DIN 3	DefaultNo	Delete
DIN 4 = HI	Din4	LO to HI	DIN 4	DefaultNo	Delete
DIN 4 = LO	Din4	HI to LO	DIN 4	DefaultNo	Delete
DIN 5 = HI	Din5	LO to HI	DIN 5	DefaultNo	Delete
DIN 5 = LO	Din5	HI to LO	DIN 5	DefaultNo	Delete
DIN 6 = HI	Din6	LO to HI	DIN 6	DefaultNo	Delete
DIN 6 = LO	Din6	HI to LO	DIN 6	DefaultNo	Delete

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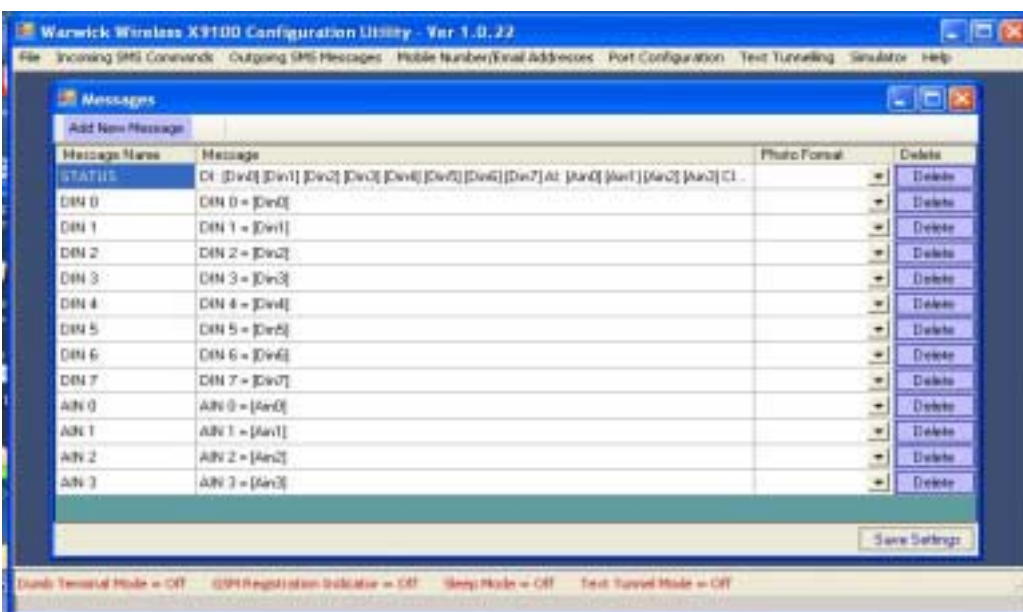
Digital Port Message Triggers

The SMS message entered into the **Trigger Name** will be sent when the input port in **Port Name** is activated in the direction set in **Trigger Direction** (from high to low or low to high). This message will be sent to the phone number or email entered in **Mobile No/Email**.



Analogue Port Message Triggers

Outgoing **Analogue Port Triggers** are set in a similar way. A message entered in **Trigger Name** will be sent to a mobile or email set by **Mobile No/Email** when the analogue threshold is reached set by **Trigger Level** in the direction set by **Trigger Direction**. The message will not be sent again until the value set in **Reset Level** has been reached.



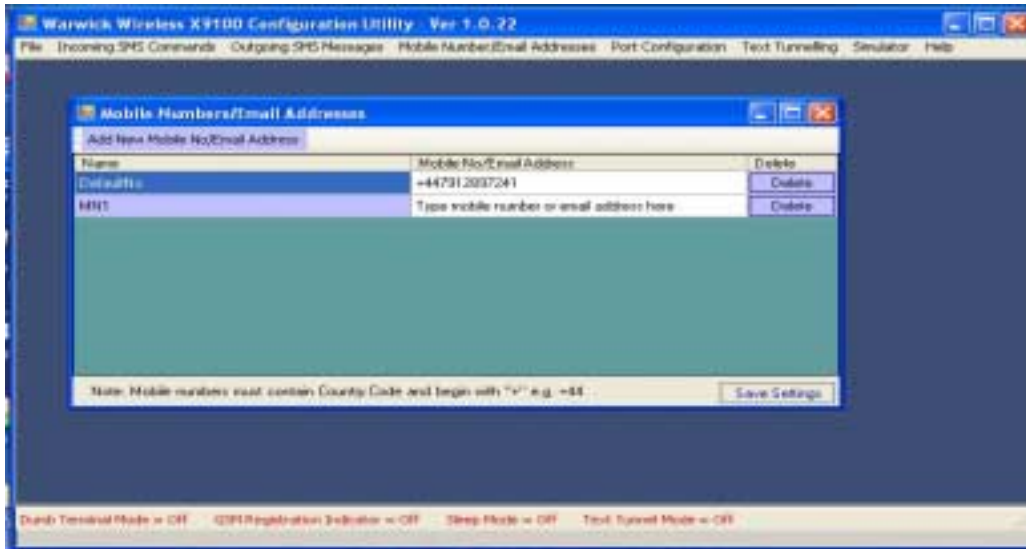
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Out Going SMS/Email Messages

SMS messages can be sent in response to a incoming SMS Command such as STATUS

Mobile Number/Email Address



A **Name** is entered for each mobile phone number or email address entered in **Mobile No/Email Address**.

Email Sending Parameters

The default shown is for O2 Pay As You Go. The user must refer to their preferred network provider for this information.

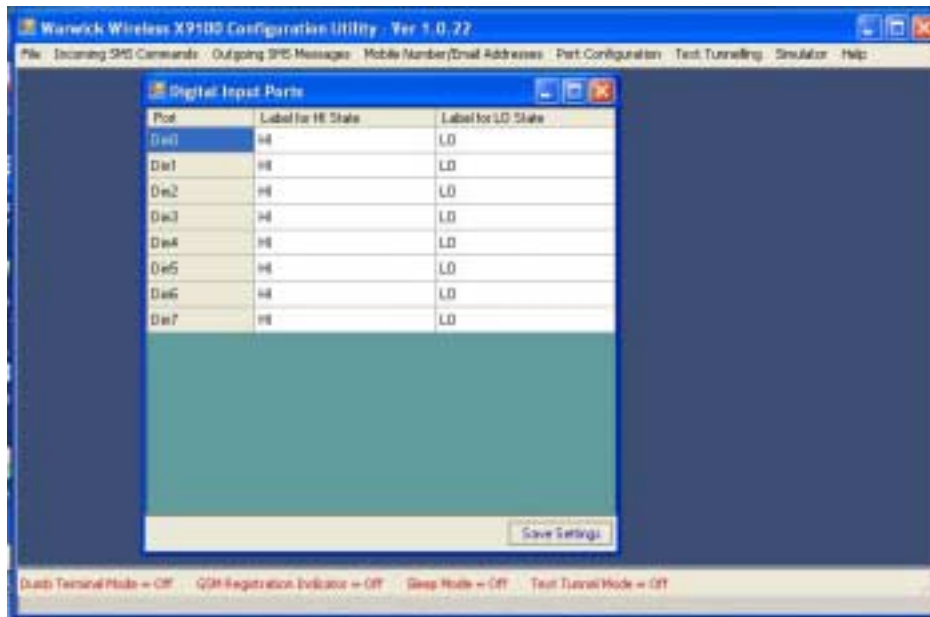
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Port Configuration

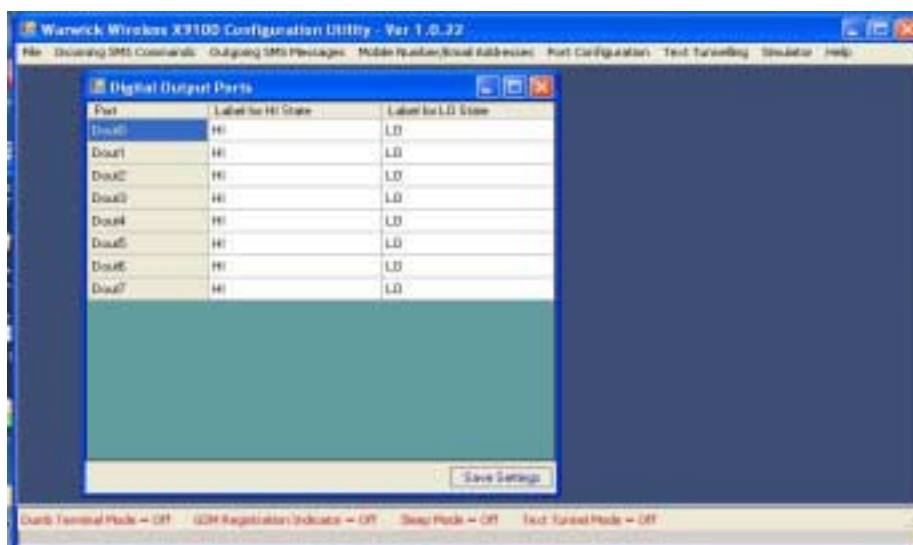
Digital Inputs

Enter the text that will be sent when each Digital or Analogue Input port goes low or high.



Digital Outputs

Enter the text associated with the Digital Output port command. If the port is to respond by setting its output high then HI is entered and LO is entered to set the port low.



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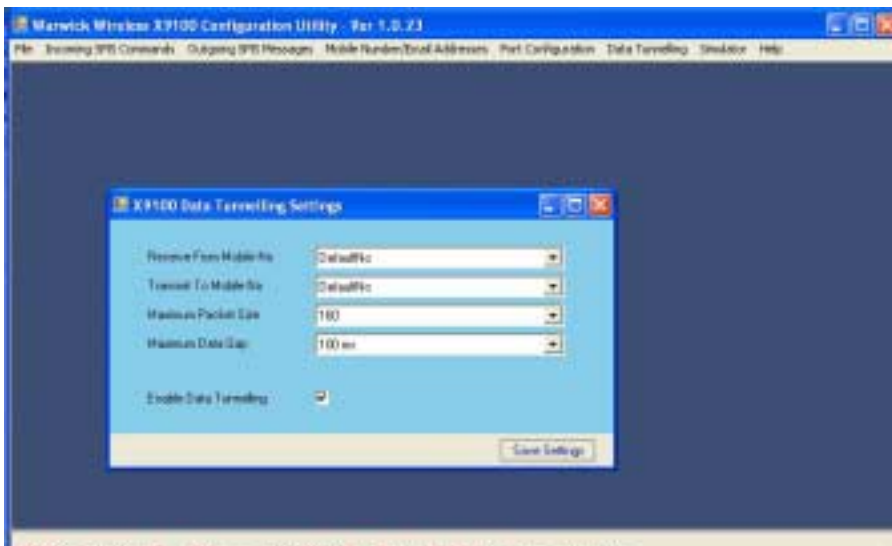
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Analogue Input Ports

The four analogue inputs can be scaled by setting **Port Max Value** to the required full scale value. Two thresholds can be set in the **Report Min Value** and **Report Max Value**. An SMS message set in **Outgoing SMS Messages** when the Max Value is reached. The actual value can be sent if required. A SMS message can be sent when the value fall below the Min Value.



SMS Data Tunnelling



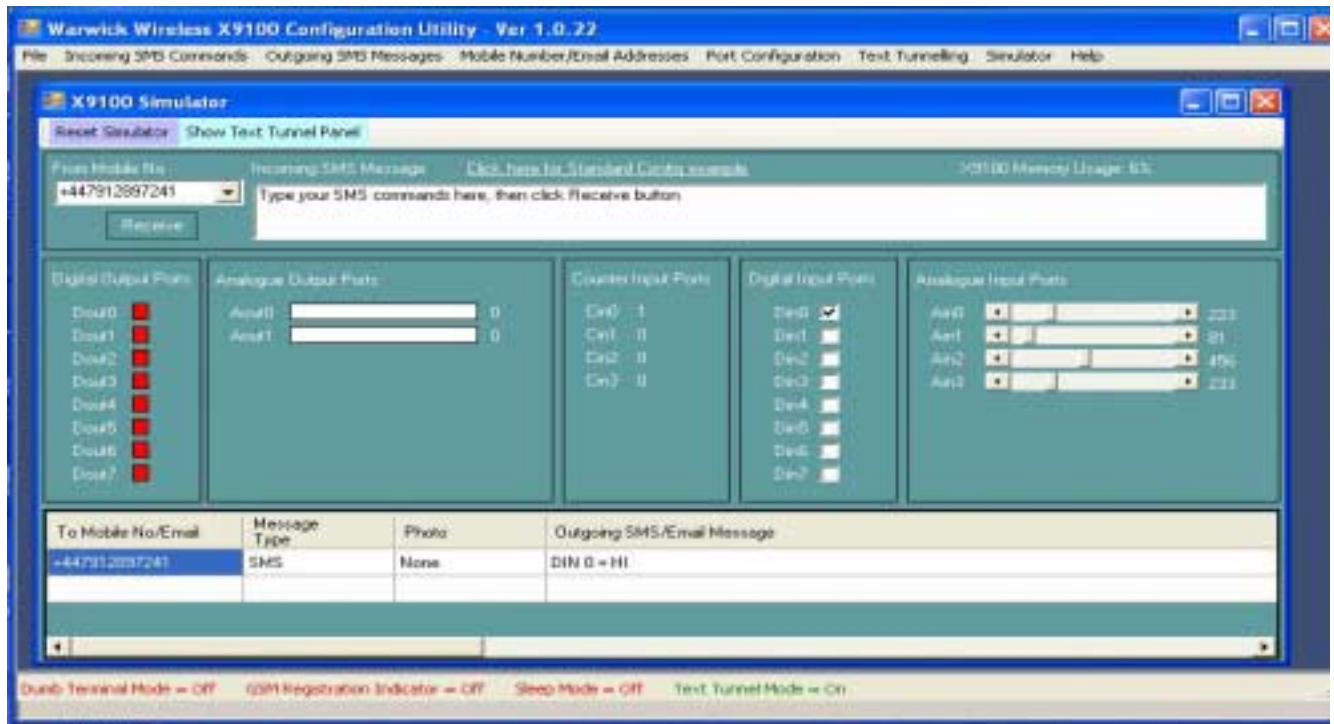
Raw data sent to the serial port will be formed into a SMS Message and sent to the phone number defined in **Transmit Mobile No**. If it is sent to another X9100-GSM set in Data Tunnelling Mode with the phone number set to **Receive From Mobile No** it will be presented in the same form on the Serial output port.

The **Data Tunnelling Mode** is set in the **File Menu**. The bottom menu bar indicator will turn green when it is selected

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Simulator



When all the parameters have been entered the simulator can be used to test each function without the use of expensive call time.

Digital outputs can be activated by typing a text message in the **Received Text Message Box** and then pressing the **Receive** button.

Digital inputs can be ticked or un-ticked thereby generating a text message which will appear in the **Sent SMS Messages** at the bottom of the simulator box.

Counter values will also be displayed in the **Counter Input Box**.

The Analogue sliders associated with each analogue input are used to generate analogue trigger levels. The SMS Messages appear in the **Sent SMS Messages Box**.

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GPRS Wireless Modem Mode

Set the Wireless Data Modem (Dumb Terminal Mode) option in the **File Menu** and Download the configuration to the X9100-GSM.

Connect the X9100-GSM to the PC using the X9103 cable.

Run a dumb terminal program such as HyperTerminal in the Accessories Section of the PC

This can be done by:

Click on Start,
All Programs,
Accessories,
Communications
Hyper Terminal

Enter a new name for the session and select a COM Port

Click on File, then Properties and configure;

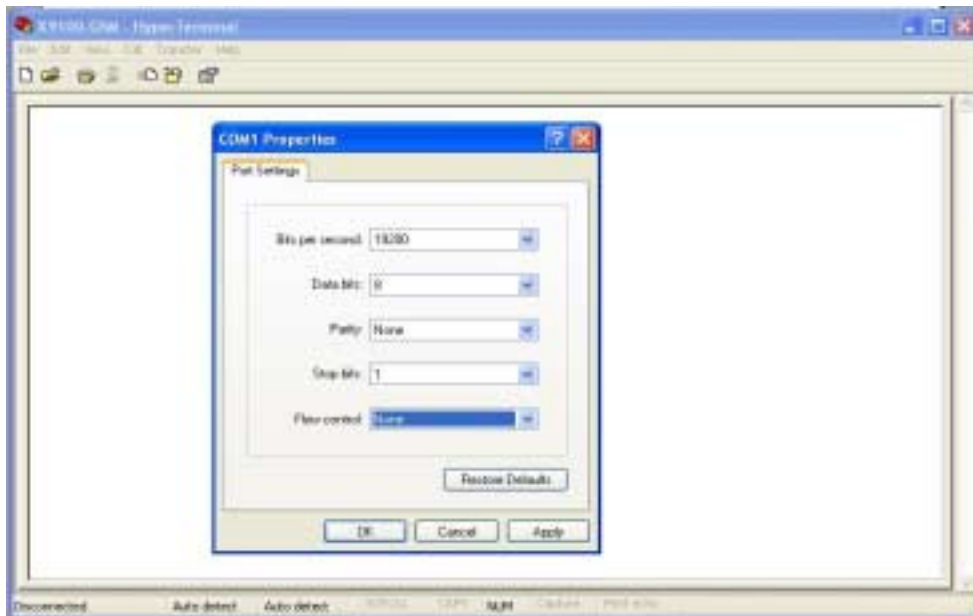
Baud Rate 19,200

Data Bits 8

Parity None

Stop Bits 1

Flow Control None

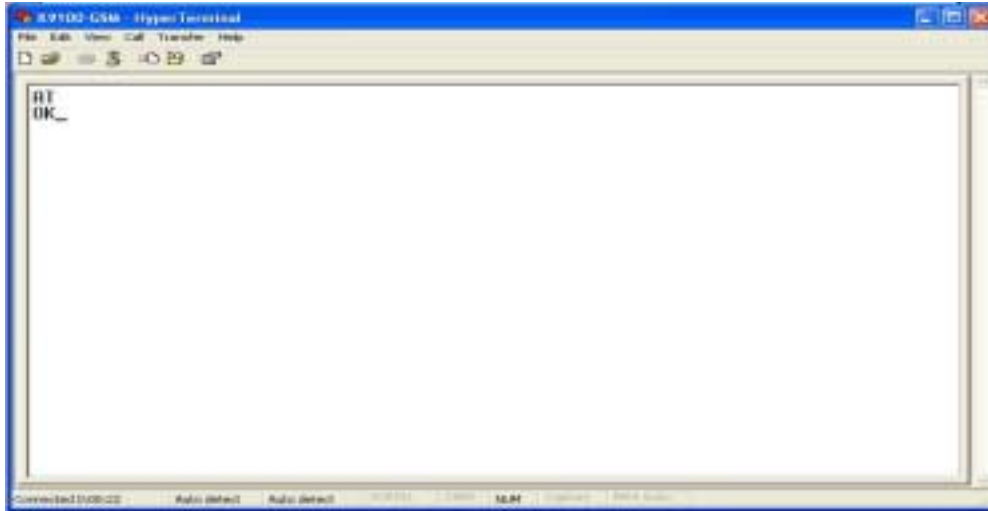


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AT Commands



The connection can be tested by typing A then T and Carriage Return.
The X9100-GSM will respond with OK.

To make a call type: ATD12345...(Phone Number)
The X9100-GSM will respond with OK

To end a call type : ATH
The X9100-GSM will respond with OK

Receiver signal strength: AT+CSQ
The X9100-GSM will respond with +CSQ: N,0 where "N" is a number between 0 and 20

DS189 has the full AT Instruction Set and can be down loaded from:

<http://www.radiotelemetry.co.uk/GSMGPRS.htm>

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SCADA

A PC2000 SCADA Packages are available for Monitoring, Control and Logging. A Dual Band GSM Modem PCMCIA Card is supplied with the package.

ANTENNA

X612-GSM External GSM Antenna 100mm of feeder cable
X613-GSM Mast Mounted Dipole Antenna with 3m of feeder cable.

ORDER CODES

X9100-GSM	Standard X9100-GSM Telemetry Engine
X9100-GSM-BAT	Standard X9100-GSM Telemetry Engine with Battery Charger
X9101-GSM	Standard X9100-GSM Telemetry Engine, IP65 Enclosure Solar Panels
X612-GSM	External GSM Antenna 100mm of feeder cable
X613-GSM	Mast Mounted Dipole Antenna with 3m of feeder cable

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A Brief Summary of Standard AT Commands

Command	Description
A/	RE-ISSUES LAST AT COMMAND GIVEN
ATA	ANSWER INCOMING CALL
ATD	MOBILE ORIGINATED CALL TO DIALABLE NUMBER
ATD<MEM><N>	ORIGINATE CALL TO PHONE NUMBER IN MEMORY <MEM> >
ATD<N>	ORIGINATE CALL TO PHONE NUMBER IN CURRENT MEMORY
ATD<STR>	ORIGINATE CALL TO PHONE NUMBER IN MEMORY WHICH CORRESPONDS TO ALPHANUMERIC FIELD <STR>
ATDL	REDIAL LAST TELEPHONE NUMBER USED
ATE	SET COMMAND ECHO MODE
ATH	DISCONNECT EXISTING CONNECTION
ATI	DISPLAY PRODUCT IDENTIFICATION INFORMATION
ATL	SET MONITOR SPEAKER LOUDNESS
ATM	SET MONITOR SPEAKER MODE
+++	SWITCH FROM DATA MODE OR PPP ONLINE MODE TO COMMAND MODE
ATO	SWITCH FROM COMMAND MODE TO DATA MODE
ATP	SELECT PULSE DIALLING
ATQ	SET RESULT CODE PRESENTATION MODE
ATS0	SET NUMBER OF RINGS BEFORE AUTOMATICALLY ANSWERING THE CALL
ATS3	SET COMMAND LINE TERMINATION CHARACTER
ATS4	SET RESPONSE FORMATTING CHARACTER
ATS5	SET COMMAND LINE EDITING CHARACTER
ATS6	SET PAUSE BEFORE BLIND DIALLING
ATS7	SET NUMBER OF SECONDS TO WAIT FOR CONNECTION COMPLETION
ATS8	SET NUMBER OF SECONDS TO WAIT WHEN COMMA DIAL MODIFIER USED
ATS10	SET DISCONNECT DELAY AFTER INDICATING THE ABSENCE OF DATA CARRIER

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DATA SHEET 183-5

ATT	SELECT TONE DIALLING
ATV	SET RESULT CODE FORMAT MODE
ATX	SET CONNECT RESULT CODE FORMAT AND CALL MONITORING
ATZ	SET ALL CURRENT PARAMETERS TO USER DEFINED PROFILE
AT&C	SET DCD FUNCTION MODE
AT&D	SET DTR FUNCTION MODE
AT&F	SET ALL CURRENT PARAMETERS TO MANUFACTURER DEFAULTS
AT&V	DISPLAY CURRENT CONFIGURATION
AT&W	STORE CURRENT PARAMETER TO USER DEFINED PROFILE
AT+DR	V42BIS DATA COMPRESSION REPORTING CONTROL
AT+DS	V42BIS DATA COMPRESSION CONTROL
AT+GCAP	REQUEST COMPLETE TA CAPABILITIES LIST
AT+GMI	REQUEST MANUFACTURER IDENTIFICATION
AT+GMM	REQUEST TA MODEL IDENTIFICATION
AT+GMR	REQUEST TA REVISION IDENTIFICATION
AT+GOI	REQUEST GLOBAL OBJECT IDENTIFICATION
AT+GSN	REQUEST TA SERIAL NUMBER IDENTIFICATION (IMEI)
AT+ICF	SET TE-TA CONTROL CHARACTER FRAMING
AT+IFC	SET TE-TA LOCAL DATA FLOW CONTROL
AT+ILRR	SET TE-TA LOCAL RATE REPORTING MODE
AT+IPR	SET FIXED LOCAL RATE

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AT Command for a GPRS Data Connection

Command	Description
AT+CGATT	ATTACH/DETACH FROM GPRS SERVICE
AT+CGDCONT	DEFINE PDP CONTEXT
AT+CGQMIN	QUALITY OF SERVICE PROFILE (MINIMUM ACCEPTABLE)
AT+CGQREQ	QUALITY OF SERVICE PROFILE (REQUESTED)
AT+CGACT	CONTEXT ACTIVATION
AT+CGDATA	ENTER DATA STATE
AT+CGPADDR	SHOW PDP ADDRESS
AT+CGCLASS	GPRS MOBILE STATION CLASS
AT+CGEREP	CONTROL UNSOLICITED GPRS EVENT REPORTING
AT+CGREG	NETWORK REGISTRATION STATUS
AT+CGSMS	SELECT SERVICE FOR MO SMS MESSAGES
AT+CGCOUNT	GPRS PACKET COUNTERS

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AT Commands for a TCP/IP Connection

Command	Description
AT+CIPSTART	START UP TCP OR UDP CONNECTION
AT+CIPSEND	SEND DATA THROUGH TCP OR UDP CONNECTION
AT+CIPCLOSE	CLOSE CONNECTION
AT+CIPSHUT	DEACTIVATE GPRS PDP CONTEXT
AT+CLPORT	SET LOCAL PORT
AT+CSTT	SET APN, USER NAME, PASSWORD
AT+CIICR	BRING UP WIRELESS CONNECTION WITH GPRS OR CSD
AT+CIFSR	GET LOCAL IP ADDRESS
AT+CIPSTATUS	QUERY CURRENT CONNECTION STATUS
AT+CDNSCFG	CONFIGURE DOMAIN NAME SERVER
AT+CDNSGIP	QUERY IP ADDRESS OF GIVEN DOMAIN NAME
AT+CDNSORIP	CONNECT WITH IP ADDRESS OR DOMAIN NAME SERVER
AT+CIPHEAD	ADD AN IP HEADER WHEN RECEIVING DATA
AT+CIPATS	SET AUTO SENDING TIMER
AT+CIPSPRT	SET PROMPT OF '>' WHEN SENDING DATA
AT+CIPSERVER	CONFIGURE AS SERVER
AT+CIPCSGP	SET CSD OR GPRS FOR CONNECTION MODE
AT+CIPCCON	CHOOSE CONNECTION
AT+CIPFLP	FIX LOCAL PORT
AT+CIPSRIP	SHOW WHERE RECEIVED DATA FROM
AT+CIPDPDP	SET WHETHER CHECK STATE OF GPRS NETWORK TIMING
AT+CIPSCONT	SAVE TCP/IP APPLICATION CONTEXT
AT+CIPMODE	SELECT TCP/IP APPLICATION MODE
AT+CIPCCFG	CONFIGURE TRANSPARENT TRANSFER MODE

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