

**X9101-5 GSM TELEMETRY RTU**  
**INSTRUCTION MANUAL**



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## 1.0 FEATURES

- Automatic connection to the GSM/GPRS Network.
- Measurement and Control by low cost SMS messages dedicated Web Site or Server.
- Powerful PC Configuration Utility and Simulator .
- Remote Configuration by SMS Messages or GPRS.
- Real Time Clock for Logging and Watch Dog SMS
- LCD Display for local display of Parameters and Status (Option)
- Data Logging
- 8 Digital Inputs.
- 4 Pulse Counter Inputs, 32 Bit.
- 8 Digital Outputs.
- 4 Analogue Inputs .
- Transparent Serial Data using low cost SMS Messaging or GPRS without the need for AT Instructions
- All Inputs can be configured to local Outputs.
- 128K FRAM Memory.
- DIN Rail Mounted
- PC Monitoring and Logging Software.
- Size: 80mm by 55mm by 160mm
- Power Supply 12Vdc,24Vdc, 110Vac, 240Vac.
- 48 Hour Battery Back Up

## 2.0 INTRODUCTION

The X9101-GSM Telemetry RTU is a low cost self contained IP65 module which can automatically connect to the GSM and GPRS Networks. Analogue, digital, pulse counter and serial data can be transparently passed to and from multiple Mobile Phones, PC Servers or a dedicated Web Site. The Real Time Clock can be used for the Data Logging function or sending a Watch Dog SMS messages. All SMS messages, data and status can be displayed on an optional LCD Display. Local control is provided by mapping analogue thresholds and digital inputs to any of the digital 8 outputs.

### 2.1 Monitoring and Control

The X9101-GSM RTU can send and receive digital and analogue alarm conditions and pulse counter data using low cost SMS messaging/ 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.

### 2.2 Data Logging.

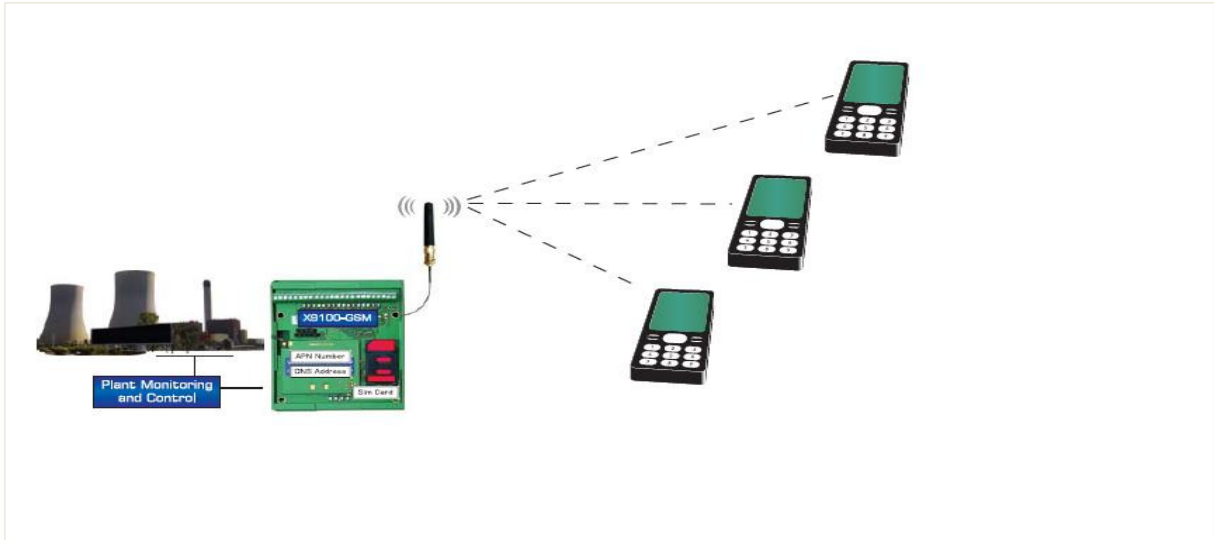
The X9101-GSM RTU can be configured to store time stamped values and messages from inputs at preset times or when the value changes by a pre-set amount. The data is stored in the 128K FRAM Memory and either down loaded on request or at pre-set times. The data can be displayed on the LCD Display

### 2.3 Energy Metering

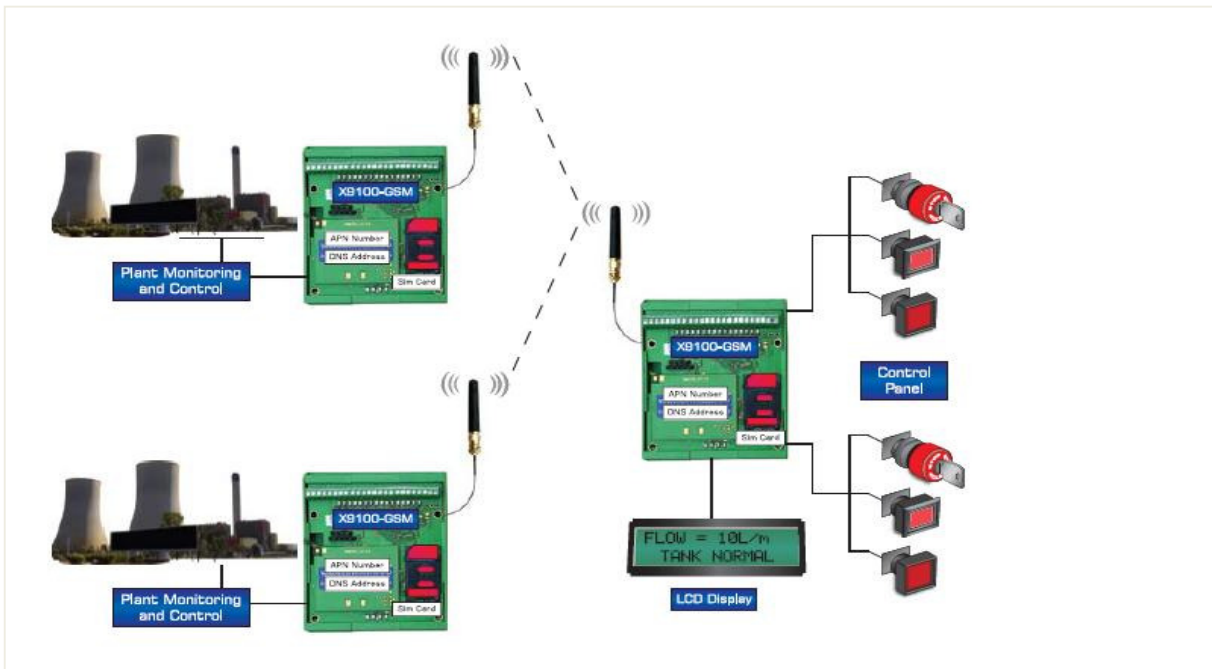
Four digital inputs can be configured to four 32 bit pulse counter inputs. The current value of each counter can be transmitted using SMS Messages or the GPRS data network at pre-set times or when a pre-set value has been exceeded.

### 3.0 APPLICATIONS

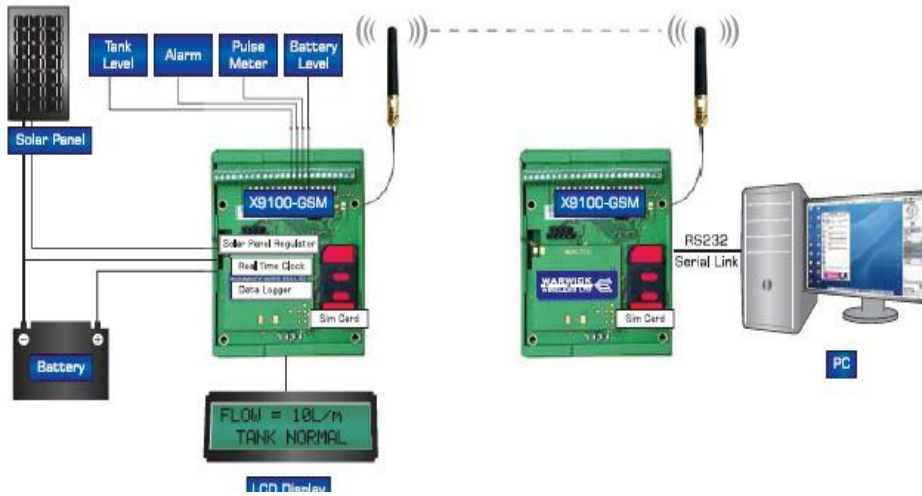
#### 3.1 Plant Monitoring and Control using Multiple Mobile Phones



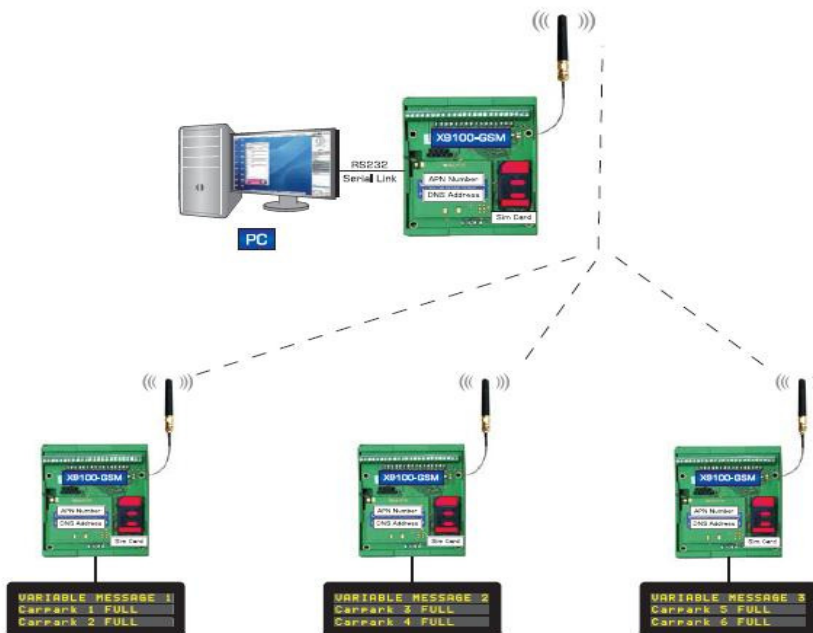
#### 3.2 Back to Back Plant Monitoring with Local and Remote Control



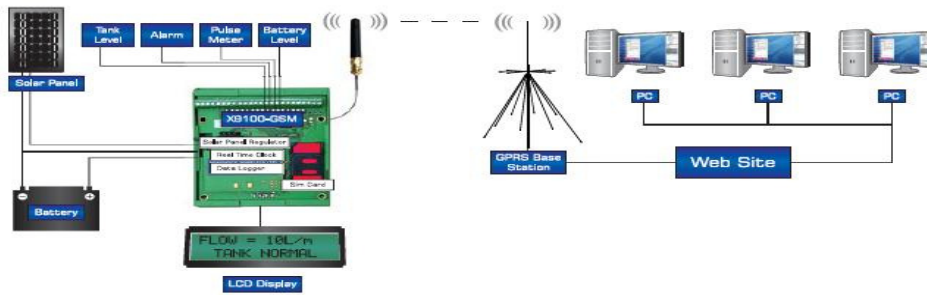
### 3.3 SMS Data Logging and Real Time Clock



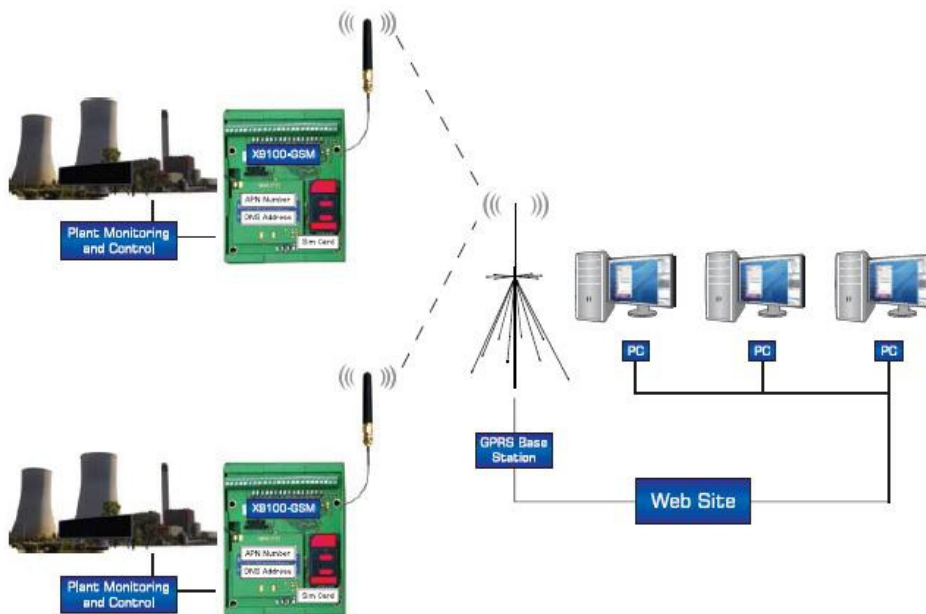
### 3.4 Transparent Serial Communications (No AT Instructions are needed)



### 3.5 GPRS Data Logging with Real Time Clock



### 3.6 GPRS Monitoring and Control



## 4.0 HARDWARE

The X9101-GSM Telemetry Engine has the following screw terminal connections:

### Terminal Block A

PIN	FUNCTION	DESCRIPTION	NOTES
1	0V	0Volt Supply	Input
2	+V	6 -16V or 10-26V	Input
3	+Vswt	Switched Transducer Supply Output	Output
4	Dout5	Digital Output 5 Open Collector	Output
5	Dout4	Digital Output 4 Open Collector	Output
6	Dout3	Digital Output 3 Open Collector	Output
7	Dout2	Digital Output 2 Open Collector	Output
8	Dout1 Relay 1	Digital Output 1 Volt Free Contact	Output
9	Dout0 Relay 2	Digital Output 0 Volt Free Contact	Output
10	Relay Common	Relay Common	Input

### Terminal Block B

PIN	FUNCTION	DESCRIPTION	NOTES
11	Ain0	Analogue Input 0	0-5V, 0-20mA and 4-20mA
12	Ain1	Analogue Input 1	0-5V, 0-20mA and 4-20mA
13	Din7	Digital Input 7	5-26V Input
14	Din6	Digital Input 6	5-26V Input
15	Din5	Digital Input 5	5-26V Input
16	Din4/Cin0	Digital Input 4/ Pulse Counter 0	High Speed Counter Input 1KHz
17	Din3/Cin3	Digital Input 3/ Pulse Counter 3	Low Speed Counter Input 5Hz
18	Din2/Cin2	Digital Input 2/ Pulse Counter 2	Low Speed Counter Input 5Hz
19	Din1/Cin1	Digital Input 1/ Pulse Counter 1	Low Speed Counter Input 5Hz
20	Din0	Digital Input 0	5-26V Input
21	Ain 2	Analogue Input 2	0-5V, 0-20mA and 4-20mA
22	Ain 3	Analogue Input 3	0-5V, 0-20mA and 4-20mA

#### 4.1 Power Supply (0V on Pin 1, 12V on Pin 2)

The X9101-GSM CPU board operates from a regulated supply.

At 12V the Transmit current : 60mA to 500mA

Receiving current : 36mA

Standby : 4mA

The Power Supply option of 12Vdc, 24Vdc, 110Vdc or 240Vdc are available.

#### 4.2 Switched Transducer Supply ( Pin 3)

The input supply is switched on and off by the Standby Function. A transducer can be powered from the output and switched off during a Standby period thereby saving power.

#### 4.3 Digital Outputs (Pin 4 to Pin 7)

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 24V. The maximum current is 50mA

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

#### 4.4 Relay Outputs (Pin 8 to Pin 10)

Two voltage free relay contacts rated at 1A 240Vac with their common on Pin 10

#### 4.5 Analogue Inputs (Pin 11, Pin 12 and Pin 21, Pin22 )

The Analogue Inputs are set to a range 0V to 5V, or 0-20mA. Jumpers associated with each Analogue Input are used to convert them to a 0-20mA current input by connecting a 250 ohm resistor between each input and 0V.



#### 4.6 Digital Inputs (Pin 13 to Pin 20)

A voltage between 5V to 24V will energise each Digital Input. The four Digital Inputs, Din0 to Din3, will wake up the X9101-GSM from the Sleep Mode. Time Alarm and Delay Timer will also wake up the X9101-GSM.

#### 4.7 Pulse Counter Inputs (Pin 16 to Pin 19)

A high speed counter Cin0 with a frequency of 1KHz is on Pin 16. Three other low speed Counter Cin1 to Cin3 Pin 17,18 and 19 have a frequency response of 5Hz

#### 4.8 Power up Sequence

The X9101-GSM has the 4 LEDs located on the edge of the unit.



#### Normal Switch On Sequence

Status LED	OFF	OFF	ON	ON 0.1sec, OFF 1sec	ON 0.1sec, OFF 3sec	ON 0.1sec, OFF 3sec
Rx LED	Flash 4 Times	ON	ON	ON	OFF	Receiving Message
Tx LED	Flash 4 Times	ON	ON	ON	OFF	Transmitting Message

#### SIM Card is attempting to register on the Network or the SIM Card is not Present in the SIM Card Holder.

Status LED	OFF	OFF	ON	ON 0.1sec, OFF 1sec	ON 0.1sec, OFF 1sec
Rx LED	Flash 4 Times	ON	ON	ON	Alternate ON/OFF
Tx LED	Flash 4 Times	ON	ON	ON	Alternate OFF/ON

After 90 sec the X9100-GSM will execute a Watchdog Reset and the above sequence will repeat until the fault is rectified.

#### No Signal or the Antenna is Disconnected

Status LED	OFF	OFF	ON	ON 0.1sec, OFF 1sec	ON 0.1sec, OFF 1sec
Rx LED	Flash 4 Times	ON	ON	ON	Alternate ON/OFF
Tx LED	Flash 4 Times	ON	ON	ON	OFF

After 90 sec the X9100-GSM will execute a Watchdog Reset and the above sequence will repeat until the fault is rectified.

#### The SIM Card is not Registered to the Network or the Network does not Recognize it

Status LED	OFF	OFF	ON	ON 0.1sec, OFF 1sec	ON 0.1sec, OFF 1sec
Rx LED	Flash 4 Times	ON	ON	ON	OFF
Tx LED	Flash 4 Times	ON	ON	ON	Alternate ON/OFF

After 90 sec the X9100-GSM will execute a Watchdog Reset and the above sequence will repeat until the fault is rectified.

## 5.0 QUICK START

A new configuration can be developed and tested in the shortest possible time using the flexible and intuitive X9101-GSM Configuration Utility and Simulator.

### 5.1 Send a SMS or GPRS message

1. Enter a mobile number or GPRS Address in Mobile Numbers/GPRS Addresses.
2. Compose the message in Outgoing SMS/GPRS Messages.
3. Set up a Digital Input, Timer, Counter or Analogue trigger to send the message to the Mobile Numbers/GPRS Addresses when an event happens.

### 5.2 Command the X9101 to change an Output or set or reset a parameter

1. Enter the Text/GPRS message which is going to active the output in Incoming Commands
2. Compose an acknowledge message in Outgoing SMS/GPRS Messages. This is optional.
3. Set up the Incoming Command options to activate the output and send an acknowledgement to the same source mobile number/GPRS Address and/or a different one.

### 5.3 Configure the RS232 Serial Port to Send Transparent data

Click on Data Tunnelling and select Text Tunnelling or GPRS Client/Server Options

### 5.4 Download a New Configuration when Sleep Mode is selected

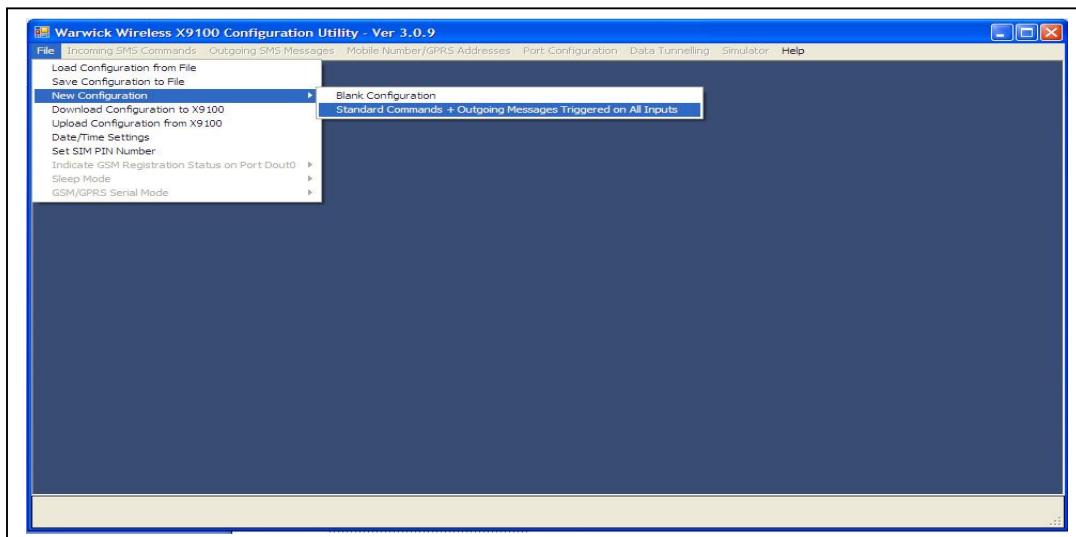
1. Remove the SIM Card and cycle the power. This will prevent the X9101-GSM from entering the Sleep Mode.
2. Select Download Configuration in the File Menu.
3. Wait 10 sec and press Download.

### 5.5 Factory Default Configuration

- 1) Install the X9101 Configuration Utility. This can be downloaded from:

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

- 2) Click on File
- 3) Click on New Configuration
- 4) Click on Standard Commands



- 5) Enter a destination mobile number. This must be in the International Format (+44 for the UK)
- 6) Click on Simulator then Open Simulator
- 7) Click on and off the white Digital Input boxes. The text messages associated with the Input will be displayed at the bottom of the Simulator.

### **Edit or Change a Message.**

- 1) Click on Outgoing Messages
- 2) Click on SMS/GPRS Messages
- 3) Click on the Message DIN 0 = [Din0]. The Edit Box will appear.
- 4) Delete DIN 0 and type PUMP
- 5) Click on OK and Save Settings
- 6) Open the Simulator or click on Reset Simulator on the top left hand side.
- 7) Click on the Din0 Box. The new message will be displayed at the bottom of the Simulator.

### **Down Load Configuration to the X9101-GSM**

- 1) Connect the programming cable to the X9101-GSM.
- 2) Insert a SIM Card.
- 3) Click on File then Download Configuration to X9101
- 4) Power up the X9101-GSM and click on Download
- 5) When Download Complete is displayed close the Download Menu

### **Testing the Standard Configuration**

Connect an excitation voltage between 5V to 24V 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 X9101-GSM when the digital inputs are energised.

Digital Input 0 High	DIN 0 = HI	Digital Input 5 High	DIN 5 = HI
Digital Input 0 Low	DIN 0 = LO	Digital Input 5 Low	DIN 5 = LO
Digital Input 1 High	DIN 1 = HI	Digital Input 6 High	DIN 6 = HI
Digital Input 1 Low	DIN 1 = LO	Digital Input 6 Low	DIN 6 = LO
Digital Input 2 High	DIN 2 = HI	Digital Input 7 High	DIN 7 = HI
Digital Input 2 Low	DIN 2 = LO	Digital Input 7 Low	DIN 7 = 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 X9101-GSM the respective digital outputs will change. The Rx LED will light when a text message is received.

<b>Port</b>	<b>Text</b>	<b>Port</b>	<b>Text</b>
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

### **Status Report**

If the word STATUS is sent to the X9101-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.

## 6.0 Configuration Examples

A new Configuration is created by:

- 1) Entering the mobile numbers and/or GPRS address that the messages are to be sent too.
- 2) Composing the message itself.
- 3) Configuring an input or timer to send the message.

### 6.0 Example 1. Configuring a Digital Input to Send a Text Message

The message "Door Open" will be sent when Din0 is taken high and "Door Closed" when Din0 is taken low. The messages will be sent to a destination mobile phone.

#### Enter the Destination Mobile Number

- 1) Click on File then New Configuration then Blank Configuration
- 2) Click on Mobile Numbers/GPRS Address
- 3) Click on Add New Mobile No or GPRS Address.
- 4) Enter the mobile number to which you wish to send the messages to in the + international format. The label MN0 is automatically assigned to this mobile number.

#### Compose the New Message

- 1) Click on Outgoing Messages then Outgoing SMS/GPRS Messages
- 2) Click on Add New Message.
- 3) Click on Enter New Message. The Edit Box will appear
- 4) Delete the text "Enter New Message"
- 5) Type "Door" then space
- 6) Click on the drop down menu and select Din0
- 7) Click Insert and then click on OK
- 8) The following message should appear in the Message Box "Door [Din0]"
- 9) Click on Save Settings.

#### Configure Din0 to send OPEN when it is taken from low to high and CLOSED when it is taken from high to low

- 1) Click on Port Configuration
- 2) Click on Digital Port Configuration then Digital Inputs.
- 3) Type OPEN in Din0, Label for HI State
- 4) Type CLOSED in Din0, Label for LO State

#### Set up Din0 to Send the Complete Message

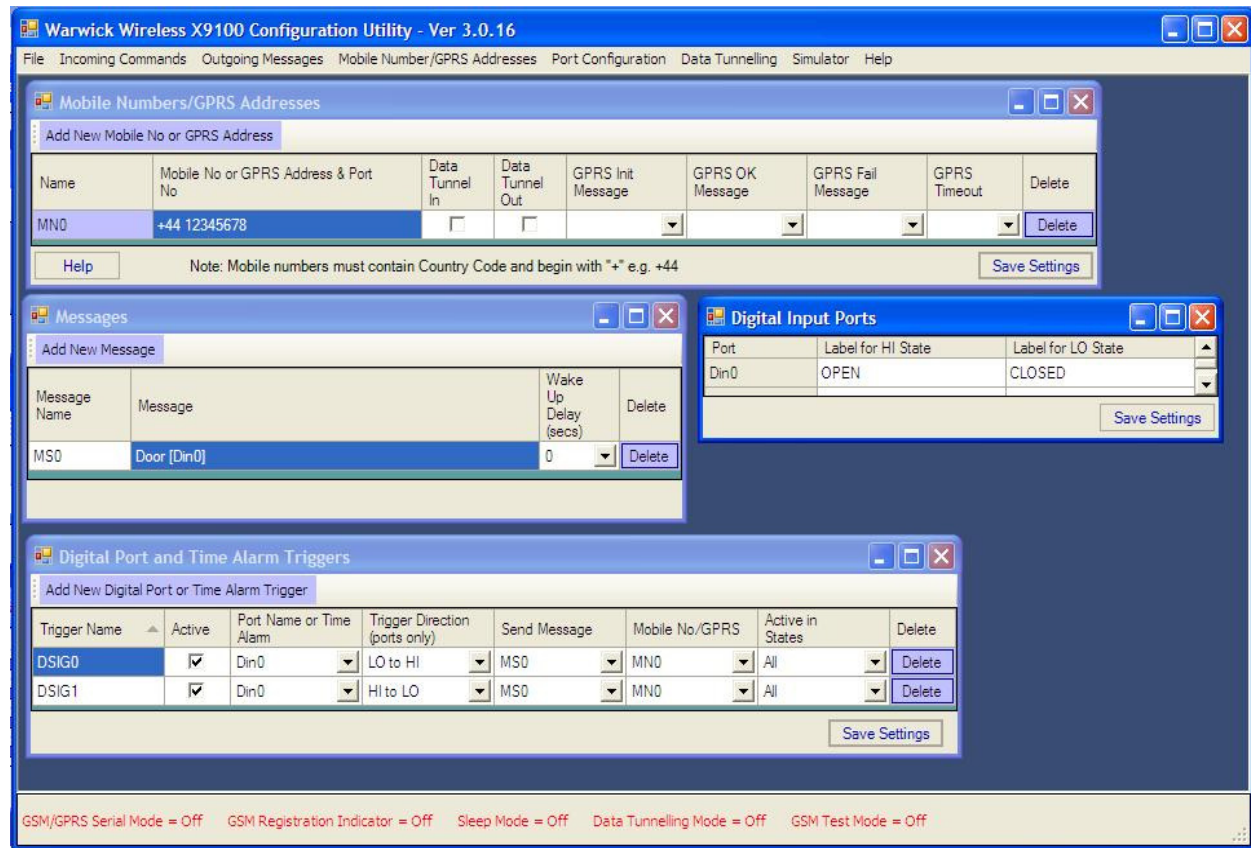
- 1) Click on Outgoing Messages then Digital Port and Timer Alarm Triggers
- 2) Click on Add New Digital Port or Timer Alarm Triggers
- 3) Click on the drop down menu Port Name or Time Alarm
- 4) Select Din0 from the Port Name drop down menu.
- 5) Select HI to LO from Trigger Direction
- 6) Select MS0 from the Send Message
- 7) Select MN0 from Mobile No/GPRS
- 8) Repeat steps 2 to 7 but select LO to HI on step 5

#### Test the Configuration in the Simulator

- 1) Click on Simulator then Open Simulator
- 2) Click on Din0. The Message will appear at the output box at the bottom

## Down Load Configuration to the X9101-GSM

- 1) Connect the programming cable to the X9101-GSM.
- 2) Click on File then Download Configuration to X9101
- 3) Power up the X9101-GSM and click on download
- 4) When Download Complete is displayed close the Download Menu
- 5) Energise digital input Din0 on pin 11. Door OPEN and Door CLOSED will be sent



### 6.1 Example 2. Control a Digital Output and Read an Analogue Input using a SMSText Message

The following example will energise digital output Din0 when the SMS Text Message "ON" is received. Din0 will de-energise when the SMS Text Message "OFF" is received.

An acknowledge message will be sent to the sending mobile phone. A digital input and an analogue input will also be sent to a designated mobile phone when the SMS Message "STATUS" is received.

#### Enter then Mobile Numbers and GPRS Parameters

- 1) Click on File then New Configuration then Blank Configuration
- 2) Click on Mobile Numbers/GPRS Address
- 3) Click on Add New Mobile No or GPRS Address.
- 4) Enter the mobile number to which you wish to send the messages to. MN0 is automatically assigned to this mobile number.

## **Compose the Acknowledge and Status Message**

- 1) Click on Outgoing Messages then Outgoing SMS/GPRS Messages
- 2) Click on Add New Message.
- 3) Click on Enter New Message. The Edit Box will appear
- 4) Delete the text "Enter New Message"
- 5) Type Digital Output 0 = ON. This will be given the message name of MS0
  
- 6) Click on Enter New Message. The Edit Box will appear
- 7) Delete the text "Enter New Message"
- 8) Type: Digital Output 0 = OFF.
- 9) Click on OK and the message will be entered in the Message Box and called MS1
  
- 10) The next thing to do is to compose a status message
- 11) Click on Enter New Message. The Edit Box will appear
- 12) Delete the text "Enter New Message"
- 13) Type: Digital Output =
- 14) Use the drop down menu to select Dout1
- 15) Type: Analogue Input =
- 16) Use the drop down menu to select Ain0
- 17) Click on OK and the message will be entered in the Message Box and called MS2

## **Enter SMS Commands**

- 1) Click on Incoming Commands
- 2) Click on Add New Command
- 3) In the Command Text Box type ON. When this text is received the follow action will be taken
- 4) From the drop down menu select Dout0.
- 5) Set the To Value to HI
- 6) Use the drop down menu on Send Outgoing Message to select MS0
- 7) Use the drop down menu on Mobile No or GPRS Address to select Reply.

When the text message ON is received digital output 0 will be set to the high state and the message Digital Output 0 = ON will be sent back to the sending mobile phone.

- 8) Click on Incoming Commands
- 9) Click on Add New Command
- 10) In the Command Text Box type OFF. When this text is received the follow action will be taken
- 11) From the drop down menu select Dout0.
- 12) Set the To Value to LO
- 13) Use the drop down menu on Send Outgoing Message to select MS1
- 14) Use the drop down menu on Mobile No or GPRS Address to select Reply

When the text message OFF is received digital output 0 will be set to the low state and the message Digital Output 0 = OFF will be sent back to the sending mobile phone.

- 15) Click on Incoming Commands
- 16) Click on Add New Command
- 17) In the Command Text Box type STATUS.
- 18) Use the drop down menu on Send Outgoing Message to select MS2
- 19) Use the drop down menu on Mobile No or GPRS Address to select MN0

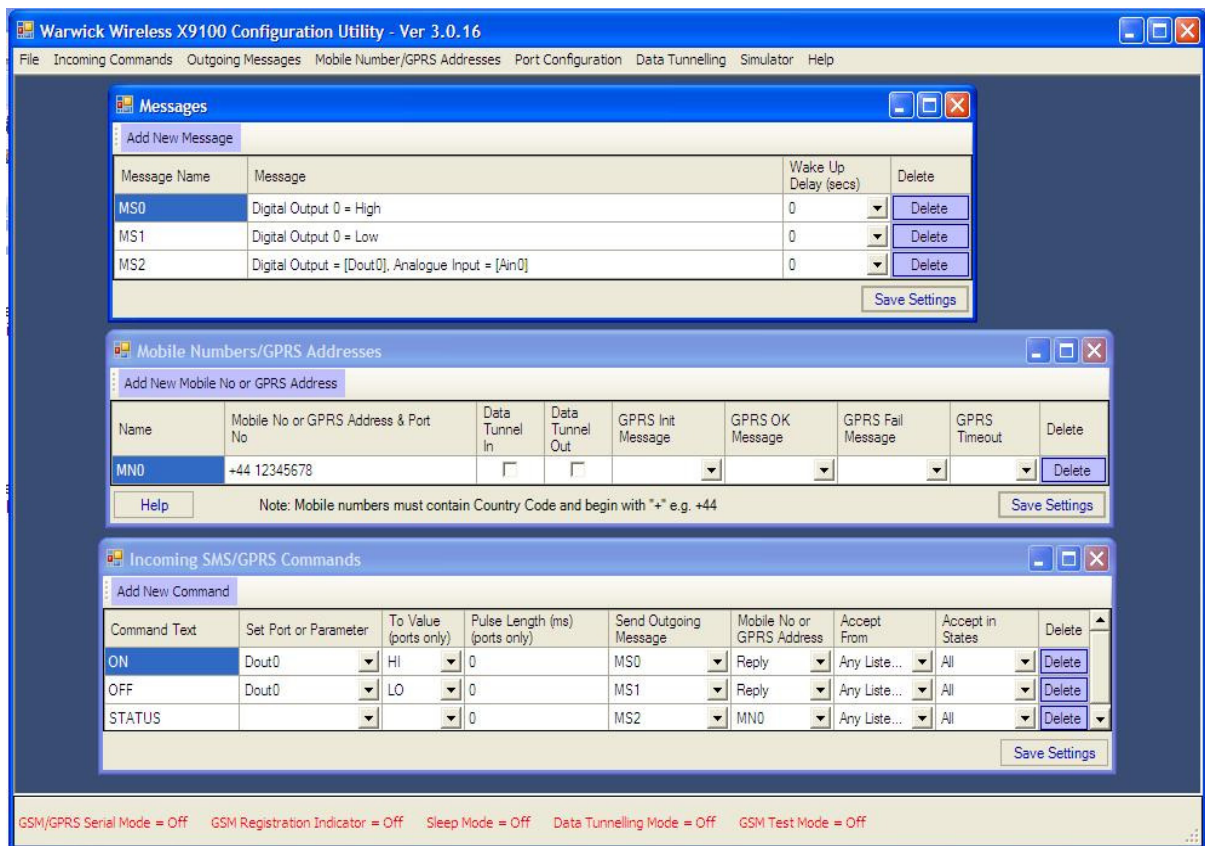
When the text message STATUS is received the status of digital output 0 and the current value of the analogue input will be sent to the mobile phone MNO

## Test the Configuration in the Simulator

- 1) Click on Simulator then Open Simulator
- 2) The received text command is typed in the receiver box at the top of the simulator display.  
Type: ON in the box and click on the Receive button.
- 3) Digital output Dout0 will turn green and the message Digital Output 0 = High will be displayed in the Outgoing SMS Messages.
- 4) Type: OFF in the box and click on the Receiver button.
- 5) Digital output Dout0 will turn red and the message Digital Output 0 = Low will be displayed in the Outgoing SMS Messages.
- 6) Type: STATUS in the box and click on the Receiver button.
- 7) Digital Output 0 = LO, Analogue Input = 0 will be displayed.
- 8) Type: OFF in the box and click on the Receiver button.
- 9) Move the slider of Analogue Ain0 to a new value and type STATUS in the in box.
- 10) Digital Output 0 = HI, Analogue Input = 234 will be displayed.

## Down Load Configuration to the X9101-GSM

- 1) Connect the programming cable to the X9101-GSM.
- 2) Click on File then Download Configuration to X9101
- 3) Power up the X9101-GSM and click on download
- 4) When Download Complete is displayed close the Download Menu



## 6.2 Example 3. The Timer is used to send an Analogue Value to a Mobile Phone and a Web Site every 15 Minutes

The following example will send the value of Analogue Input An0 to a mobile phone and web site at set time intervals or when Digital Input Din1 is energised.

### Enter then Mobile Numbers and GPRS Parameters

- 1) Click on File then New Configuration then Blank Configuration
- 2) Click on Mobile Numbers/GPRS Address
- 3) Click on Add New Mobile No or GPRS Address.
- 4) Enter the mobile number to which you wish to send the messages to. MN0 is automatically assigned to this mobile number.
- 5) Click on Add New Mobile No or GPRS Address again and enter the URL of the destination GPRS
- 6) Web Site in this case it will be the Warwick Wireless web site:

[www.my-data.me/upload.jsp?c=.80](http://www.my-data.me/upload.jsp?c=.80)

MN1 is automatically assigned to this GPRS Address.

- 7) Click on GPRS Parameters and enter the APN, User Name and Password for the GPRS SIM Card.
- 8) Enter the DNS Address of the destination Web Server. In this case it will be Warwick Wireless Server 193.113.200.200
- 9) A unique alpha-numeric string can be entered into the Sender ID. This can be used in a message to show where it has come from.

### Compose the New Message

- 1) Click on Outgoing Messages then Outgoing SMS/GPRS Messages
- 2) Click on Add New Message.
- 3) Click on Enter New Message. The Edit Box will appear
- 4) Delete the text "Enter New Message"
- 5) Click on the drop down menu and find Sender ID. Click on it and then press the Insert button  
Sender ID will appear in the Edit Box
- 6) Click on the drop down menu and select Date Time and click on Insert
- 7) Type in "Temperature = " then use the drop down menu to select and insert Ain0
- 8) The New Message should now read:

[Sender ID], [Date Time] Temperature = [Ain0]

- 9) Click on OK and the message will be entered in the Message Box and called MS0

### Set up the Timer Trigger

- 1) Click Outgoing Messages then on Digital Ports and Time Alarm Message Triggers.
- 2) Click on Add New Digital Port or Timer Alarm
- 3) Click on the drop down menu Port Name or Time Alarm and select Delay Time Alarm.
- 4) Leave Trigger Direction blank
- 5) Click on the drop down menu Send Message and select MS0
- 6) Click on the drop down menu Mobile No./GPRS and select MN0. This will send the message MS0 to mobile phone MN0 when the Delay Time Alarm is activated.
- 7) Repeat steps 2 to 6 but this time select MN1. This will send the message to the web site.
- 8) To send the message MN0 when Din0 is taken from high to low click on Add New Digital Port or Time Alarm
- 9) Select Din0 from the Port Name drop down menu.
- 10) Select HI to LO from Trigger Direction
- 11) Select MS0 from the Send Message
- 12) Select MN0 from Mobile No/GPRS
- 13) Repeat steps 9 to 12 but send the message to MN1



### **Set up the Analogue Scaling**

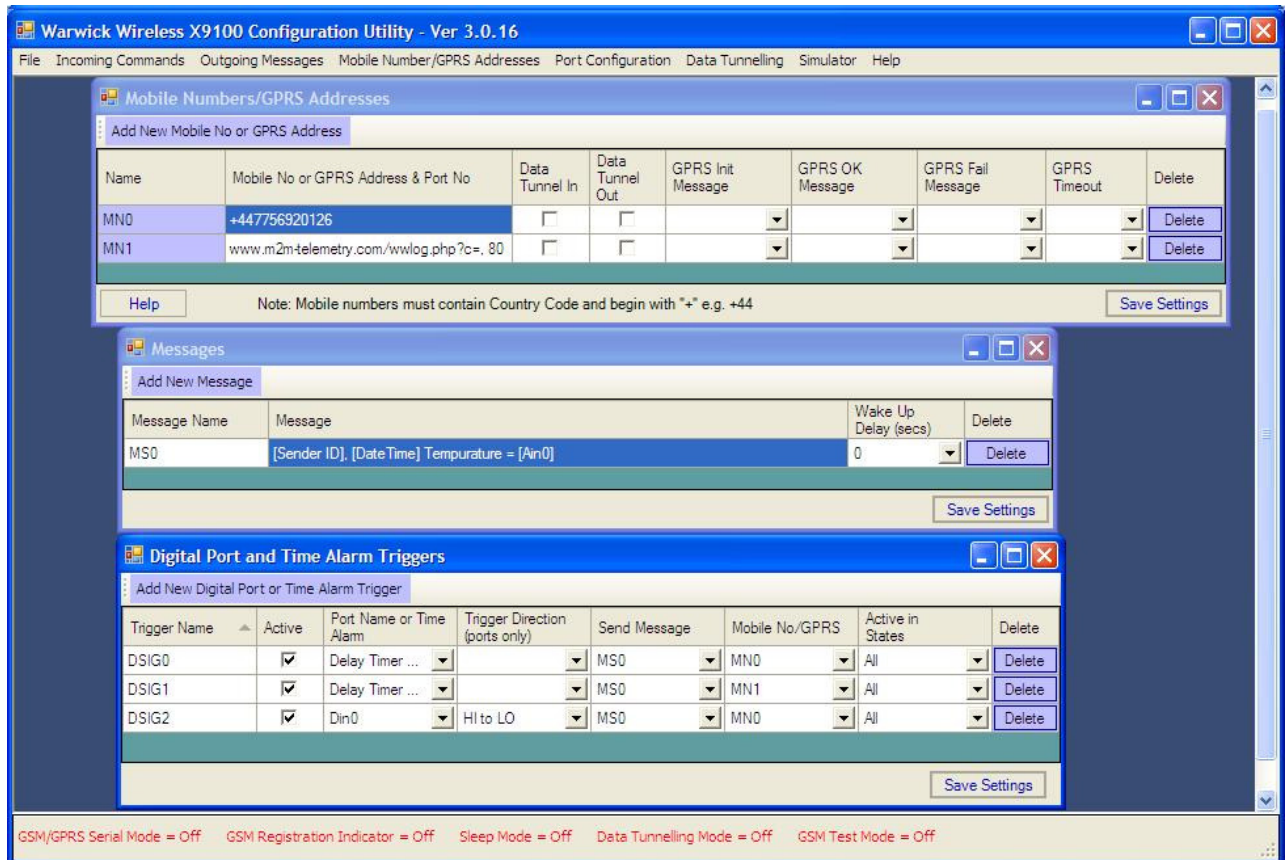
- 1) Click on Port Configuration
- 2) Click on Analogue Port Configuration
- 3) Click on Analogue Input Ports
- 4) The resolution of the ADC is 10 bit so Port Min Value should be 0 and Port Max Value should be 1023.
- 5) Set the Report Values to the span need for the application. For example set Report Min Value to 0, set Report Max Value to 100. The vale included in the message will then be somewhere between 0 and 100.

### **Test the Configuration in the Simulator**

- 1) Click on Simulator then Open Simulator
- 2) Click on the Delay Timer Alarm Box. The Message will appear at the output box at the bottom
- 3) Click on Din0. The Message will appear at the output box at the bottom

### **Down Load Configuration and set the Delay Timer**

- 5) Connect the programming cable to the X9101-GSM.
- 6) Click on File then Download Configuration to X9101
- 7) Power up the X9101-GSM and click on download
- 8) When Download Complete is displayed close the Download Menu
- 9) The Delay Timer is set by clicking on File then Date/Time Settings
- 10) In Delay Timer Alarm Settings click on Time Units and select Minutes
- 11) Select 15 in the Threshold Count
- 12) Click on Set Time and Alarms. The message RTC Set will be displayed
- 13) Click on Read Date/Time/Alarm Settings. The current settings will be displayed.



### 6.3 Example 4. Change a Mobile Number by SMS Message

The following example will change two mobile numbers by SMS message and a conformation message will be sent back.

#### Enter Two Phone Numbers MN0 and MN1

- 1) Click on Mobile Numbers/GPRS Address
- 2) Enter a mobile number in the international format in MN0
- 3) Enter a mobile number in the international format in MN1

#### Enter two Conformation Message

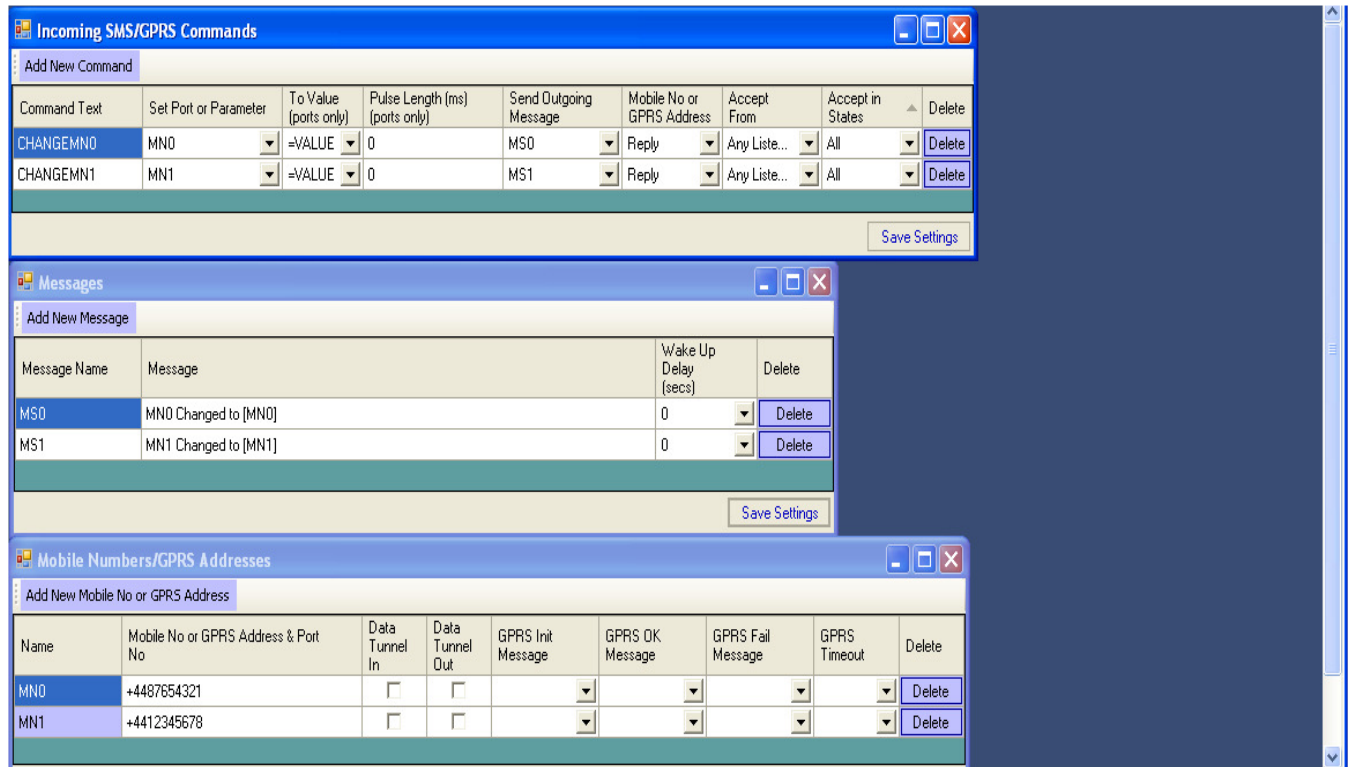
- 4) Click on Outgoing Messages then Outgoing SMS/GPRS Messages
- 5) Click on Enter New Message Here
- 6) Type "MN0 changed to"
- 7) Select MN0 from the dropdown menu and press Insert
- 8) Press OK
- 9) Repeat step 5 to 8 with MN0

#### Enter Incoming SMS Text Command

- 10) Click on Incoming Commands
- 11) Click on Add New Command
- 12) Type "CHANGEMNO" in Command Text
- 13) Select MN0 in the dropdown menu of Set Port or Parameter
- 14) Select "=VALUE" in To Value
- 15) Select message MS0 in Select Outgoing Message
- 16) Select "Reply" in Mobile Number or GPRS Address

## Test the Configuration in the Simulator

- 1) Click on Simulator then Open Simulator
- 2) Click on "Type your SMS Commands here and Click the Receive Button"
- 3) Type the Message "**CHANGEMNO=+4434567890**". This is the text message that should be sent to the X9101-GSM
- 4) Press the Receive button
- 5) The new number along with the conformation message should appear in the box at the bottom.



## 6.4 Example 5. Log all the Analogue and Digital Inputs and send them to a Website as a CSV File.

The following example will Log all the Analogue and Digital Inputs at 3 Hour intervals and send them to a Website once a day as a CSV File.

### Enter then Mobile Numbers and GPRS Parameters

- 1) Click on File then New Configuration then Blank Configuration
- 2) Click on Mobile Numbers/GPRS Address
- 3) Click on Add New Mobile No or GPRS Address again and enter the URL of the destination GPRS
- 4) Web Site in this case it will be the Warwick Wireless test web site:

[www.my-data.me/upload.jsp?c=.80](http://www.my-data.me/upload.jsp?c=.80)

- 5) MN0 is automatically assigned to this GPRS Address.
- 6) Click on GPRS Parameters and enter the APN, User Name and Password for the GPRS SIM Card.
- 7) Enter the DNS Address of the destination Web Server. In this case it will be Warwick Wireless Server 193.113.200.200
- 8) A unique alpha-numeric string can be entered into the Sender ID. This can be used in a message to show where it has come from.

- 8) Click on Add New Mobile No or GPRS Address.
- 9) Enter the mobile number to which you wish to send the messages to. MN1 is automatically assigned to this mobile number

### **Compose the New Message**

- 1) Click on Outgoing Messages then Outgoing SMS/GPRS Messages
- 2) Click on Add New Message.
- 3) Click on Enter New Message. The Edit Box will appear
- 4) Delete the text "Enter New Message"
- 5) Click on the drop down menu and find Sender ID. Click on it and then press the Insert button  
Sender ID will appear in the Edit Box
- 6) Click on the drop down menu and select Date Time and click on Insert
- 7) Type in a standard CSV File using the drop down menu to insert the parameters.

[SenderID],[DateTime],D0,[Din0],D1,[Din1],D2,[Din2],D3,[Din3],D4,[Din4],D5,[Din5],D6,[Din6],D7,[Din7],A0,[Ain0],A1,[Ain1],A2,[Ain2],A3,[Ain3],C0,[Cin0],C1,[Cin1],C2,[Cin2],C3,[Cin3]

The above parameters can be edited to save memory space in the Log.

- 8) Click on OK and the message will be entered in the Message Box and called MS0
- 9) Click on Add New Message
- 10) Click on the Enter New Message Box
- 11) Select the single parameter [log] from the dropdown menu. This used to send the contents of the log to both the web site and a mobile phone.
- 12) Click OK

### **Set up the Timer Trigger**

- 1) Click Outgoing Messages then on Digital Ports and Time Alarm Message Triggers.
- 2) Click on Add New Digital Port or Timer Alarm
- 3) Click on the drop down menu Port Name or Time Alarm and select Delay Time Alarm.
- 4) Leave Trigger Direction blank
- 5) Click on the drop down menu Send Message and select MS0.
- 6) Click on the drop down menu Mobile No./GPRS and select Log. This will send the message MS0 to the log when the Delay Time Alarm is activated.
- 7) Click on Add New Digital Port or Timer Alarm
- 8) Click on the drop down menu Port Name or Time Alarm and select Time Alarm.
- 9) Leave Trigger Direction blank
- 10) Click on the drop down menu Send Message and select MS3.
- 11) Click on drop down menu Mobile No./GPRS and select MN0. This will send the contents of the log to the website.
- 12) Repeat steps 8 to 11 but enter MN1. This will send the the contents of the log to the mobile phone.

### **Set up the Analogue Scaling**

- 1) Click on Port Configuration
- 2) Click on Analogue Port Configuration
- 3) Click on Analogue Input Ports
- 4) The resolution of the ADC is 10 bit so Port Min Value should be 0 and Port Max Value should be 1023.
- 5) Set the Report Values to the span need for the application. For example set Report Min Value to 0, set Report Max Value to 100. The vale included in the message will then be somewhere between 0 and 100.

### **Test the Configuration in the Simulator**

- 1) Click on Simulator then Open Simulator
- 2) Click on the Delay Timer Alarm Box. The Message will appear at the output box at the bottom
- 3) Click on Din0. The Message will appear at the output box at the bottom

## Down Load Configuration and set the Delay Timer

- 1) Connect the programming cable to the X9101-GSM.
- 2) Click on File then Download Configuration to X9101
- 3) Power up the X9101-GSM and click on download
- 4) When Download Complete is displayed close the Download Menu
- 5) The Delay Timer is set by clicking on File then Date/Time Settings
- 6) In Delay Timer Alarm Settings click on Time Units and select Minutes
- 7) Select 15 in the Threshold Count
- 8) Click on Set Time and Alarms. The message RTC Set will be displayed
- 9) Click on Read Date/Time/Alarm Settings. The current settings will be displayed.

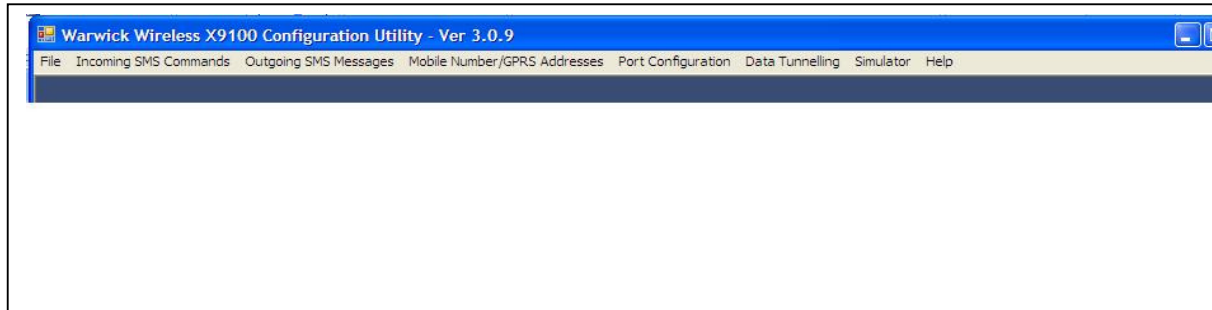
The screenshot displays three overlapping windows from a configuration utility:

- Digital Port and Time Alarm Triggers:** A table with columns: Trigger Name, Active, Port Name or Time Alarm, Trigger Direction (ports only), Send Message, Mobile No/GPRS, Active in States, and Delete. It lists three entries for DSIG1 and DSIG2.
- Messages:** A table with columns: Message Name, Message, Wake Up Delay (secs), and Delete. It lists four entries: MS0, MS1, MS2, and MS3.
- Mobile Numbers/GPRS Addresses:** A table with columns: Name, Mobile No or GPRS Address & Port No, Data Tunnel In, Data Tunnel Out, GPRS Init Message, GPRS OK Message, GPRS Fail Message, GPRS Timeout, and Delete. It lists two entries: MN0 and MN1.

At the bottom of the interface, a status bar shows the following settings: GSM/GPRS Serial Mode = Off, GSM Registration Indicator = Off, Sleep Mode = On, Data Tunelling Mode = Off, GSM Test Mode = Off.

## 7.0 THE CONFIGURATION UTILITY AND SIMULATOR

The top command bar will display:



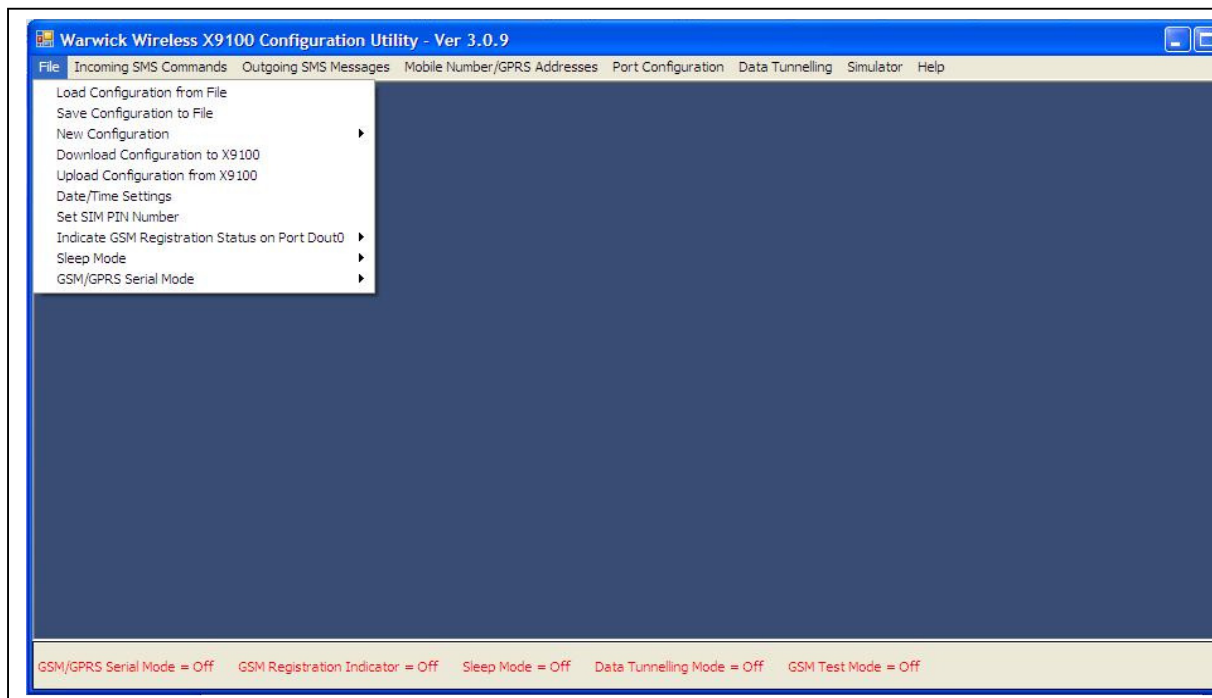
**File Incoming SMS Commands Outgoing SMS Messages**  
**Mobile Number/GPRS Address Port Configuration Sleep Mode Simulator Help**

### Down Load New Configuration to X9101

The current configuration is loaded into the X9101-GSM via the PC connecting cable.

### 7.0 File

Clicking on File will produce the following Menu



### 7.1 Load Configuration from File

A Configuration .xml file can be loaded from PC Folder into the Configuration Utility.

### 7.2 Save Configuration to File.

A Configuration .xml file can be saved to a PC Folder

### 7.3 New Configuration

#### Blank Configuration

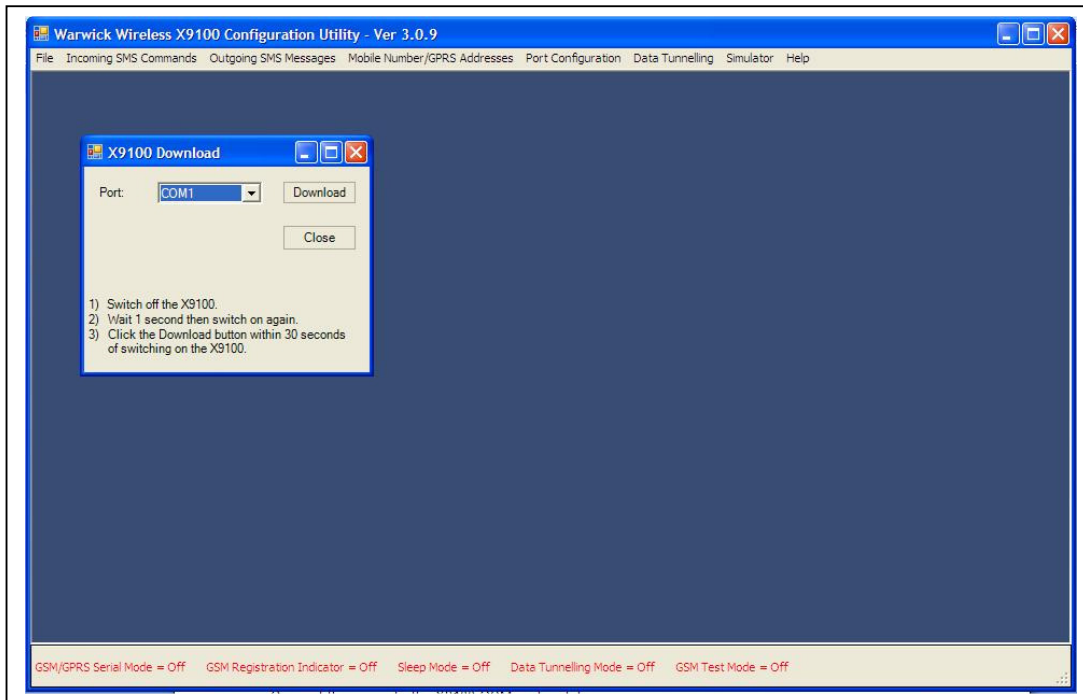
The Configuration Utility is reset so that a new configuration can be created

#### Standard Configuration

An example configuration for a typical application is loaded into the Configuration Utility

## 7.4 Download New Configuration to X9101

Use the PC cable or USB to Serial converter to connect the PC to the X9101-GSM.  
Fully test the Configuration in the Configuration Simulator before down loading.  
Connect the X9101 to the PC using the Serial Cable.  
Click on **Download Configuration to X9101-GSM**



Select the correct Serial Com Port.  
Switch on the power to the X9101-GSM  
The Red LED will light  
Wait until the Rx and TX LEDs stop flashing then click on down load.  
After a few seconds the X9101 will respond with Downloading. Then Download Complete  
If the above sequence does not start click on download again.

## 7.5 Upload New Configuration from X9101

A configuration can be up loaded from the X9101-GSM via the PC connecting cable.

## 7.6 Time and Date Settings.

The Time and Date can be read or set on the battery backed Real Time Clock.

A Time Alarm can be set which can be used to send an SMS/GPRS message at a specific time of day, day of the week or month of the year. Leave the fields black that are not required.

A Delay Time Alarm can be set in minutes or seconds. This is used to Log a reading or send a SMS/GPRS message after a preset time delay.

## 7.7 Set SIM PIN Number

Some networks require a SIM PIN number. If this is the case it can be entered and enable in the boxes provided.

## 7.8 Set SMS Limit

The total number of SMS Messages can be set. This is used to prevent a malfunction on the Host equipment from sending an unlimited number of SMS messages. A test command is used to reset the running total.

## 7.9 Indicate GSM Registration Status on Port D0

The Output Port D0 on pin 12 can be set to energise when the X9101-GSM has established a GSM Network Connection. This can be used in the Serial Data Mode as a RTS signal or to energise an external device .

## 7.10 Sleep Mode

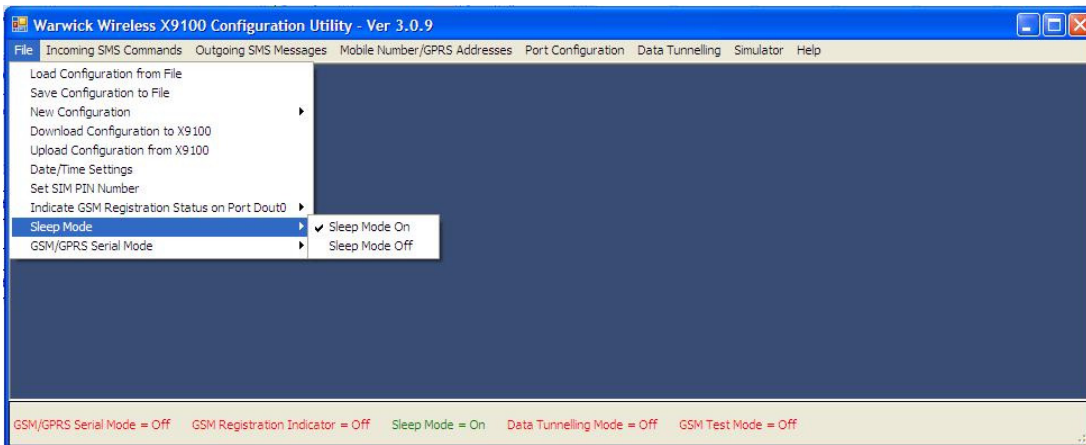
Selecting the sleep mode will set the X9101-GSM in a power saving mode. It will take 1.5mA at 12V.

The X9101-GSM will wake up, send an SMS/GPRS message or Log a reading and then go back to Sleep Mode if any of the following are activated:

- Digital Inputs D0,D1,D2 or D3 are changed.
- Delay Time Alarm is triggered.
- Time Alarm is triggered.

The sleep mode can be selected in the **File** menu.

1. Click on **File**
2. Click on **Sleep Mode**
3. Click on **Sleep Mode On**
4. **Sleep Mode On** will go green on the bottom of the Configuration Utility



To download a new Configuration when the X9101-GSM is in Sleep Mode remove the SIM Card and then cycle the power.

## 7.11 GSM/GPRS Serial Mode

Standard GSM AT Commands can be used to operate the X9101-GSM in Terminal Data Mode

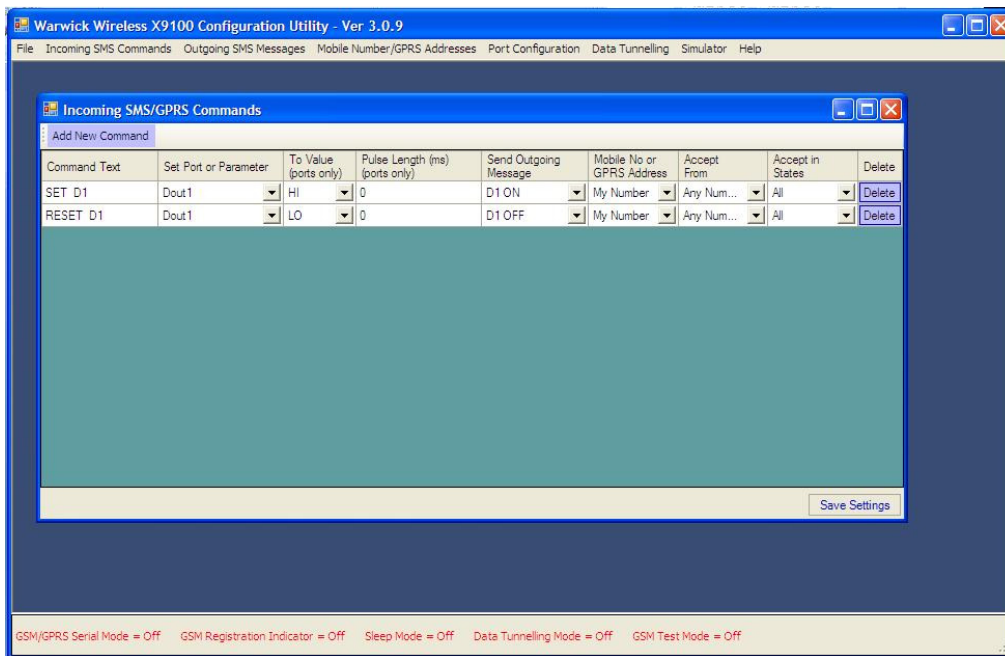
A full set of AT commands is available in DS188 which can be downloaded from:

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

An alternative to this would be to use the transparent Data Tunneling Mode which would not need the AT Instructions.



## 8.0 INCOMING SMS/GPRS 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 on 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 or GPRS Address**.

In the above example the message SET D1 is texted to the number on the SIM Card inserted into the X9101-GSM. Dout1 is then set High and a message D1 ON is set back to My Number.

My number is a mobile number entered in Mobile Number/GPRS Addresses

### 8.1 Remote Configuration

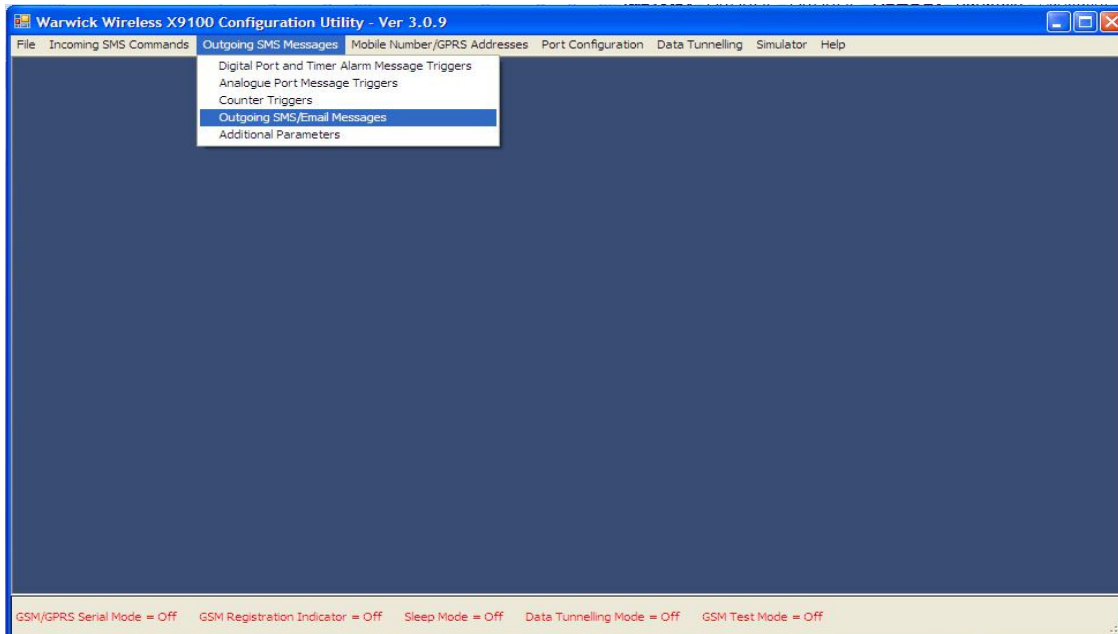
The following parameters can be changed remotely by SMS messages:

- All Mobile Numbers
- GPRS APN Address
- GPRS User Name
- GPRS Password
- GPRS DNS Address
- Sender ID
- GSM Op Code
- Data Flag
- Reset Counter 0
- Reset Counter 1
- Reset Counter 2
- Reset Counter 3
- Reset Data Log
- Reset SMS Counter
- State

## 9.0 SENDING AN OUTGOING SMS/GPRS MESSAGE

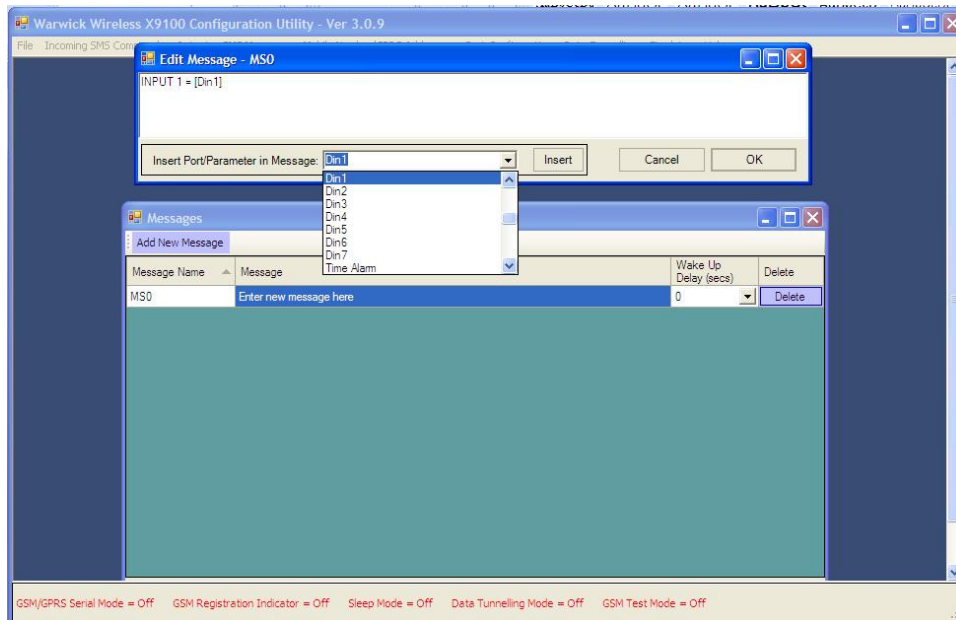
To send an SMS or GPRS message follow the three basic steps

1. Enter a mobile number or GPRS Address in Mobile Numbers/GPRS Addresses.
2. Compose the message in Outgoing SMS/GPRS Messages.
3. Set up a Digital Input, Timer, Counter or Analogue trigger to send the message to the mobile Numbers/GPRS Addresses when an event happens.



### 9.1 Composing a New Text Message

1. Click on Outgoing Messages then Outgoing SMS/GPRS Messages.
2. Enter a Message Name. The default name is MS0. This will be used by the Configuration Utility to identify the message. It will not form any part of the message.
3. Click on the box "Enter new message here"
4. The Edit Message Box will appear.
5. Write the new message in the Edit Message Box. The state of a parameter or multiple parameters can be included in the message as follows:
6. Click on the drop down menu pointer
7. Select the parameter from the drop down menu
8. Click Insert
9. The parameter will appear in the message with brackets around it.
10. When the message is completed click on OK.

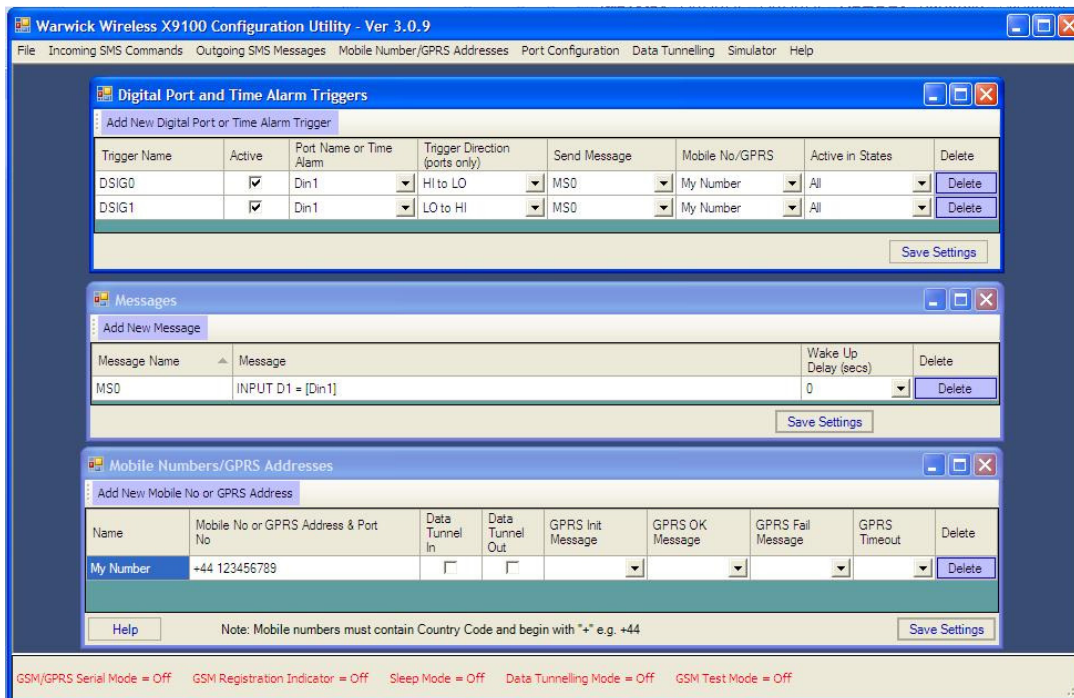


## 9.2 Configure a Trigger to Send a SMS/GPRS Message

A new SMS message is composed in the Outgoing SMS/GPRS Messages section. Once composed, it can be sent by activating any or all of the Digital, Analogue, Pulse Counter or Time trigger thresholds to any number of mobile phones or GPRS Addresses.

Three menus are used to send a Text Message. These are:

### Digital Port and Time Alarm Triggers Analogue Port Message Triggers Counter Triggers



In the above example, the state of Digital Input 1 (Din1) is sent in message MS0 ( INPUT D1= ) to the mobile number My Number when Din1 goes from high to low and when it goes from low to high.

## 10.0 MOBILE NUMBERS/GPRS ADDRESSES

### 10.0 Enter the Destination Mobile Number

1. Click on **Mobile Numbers/GPRS Address**
2. Click on **Add New Mobile No or GPRS Address**
3. The name of the new number will be MN0. This will be used by the Configuration to identify the number. It can be changed by typing say "My Number".
4. Enter the destination mobile number of the text message.

### 10.1 Enter a New SMS/GPRS Message

5. Click on **Outgoing SMS Messages**
6. Click on **Add New Message**
7. Click on Enter new message here. The **Edit Message Box** will appear.
8. Write the new message in the box. This will be: INPUT D1 =
9. At this point click on the Down Arrow by the **Insert Port/Parameter in Message**.
10. Select Din1 and press **Insert**. Din1 will appear in brackets at the end of the message.  
INPUT D1 = [Din1]
  
11. Every time this message is sent it will attach the status of Din 1. In this example it will be  
HI or LO. This text can be changed in **Port Configuration / Digital Port Configuration / Digital Input Ports**

INPUT D1 = HI  
INPUT D1 = LO

when Din1 is taken high  
when Din1 is taken low

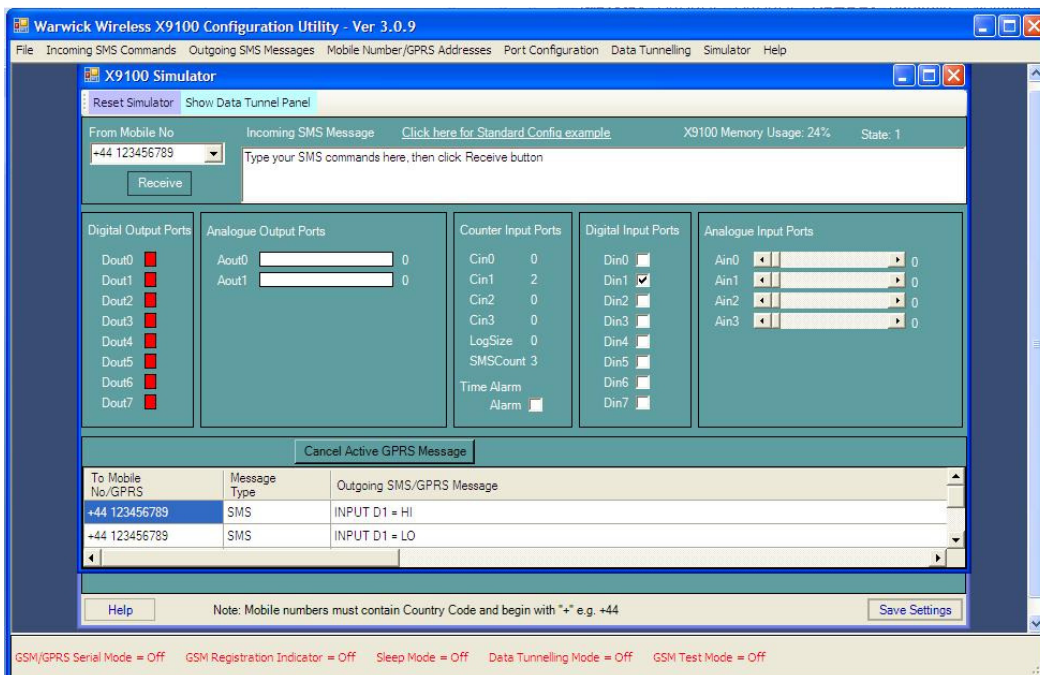
## 11.0 PORTS AND THE REAL TIME CLOCK

The following example uses a Digital Input Port to send a SMS message:

1. Click on **Digital Port and Time Alarm Triggers**
2. Click on **Add New Digital Port or Time Alarm Trigger**
3. Click on the down arrow in Port Name or Time Alarm and select Din1
4. Click on the down arrow in the Trigger Direction and select HI to LO
5. **Send Message** selects the message to be sent when digital input goes from high to low. Click on the down arrow and select the message.
6. Mobile No/GPRS selects the destination telephone number
7. The Active in State should be set to all
8. Save Settings

### 11.0 Test the Configuration in the Simulator

Click on **Simulator** then **Open Simulator**



1. Click on and the Din1 box and then Click on it again.
2. The message will appear in the Outgoing SMS/GPRS Message

## 11.1 Digital Port Status Message

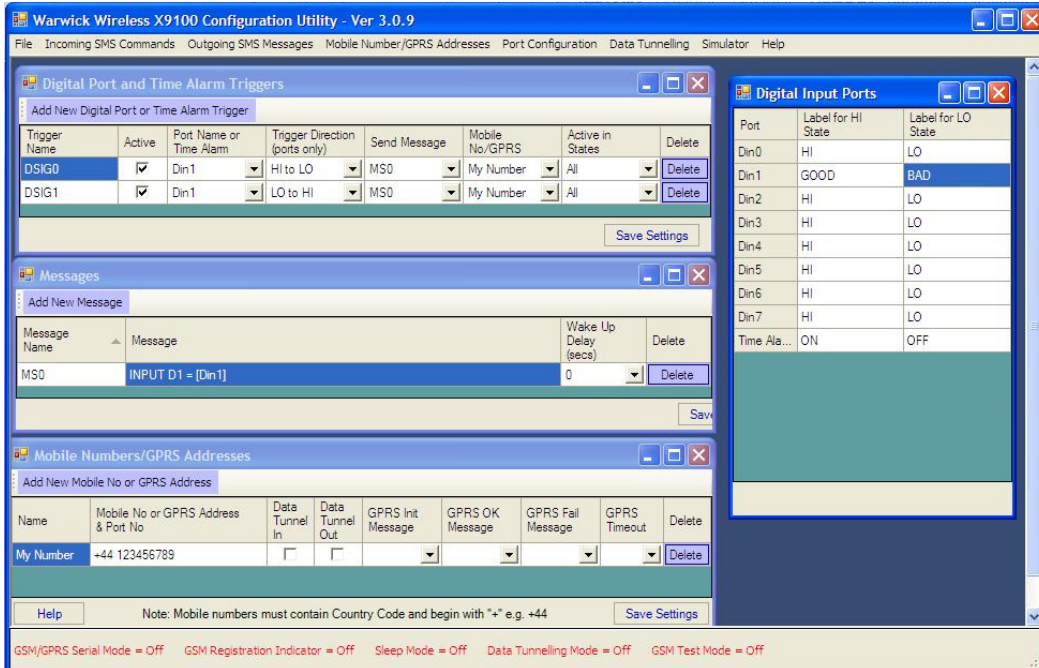
The Port Status Message is the text that will be inserted into the message depending on the condition of the port. In the case of a Digital Input, this part of the message will depend on whether the port is set high or low.

To change the Port Status Message:

1. Click on Port Configuration
2. Click on Digital Port Configuration
3. Click on Digital Port Inputs
4. Change "HI" in Din1, Label for HI State to "GOOD"
5. Change "LO" in Din1, Label for LO State to "BAD"

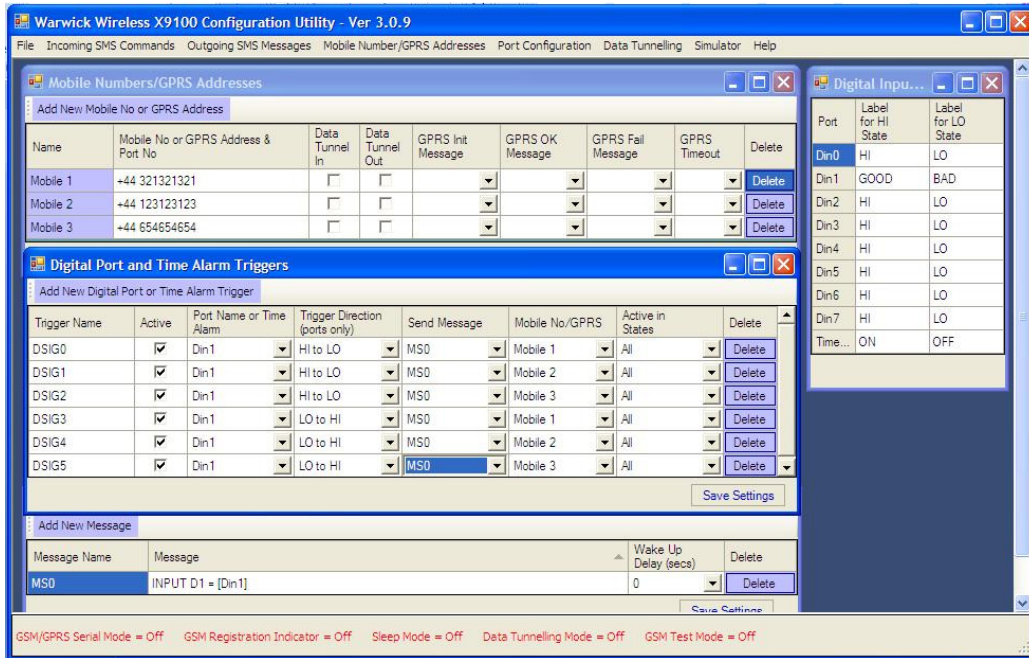
The text message sent when digital input Din is changed will be

INPUT D1 = GOOD                      when Din1 is taken high  
INPUT D1 = BAD                        when Din1 is taken low



## 11.2 Multiple Mobile Phones

The same or different messages can be sent to different mobile phones.



The above example shows how one message can be sent to 3 mobile phones:  
The messages:

INPUT D1 = GOOD when Port 1 goes high  
INPUT D1 = BAD when Port 1 goes low

are sent to the 3 mobile phones:

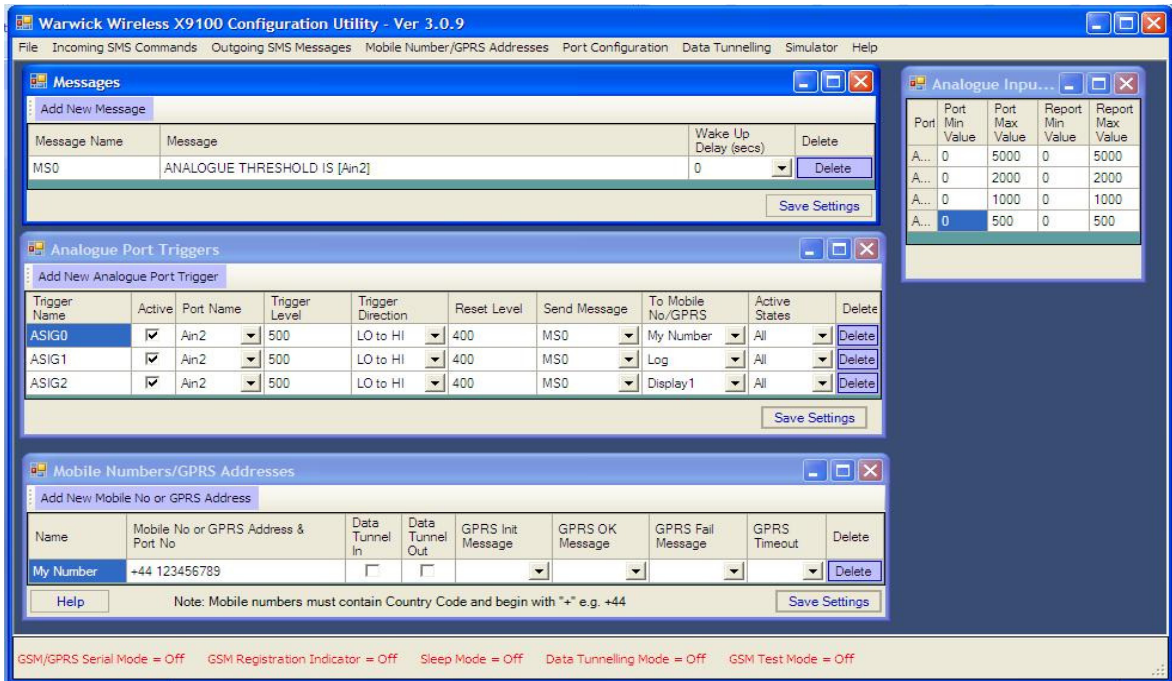
Mobile 1 +44 321321321  
Mobile 2 +44 123123123  
Mobile 3 +44 654654654

These are entered into **Mobile Numbers / GPRS Address**.



### 11.3 Analogue Inputs and Port Status Messages

Messages associated with Analogue Inputs are configured in the same way as Digital Inputs in the **Outgoing SMS Messages**.



In above example the message “ANALOGUE THRESHOLD IS (Value of Analogue Input 2)” will be sent when the threshold set in Trigger Level is reached. to all of the following:

- The mobile number set in “My Number”,
- The Data Logger
- The LCD Display

The analogue value will have to fall to the Reset Level and then rise again before the message is sent again.



## 11.4 Analogue Input Scaling (0-5V, 0-20mA and 4-20mA)

The maximum value of each analogue input can be set in:

### **Port Configuration / Analogue Port Configuration / Analogue Inputs**

The Port Min Value and Port Max Value are the resolution of the ADC. The Scaling factor are entered in the Reported Min Value and Reported Max Value.

#### **Analogue Input of 0-5V**

If the Analogue input is to measure 0 to 1000 from an input signal of 0 to 5V then the Port Min Value and Port Max Value are set to the resolution of the ADC which is 1024 and the Reported Min Value is set to 0 and the Reported Max Value is set to 1000.

#### **Analogue Input of 4-20mA**

An analogue voltage input can be converted to a mA input by connecting a 250 ohm resistor between the input and ground.

If the Analogue input is to measure 0 to 1000mVolts from a input signal of 4-20mA then the Port Min Value is set at 204 and the Port Max Value is set at 1024

Reported Min Value and the Reported Max Value is set to the span of the transducer.(eg. 0 to 1000)

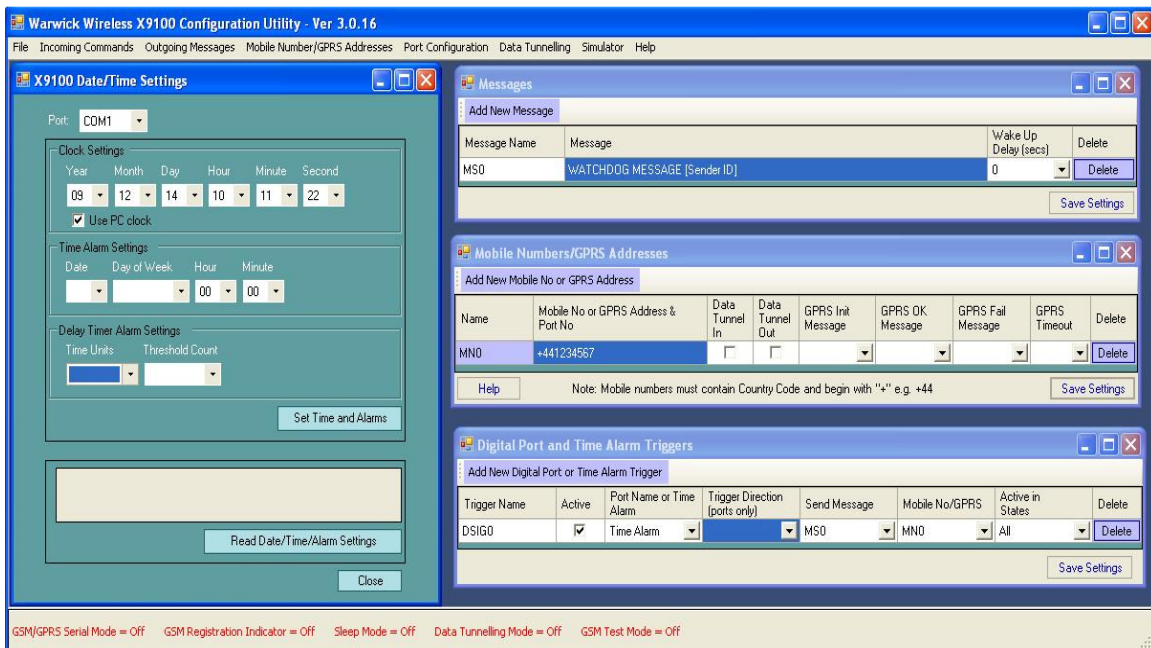
## 11.5 Real Time Clock, Date/Time and Delay Timer

There are two time function on the X9101-GSM. They are:

1. Date/Time which triggers an event at a set time and date.
2. Delay Timer which triggers an event at preset intervals on seconds or minutes.

### Date/Time

The X9101-GSM can be configured to send a message every week, every hour or every minute.



The above example will send the message “WATCH DOG” followed by The Sender ID number set in the **Mobile Numbers / GPRS Address GPRS Parameters** At Sunday at Midnight to the mobile number +44 123123123.

**Note: The X9101-GSM must be switched on and connected to the PC running the Configuration**

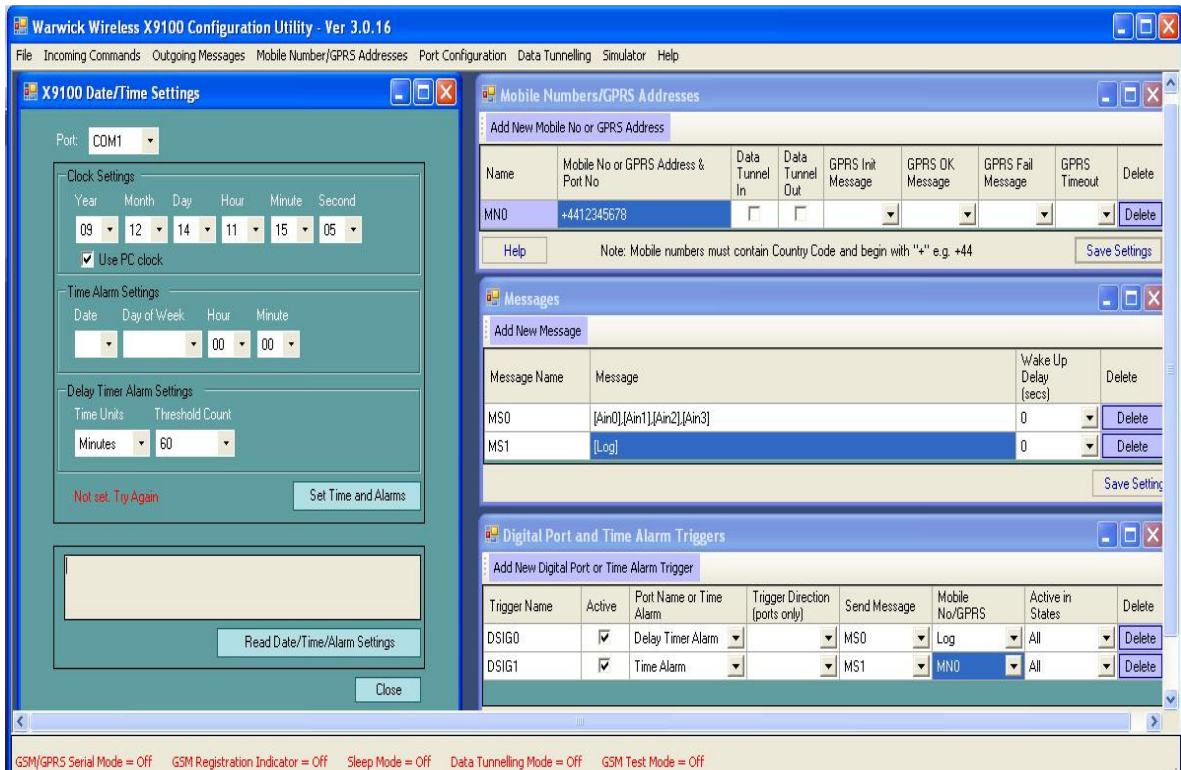
**Utility by the programming cable**

1. Click on **File**
2. Click on **Date/Time Settings**
3. Click on **Read X9101 Date/Time/Alarm Settings**. The current reading will appear in the box.
4. Set the Alarm time and date
5. Enter the destination mobile number in **Mobile Numbers/GPRS Address**.
6. Enter the message WATCH DOG [Sender ID] in **Messages**
7. Enter the Trigger message in **Digital Port and Timer Alarm Triggers** using the drop down menus.

## Delay Timer

The Delay Timer is used to trigger an event at set time periods of minutes and seconds.

The example below will use the event timer to log the four analogue inputs every 60 minutes and then use the Date/Time setting to send the contents on the log at midnight



## Setting up the Real Time Clock

1. Connect the X9101-GSM to the PC using the Programming Cable.
2. Click on File the Date/Time
3. Set the Time Alarm Settings to: Hour = 00 and Minutes = 00. This will trigger an alarm at midnight. Leave all other fields blank.
4. Set the Delay Timer to Minutes and the Threshold Count to 60.
5. Press the Set Time and Alarms button
6. The X9101-GSM will respond with Date Time Alarms Set
7. Press Read Date Time Alarm Settings.
8. The X9101-GSM will then read back the settings.

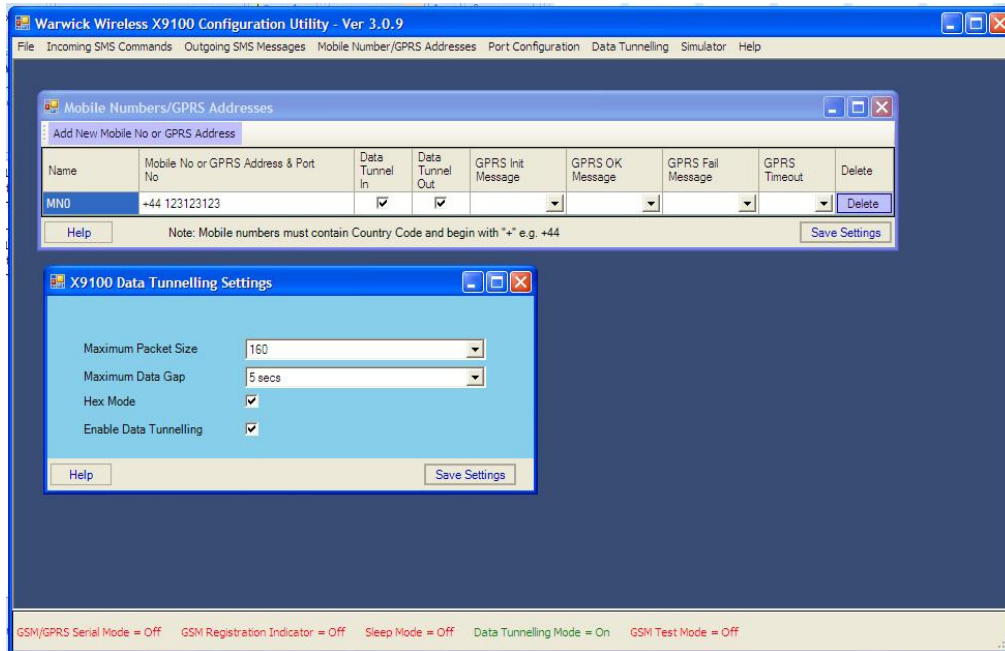
## 12.0 SERIAL DATA TEXT TUNERLLING

Serial Data can be sent and receive transparently form a Serial Port on one X9101-GSM to a Serial Port on another X9101-GSM. This is achieved by using the Serial Tunnelling function. The data is formed into an SMS message and should not exceed 160 bytes.

In the example shown below, serial data will be sent from X9101-GSM 1 with mobile number +44 123123123 to another X9101-GSM 2 with mobile number +44 654654654 and visa versa.

### 12.0 X9101-GSM 1 Configuration (Mobile Number +44 654654654)

1. Click on **Data Tunnelling**
2. Click on **Hex Mode**
3. Click on **Enable Data Tunnelling**



Click on **Mobile Numbers/GPRS Address**

Enter the destination mobile number of the SIM Card inserted in X9101-GSM 2 (+44 123123123)

Click on **Data Tunnel In**

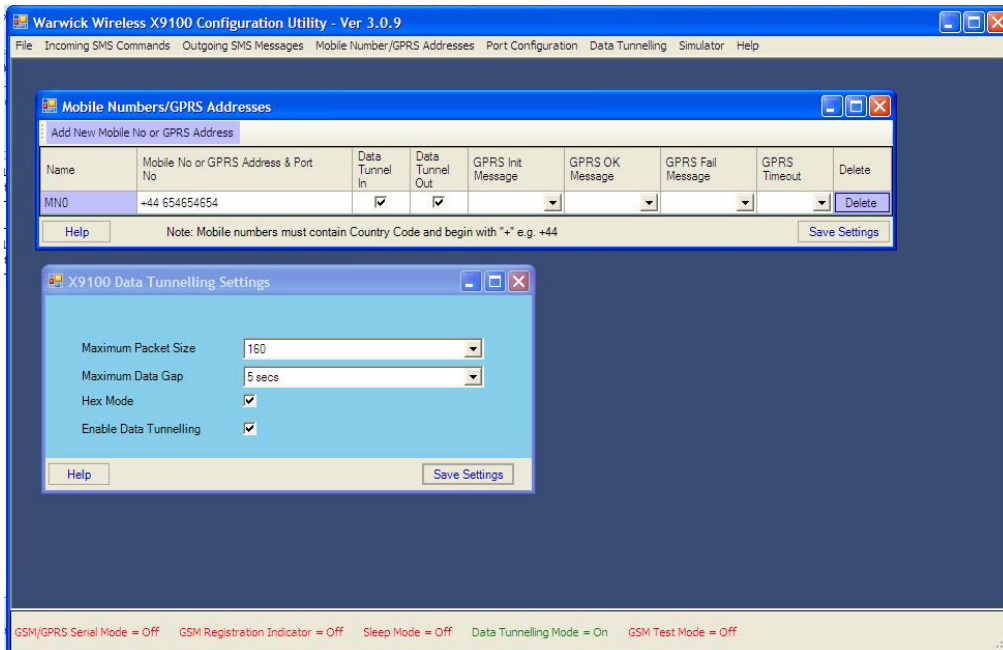
Click on **Data Tunnel Out**

The **Data Tunnelling Mode = On** will turn green at the bottom of the Configuration Utility

Click on **Save Settings**

## 12.1 X9101-GSM Configuration Mobile Number (+44 123123123)

1. Click on **Data Tunnelling**
2. Click on **Hex Mode**
3. Click on **Enable Data Tunnelling**



4. Click on **Mobile Numbers/GPRS Address**
5. Enter the destination mobile number of the SIM Card inserted in X9101-GSM 1 (+44 654654654)
6. Click on **Data Tunnel In**
7. Click on **Data Tunnel Out**
8. The **Data Tunnelling Mode = On** will turn green at the bottom of the Configuration Utility
9. Click on **Save Settings**

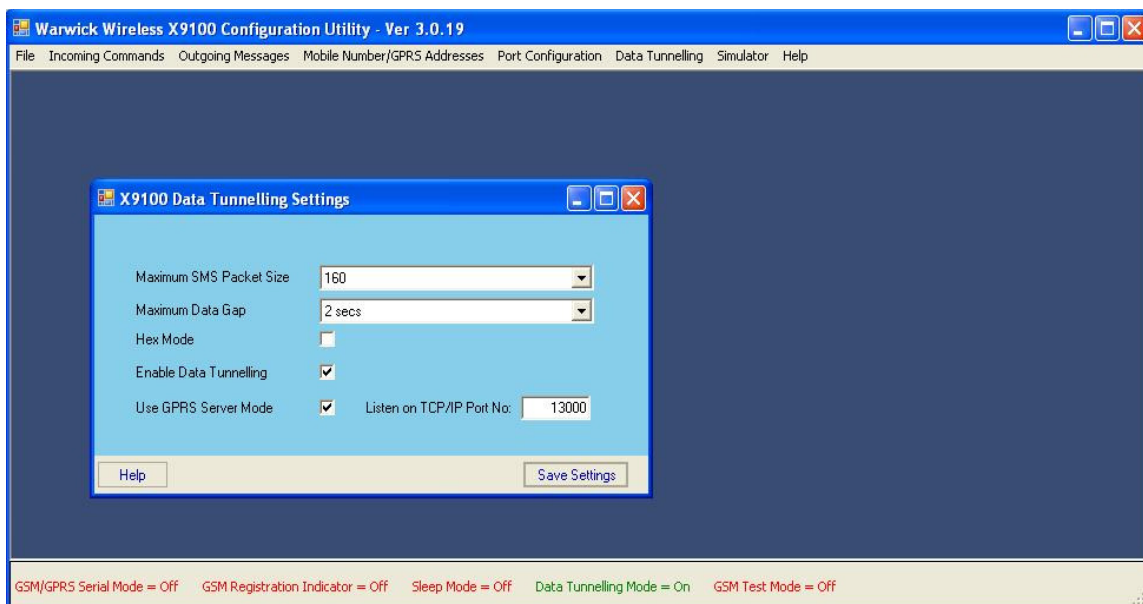
## 13.0 GPRS SERIAL DATA SERVER MODE WITH FIXED IP SIM CARD

With a standard GPRS SIM Card it is not possible to pole a distant X9101-GSM from a web site or set up transparent serial data communication between two X9101-GSM units. This can be overcome by using fixed IP SIM Cards and setting the X9101-GSM in Server Mode. The X9101-GSM is then permanently connected to the GSM network. To prevent any interactive lock up occurring the Real Time Clock is used to provide an automatic Watch Dog pulse every 24Hrs.

### 13.0 Server Mode

The X9101-GSM can be configured in Server Mode as follows:

Click on Data Tunnelling  
Click the Enable Data Tunnelling Box.  
Click the GPRS Server Mode Box  
Enter the TCP/IP Port Number



### 13.1 SIM Card Parameters

This application requires a SIM Card with a fixed IP. The parameters for the fixed IP SIM Card are entered as follows:

Click on Mobile Numbers/GPRS Address  
Click on X9101 GPRS Parameters  
Enter the following:

- The APN of the SIM Card Provider
- The User Name of the Fixed IP SIM Card
- The Password of the Fixed IP SIM Card
- The DNS Address of the Fixed IP SIM Card



Download the configurations to the X9101-GSM

The GPRS Link can be tested using HyperTerminal running on a PC connected to the Internet.

Click on: Start / All Programs / Accessories / Communications / HyperTerminal

Click on: File / Properties

Select TCP/IP (Winsock)

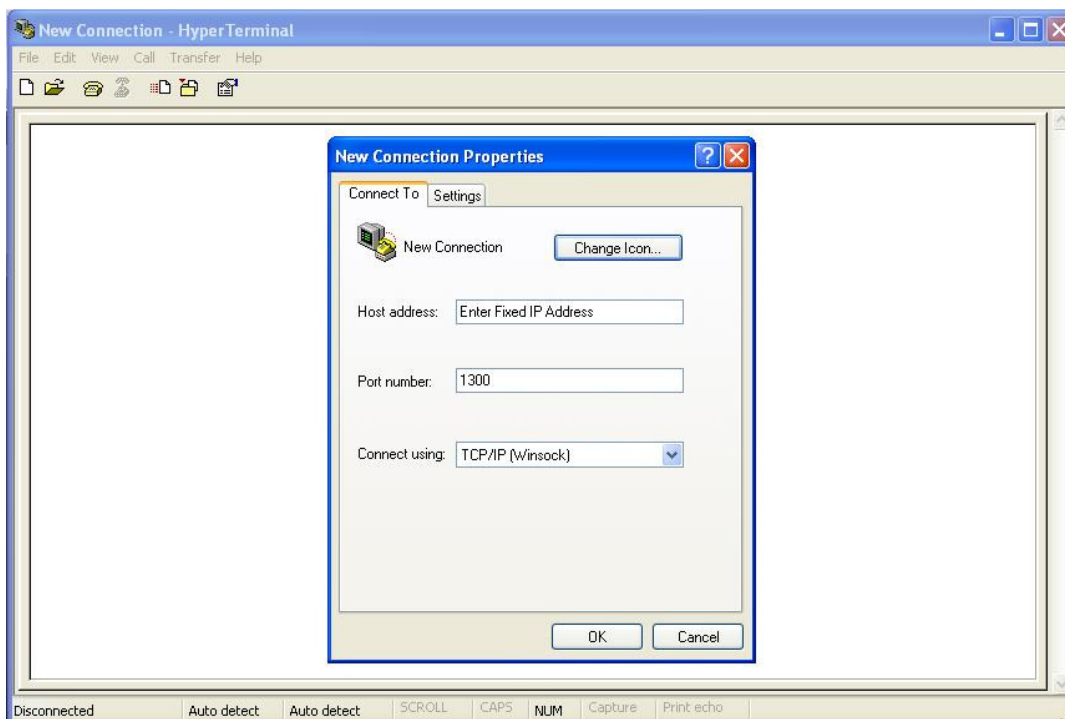
Enter the IP Address of the SIM Card.

Enter the Port Number that was entered into the X9101. In this case 1300

Click on the telephone icon to connect.

Type some random text.

This will appear on Pin 3 of the X9101-GSM Serial Port.

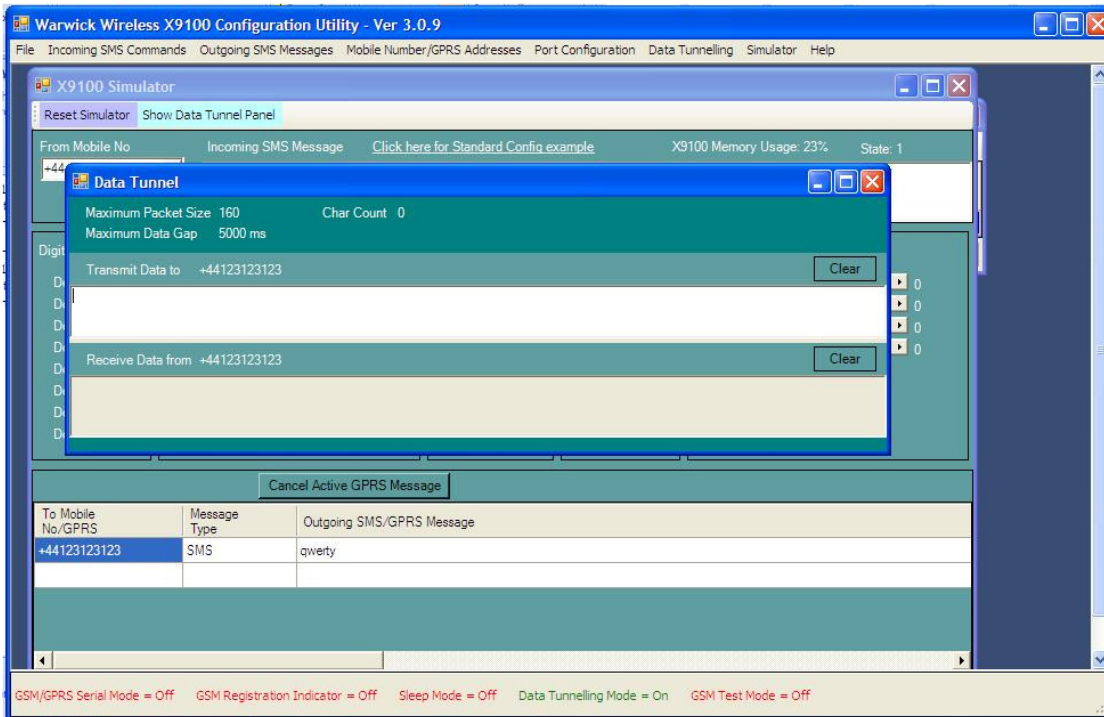


## 13.2 Simulator

The configuration can be tested in the Simulator.

1. Click on **Simulator**
2. Click on **Show Data Tunnel Panel**
3. Type a message “qwerty”

This will appear in the **Outgoing SMS/GPRS Messages** along with the destination mobile number.



## 14.0 YOUR OWN WEBSITE

Warwick Wireless provides a GPRS Web portal at [www.my-data.me](http://www.my-data.me) . It is customized with your Company Name a Company Logo. Data and messages are logged and displayed along with historical trending of measured parameters.

## 15.0 ANTENNA

- X612-GSM External GSM Antenna 100mm of feeder cable
- X613-GSM Mast Mounted Dipole Antenna with 3m of feeder cable.
- X614-GSM Magnetically Mounted Dipole Antenna.
- X615=GSM High Gain Yagi directional Antenna.

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