Robustel

Application Note

Digital Output testing of R3000

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Chapter 1. Introduction

1.1 Overview

R3000 provides two digital inputs (DI) and two digital outputs (DO), which meet the application requirement of supervisory control and monitoring system. R3000 support DO for the triggering Alarm, which includes trigger via Web GUI directly, trigger via DI, trigger via SMS and trigger via Phone call.

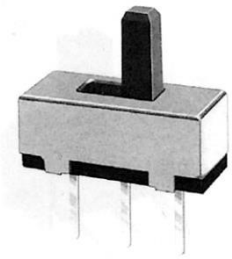
1.2 Parts Used

Hardware requirement:

- Robustel Go Rugged R3000 router.
- SIM card, which support SMS and voice call function.
- One mobile phone which support SMS and voice call function.
- Two 10K resistors, two LEDs, two slide switches, serial electric line.

10K resistor

LED



slide switch

copper wire

1.3 Assumptions

All testing has been fully tested and this Application Note is written by technically competent engineer who is familiar with Robustel products and the application requirement.

This Application Note is basing on:

- Product Model: Robustel GoRugged R3000 industrial router.
- Firmware Version: R3000_S_V1.01.01.fs.
- Configuration: This Application Note assumes that R3000 is working under its factory default settings. We mainly focus on the settings that need to configure in this Application Note.

1.4 Rectifications

Appreciate for the corrections and Rectifications to this Application Note, and if there are requests for new Application Notes please also send to email address: support@robustel.com .

1.5 File Version

Updates between document versions are cumulative. Therefore, the latest document version contains all updates made to previous versions.

Release Date	Firmware Version	Details
2014-06-20	V1.01.01	First Release

Chapter 2. Application Topology

Follow the connection diagram below, refer to **section 1.2**, connect two 10K resistors, two LEDs, two slide switches and serial electric line to the connector terminal.

We can connect "12VDC"to power input (which standard power input is 12VDC), and then use a serial electric line connect "**GND**" to "**V-**" (GND of 12VDC power).

Regarding of DO feature, in the practical use, maybe you will use other external power supply (not the power supply of R3000), remember to connect the power GND of the external power supply to pin "GND.

***Note**: please check the connector interface of R3000, you can find out "**V-**" easily at one of the pin of power input connector.*

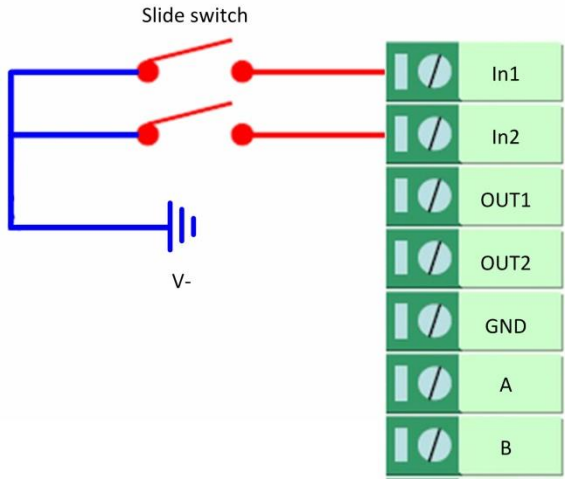


Figure 2.2 DI Connection

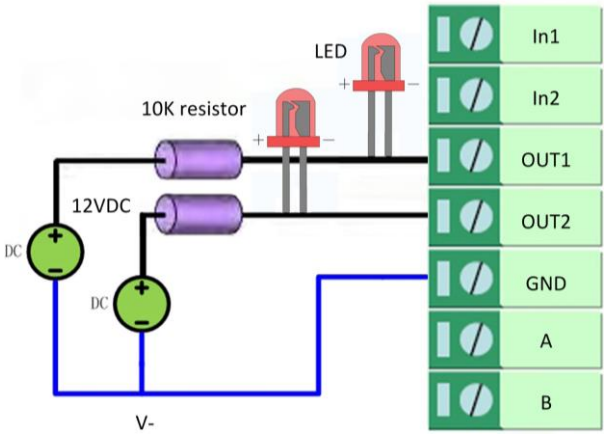


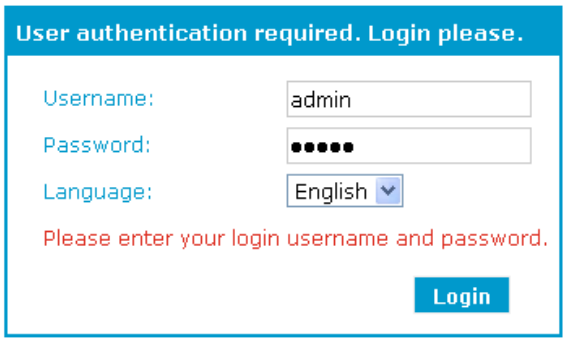
Figure 2.1 DO Connection

1. Connection diagram of DI
   - Connect slide switch to pin In1\In2 and V-. For testing, all we need to do is to change the electric level of pin In1 and In2 (DI).
2. Connection diagram of DO
   - 12VDC power supply --> 10K resistor --> LED --> pin Out1\ Out2.
   - Pin GND connect to V-.

Chapter 3. Configuration

3.1Configure Link Management

1. Install antenna, insert two SIM cards to R3000 -> power on R3000 and login R3000's Web GUI page.



Note: Factory Settings when login Web GUI

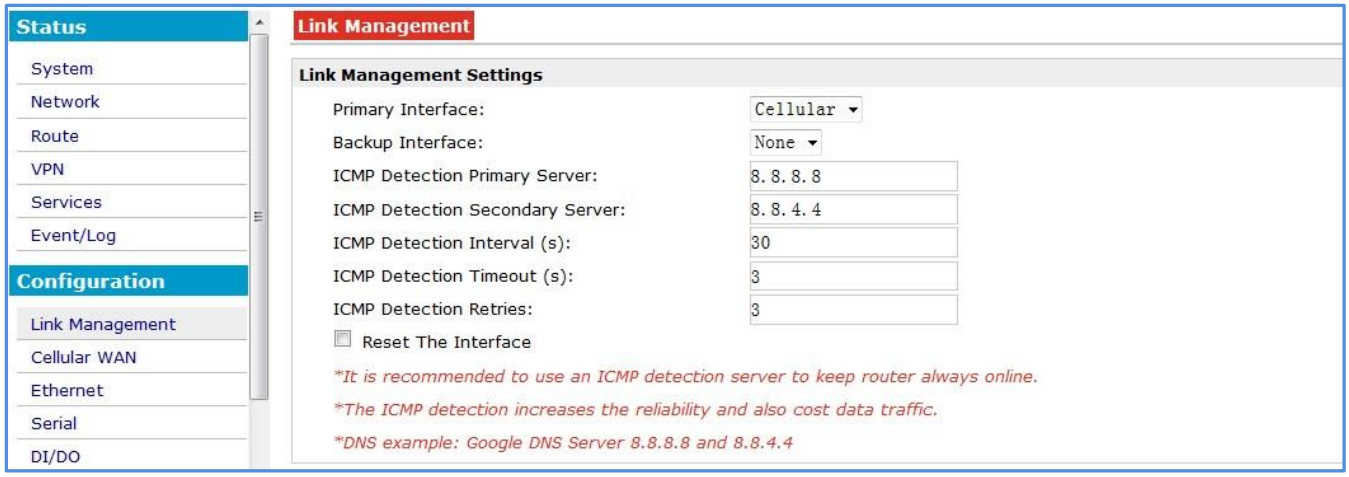
Item	Description
Username	admin
Password	admin
Eth0	192.168.0.1/255.255.255.0, LAN mode
Eth1	192.168.0.1/255.255.255.0, LAN mode
DHCP Server	Enabled.

2. Browse to "Configuration"-> "Link Management".

- Click the drop-down box of "Primary Interface" and select "Cellular".
- Click the drop-down box of "Backup Interface" and select "None".
- Set "ICMP Detection Primary Server".
- Set "ICMP Detection Secondary Server".
- Set "ICMP Detection Interval".
- Set "ICMP Detection Timeout".
- Set "ICMP Detection Retries".
- Click "Apply".

Item	Description	Setting
Primary Interface	Select "Eth0" as the primary connection interface.	Cellular
Backup Interface	Select "Cellular" as the backup connection interface.	None
ICMP Detection Primary Server	Router will ping this primary address/domain name to check that if the current connectivity is active.	8.8.8.8
ICMP Detection Secondary Server	Router will ping this secondary address/domain name to check that if the current connectivity is active.	8.8.4.4
ICMP Detection Interval	Set the ping interval.	30
ICMP Detection	Set the ping timeout.	3

Timeout		



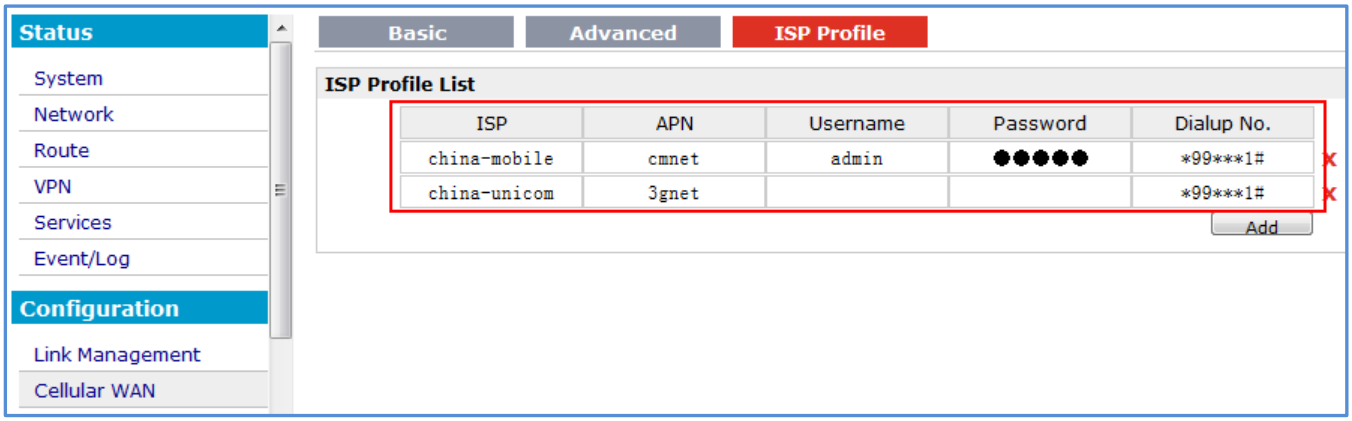
3.2Configure Cellular WAN

1. Browse to “Configuration”-> “Cellular WAN”-> “ISP Profile”.

- Click “Add” to enter the APN (Access Point Name) and Dialup No. for each ISP.
- If required please enter Username and Password in the appropriate fields.
- Click “Apply”.

Note: Usually APN, Username, Password and Dialup No. are provided by ISP accordingly.

Item	Description	Setting
ISP	Enter relevant ISP network name	Enter accordingly
APN	Enter correct APN for the network	Enter accordingly
Username	Enter correct Username for the network	Enter accordingly
Password	Enter correct Password for the network	Enter accordingly
Dialup No.	Enter correct Dialup No. for the network	Enter accordingly

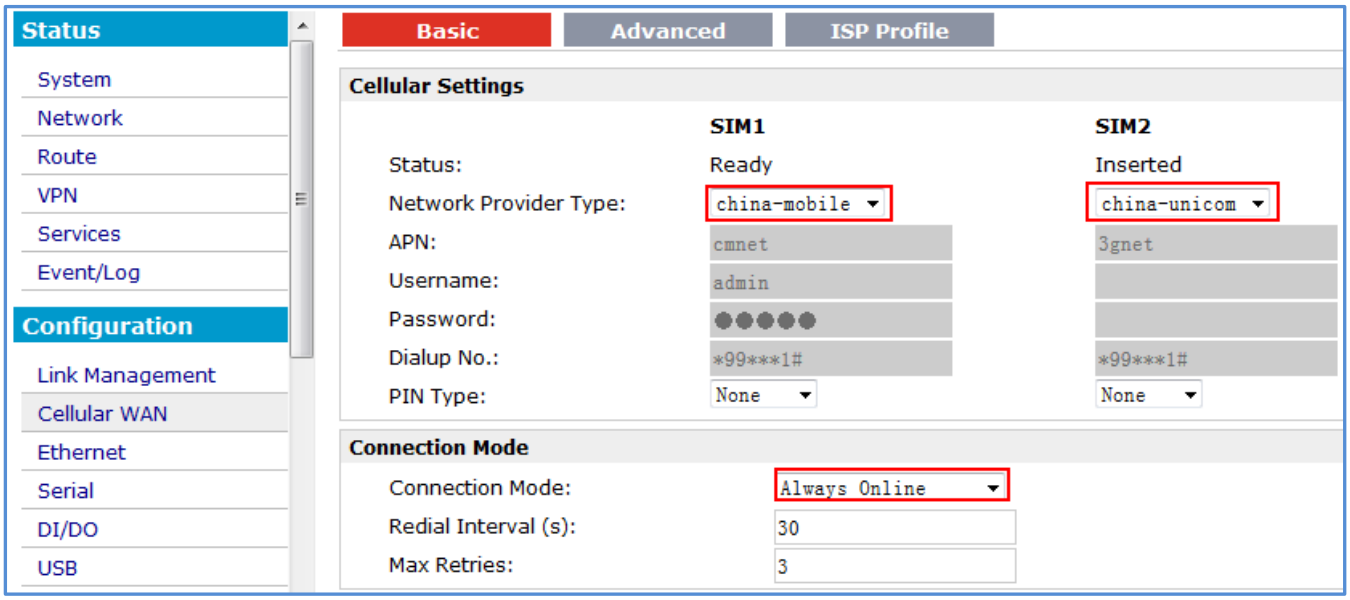


2. Browse to “Configuration”-> “Cellular WAN”-> “Basic”.

- In region “**Cellular Settings**”. Click the drop-down box of “Network Provider Type” of both SIM cards and select the correct “ISP” that you configure in “Configuration”-> “Cellular WAN”-> “ISP Profile”.
- If required please enter PIN number for SIM1 and SIM 2 in “PIN Type”.

- In region "**Connection Mode**". Click the drop-down box of "Connection Mode" to select the connection mode accordingly. "Always Online" mode is selected in this Application Note.
- Click "Apply".

Item	Description	Setting
Network Provider Type	Select from "Auto", "Custom" or the ISP name you preset in *"Configuration"->"Cellular WAN"->"ISP Profile"*.	Enter accordingly
Connection Mode	Select the connection mode when R3000 dial up to get access to Internet.	Always Online

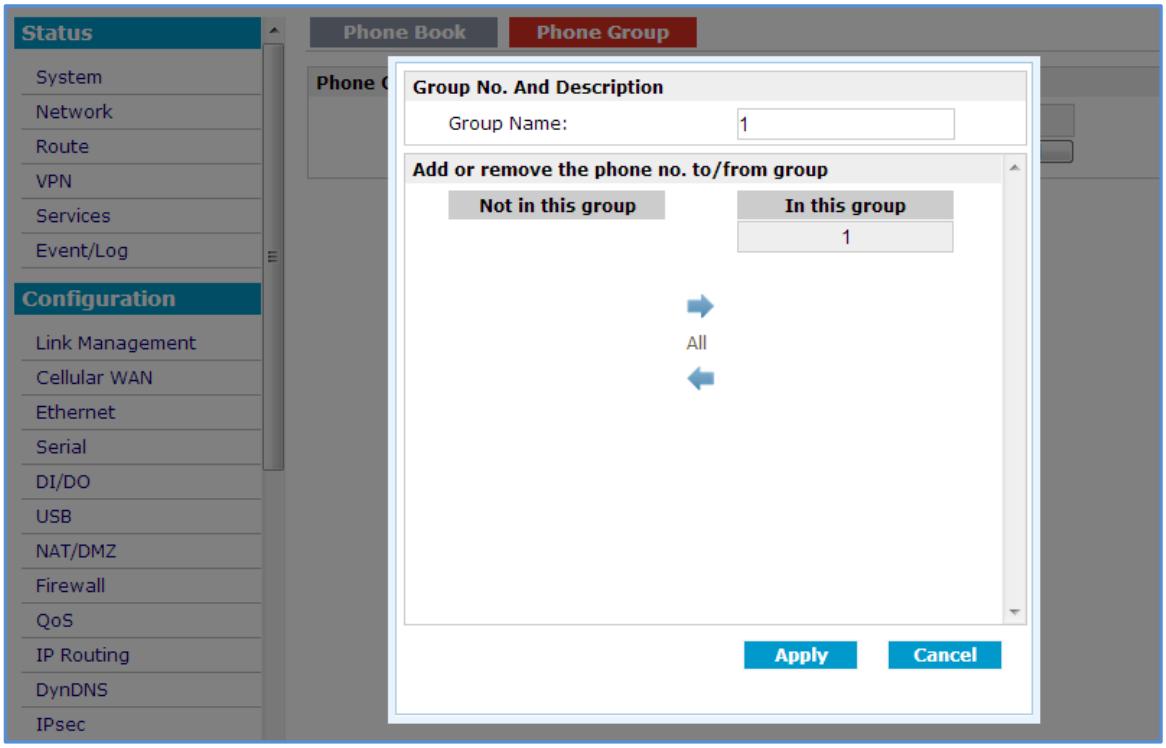


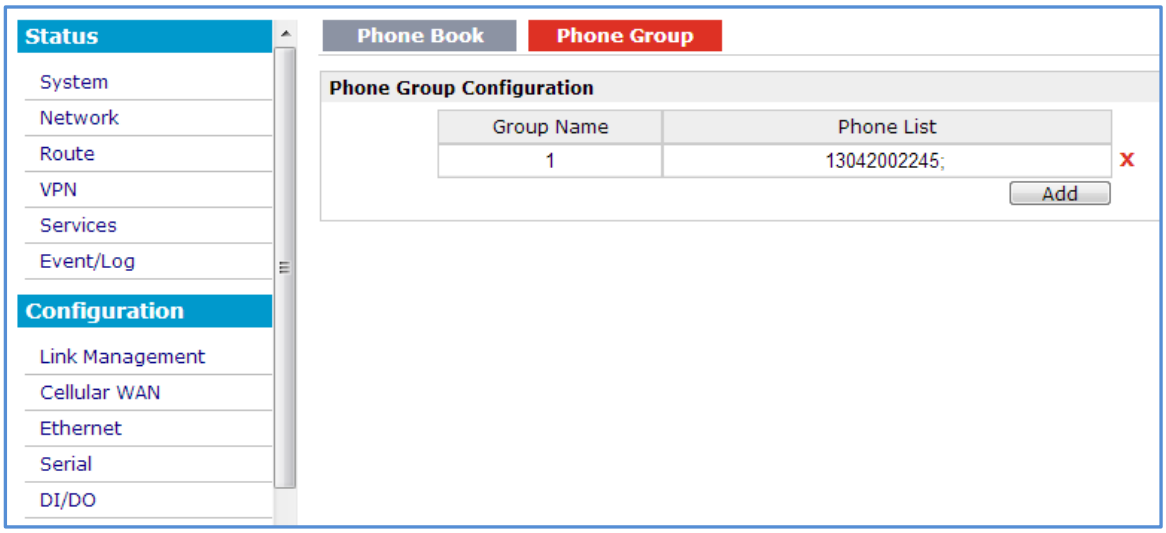
3.3 Configure Phone Book

1. Browse to "Configuration"->"Phone Book"

- Browse to "Phone book Configuration", click the add button to add a phone number.

- Browse to" Phone Group", Add the Phone number to the Phone Group.
- Click "Apply".

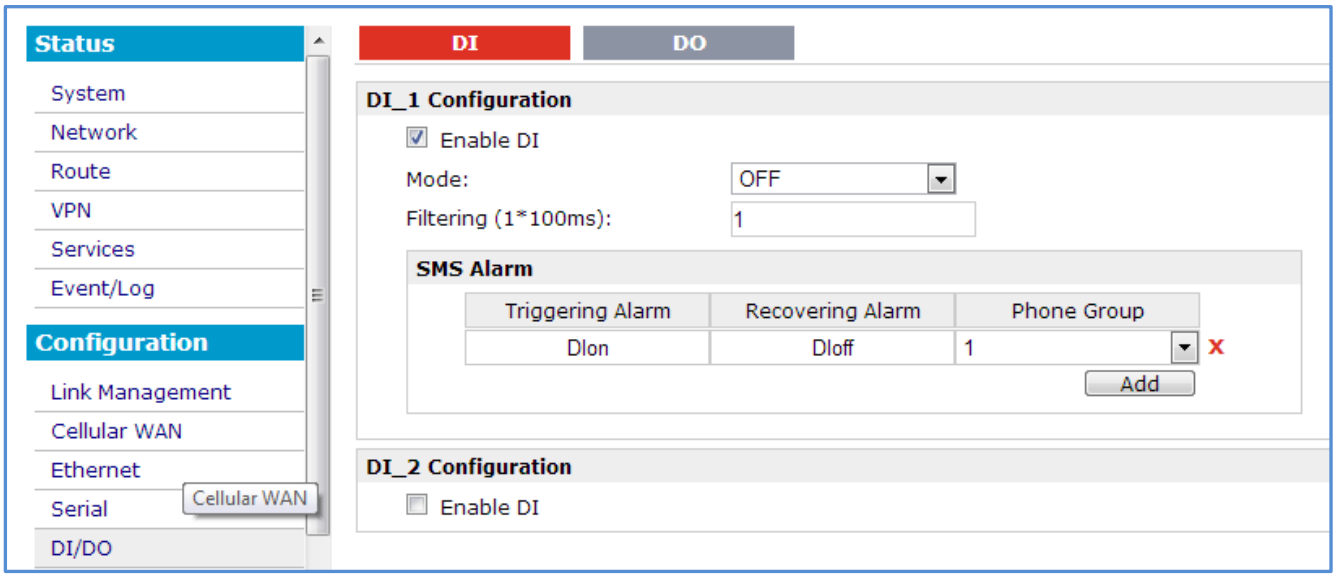




3.4Configure DI Alarm

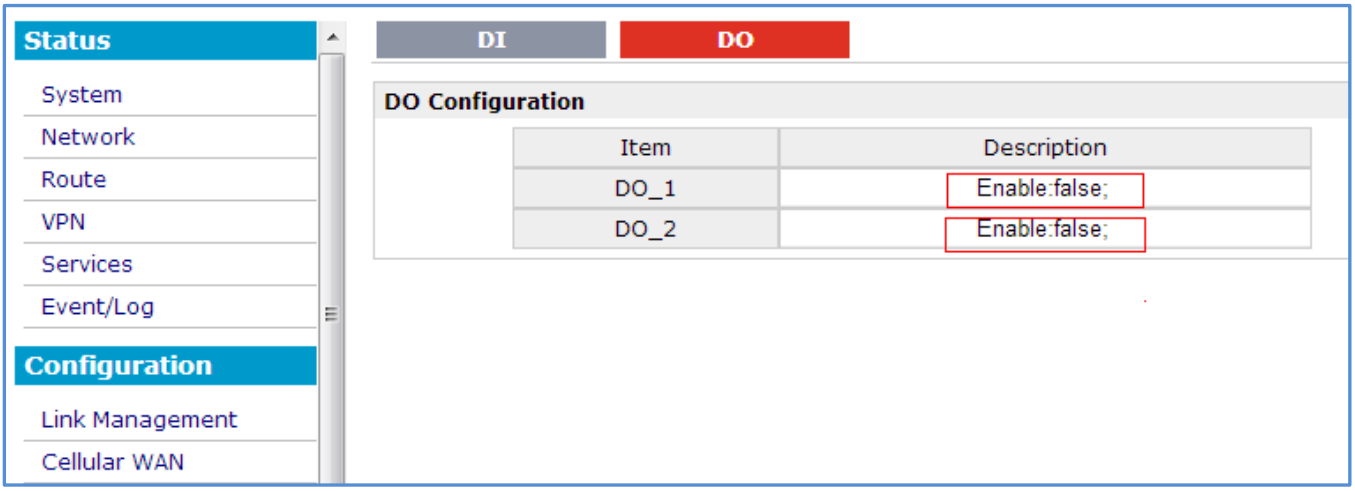
1. Browse to “Configuration”-> “DI/DO” -> “DI”, select DI_1 to configure. Click “Enable DI” then click the drop-down box of “Mode” to select “OFF”.

- Click “Add” to fill in the “DIon” on the” Tiggering” Alarm option, the “DIoff” on the “Recovering Alarm” option and click the drop-down box of “Phone Group” to select “1”.
- Click “Apply”.



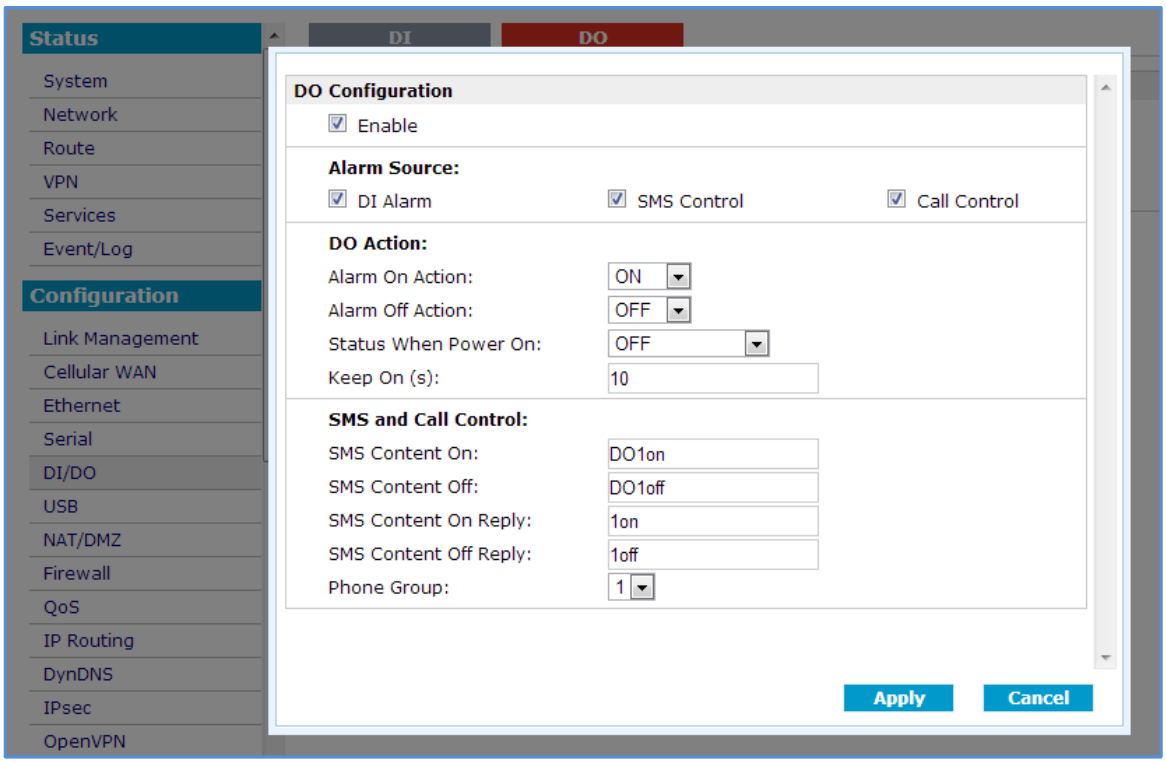
3.5Configure DO Alarm

1. Browse to “Configuration”-> “DI/DO” -> “DO”. Click “Enable:false” to enable DO_1 or DO_2.



2. Select DO_1 then Click “Enable”

- ”Click “DI Alarm” , “SMS Control” and “Call Control” to enable Click drop-down box of “Alarm off Action” to select “off” and drop-down box of “Status When Power On” to select “off”
- Fill in “DO1on” on “SMS Content on” option, fill in “DO1off” on “SMS Content off” option, fill in “1on” on “SMS Content Off Reply” option, fill in “1off” on “SMS Content Off reply ” option and click the drop-down box of “Phone Group” to select “1”.
- Click “Apply”-> “Save”-> “Reboot”.


Status
System
Network
Route
VPN
Services
Event/Log
Configuration
Link Management
Cellular WAN
Ethernet
Serial
DI/DO
USB
NAT/DMZ
Firewall
QoS
IP Routing
DynDNS
IPsec
OpenVPN
DI
DO
DO Configuration
Enable
Alarm Source:
DI Alarm
SMS Control
Call Control
DO Action:
Alarm On Action:
ON
Alarm Off Action:
OFF
Status When Power On:
OFF
Keep On (s):
10
SMS and Call Control:
SMS Content On:
DO1on
SMS Content Off:
DO1off
SMS Content On Reply:
1on
SMS Content Off Reply:
1off
Phone Group:
1
Apply
Cancel

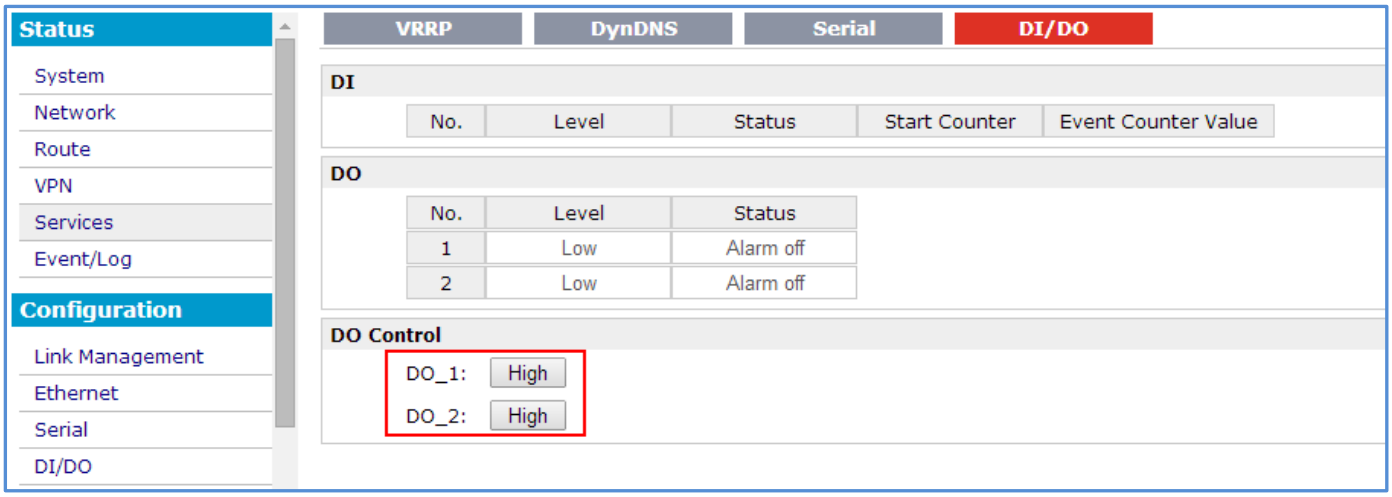
Chapter 4. Testing

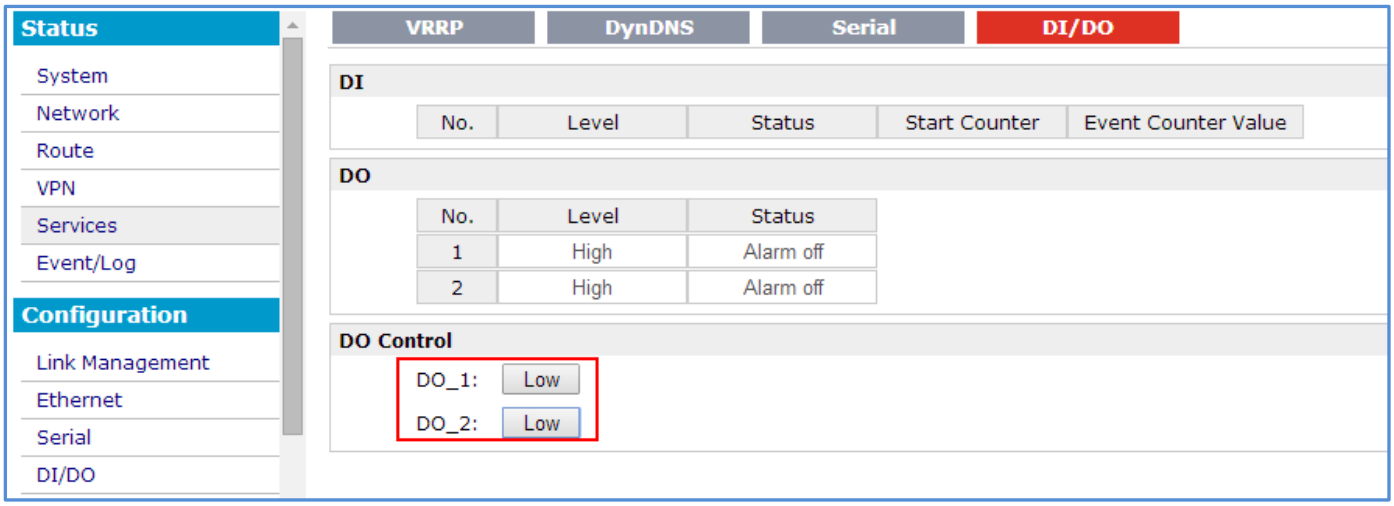
Refer to the application topology, the whole methods of DI test are listed as follow:

- If slide switch connecting to In1 closes, it will trigger DI alarm. After configure DI as DO alarm source, DO will connect to GND (which has connected to V-) , and then LED will be lit up.
- If SMS Control is configured as DO Alarm source, when send specific SMS to R3000, DO will connect to GND (which has connected to V-) , and then LED will be lit up.
- If Call Control is configured as Do Alarm source, when specific user make a call to R3000, DO will connect to GND (which has connected to V-) , and then LED will be lit up.

4.1Web Control as Alarm Source

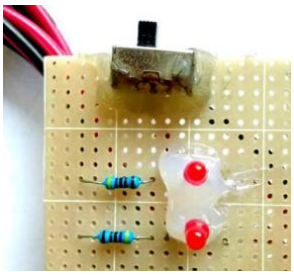
1. After DO of R3000 has been enabled. Browse to Status-> Service-> DI/DO-> DO Control->"DO_1/DO_2", click the button "High" to change the status of DO from low to high; click button "Low" to change the status of DO from high to low.





4.2 DI Control as Alarm Source

1. Browse to “Status”-> “Service” and “DI/DO”. Make sure that the DI Alarm status is “Alarm off”, DO status is “Alarm off” and the LED is off.



VRRP | DynDNS | Serial | DI/DO

DI

No.	Level	Status	Start Counter	Event Counter Value
1	High	Alarm off	Enable	0

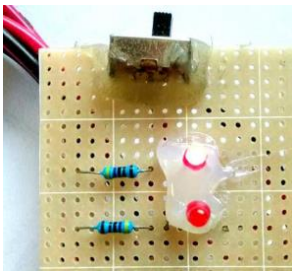
DO

No.	Level	Status
1	Low	Alarm off

DO Control

DO_1: High

2. Slide the switch connecting to In1 to close, R3000 will trigger the Alarm and send the message “DIon”to the specified phone. You can see that the status of DI change to “Alarm on”, the status of DO change to “Alarm on” and the LED will be lit up.



VRRP | DynDNS | Serial | DI/DO

DI

No.	Level	Status	Start Counter	Event Counter Value
1	Low	Alarm on	Enable	0

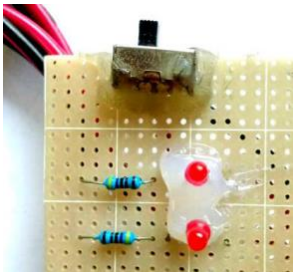
DO

No.	Level	Status
1	Low	Alarm on

DO Control

DO_1: High

3. When slide switch connecting to In1 recover original status, R3000 will trigger the Alarm and send the message “DIoff”to the specified phone, the DI/DO Alarm status will change back to Alarm off and the LED will change back to off.



VRRP | DynDNS | Serial | DI/DO

DI

No.	Level	Status	Start Counter	Event Counter Value
1	High	Alarm off	Enable	0

DO

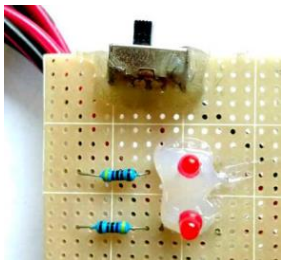
No.	Level	Status
1	Low	Alarm off

DO Control

DO_1: High

4.3SMS Control as Alarm Source

1. Browse to “Status”-> “Service” and “DI/DO”. Make sure that DO status is “Alarm off” and the LED is off.



VRRP | DynDNS | Serial | DI/DO

DI

No.	Level	Status	Start Counter	Event Counter Value
1	High	Alarm off	Enable	0

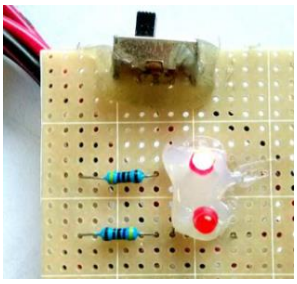
DO

No.	Level	Status
1	Low	Alarm off

DO Control

DO_1: High

2. Send the message with the content “DO1on”, R3000 will trigger the Alarm and send the message “1on” to specific phone. The status of DO change to “Alarm on” and the LED will be lit up.



VRRP | DynDNS | Serial | DI/DO

DI

No.	Level	Status	Start Counter	Event Counter Value
1	Low	Alarm on	Enable	0

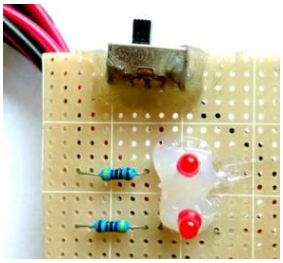
DO

No.	Level	Status
1	Low	Alarm on

DO Control

DO_1: High

3. Send the message with the content “DO1off”, R3000 will trigger the Alarm and send the message “1off” to the specified phone. The status of DO change to “Alarm off” and the LED will be lit up.



VRRP | DynDNS | Serial | DI/DO

DI

No.	Level	Status	Start Counter	Event Counter Value
1	High	Alarm off	Enable	0

DO

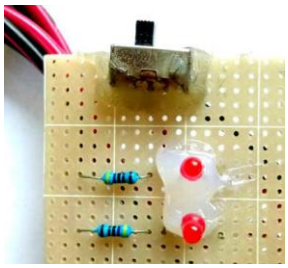
No.	Level	Status
1	Low	Alarm off

DO Control

DO_1: High

4.4Call Control as Alarm Source

1. Browse to “Status”-> “Service” and “DI/DO”. Make sure that DO status is “Alarm off” and the LED is off.



VRRP | DynDNS | Serial | DI/DO

DI

No.	Level	Status	Start Counter	Event Counter Value
1	High	Alarm off	Enable	0

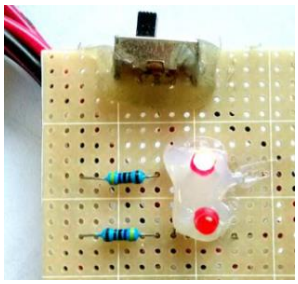
DO

No.	Level	Status
1	Low	Alarm off

DO Control

DO_1: High

2. Make a Phone call to the SIM Phone number, R3000 will trigger the Alarm and send the message “1on” to the specified phone. The status of DO change to “Alarm on” and the LED will be lit up.



VRRP | DynDNS | Serial | DI/DO

DI

No.	Level	Status	Start Counter	Event Counter Value
1	Low	Alarm on	Enable	0

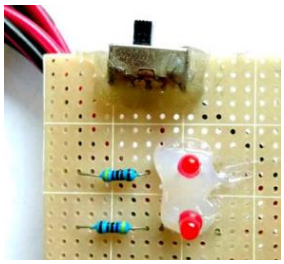
DO

No.	Level	Status
1	Low	Alarm on

DO Control

DO_1: High

3. Make a Phone call to the SIM Phone number, R3000 will trigger the Alarm and send the message “1off” to the specified phone. The status of DO change to “Alarm off” and the LED will be lit up.



VRRP | DynDNS | Serial | DI/DO

DI

No.	Level	Status	Start Counter	Event Counter Value
1	High	Alarm off	Enable	0

DO

No.	Level	Status
1	Low	Alarm off

DO Control

DO_1: High

4.5 Event/Log

Event/Log shows running process and status of R3000. Only the information relevant to the configuration above will be explained below:

1. DI/DO Alarm on

14-07-05 20:02:04 DI_1 alarm on, 0(1)
14-07-05 20:02:04 send sms using group 1, content=DIon
14-07-05 20:02:04 will send sms len=4
14-07-05 20:02:04 using sms buffer index=1
14-07-05 20:02:05 modemMonitorTask: has sms to be sent
14-07-05 20:02:05 phoneList=0(0), 13042002245
14-07-05 20:02:05 sendSmsAtComd: sms(index=1) sending...
14-07-05 20:02:05 sms:0891683110200005F011000BA13140022042F50008000800440049006F006E
14-07-05 20:02:05 sms:0891683110200005F011000BA13140022042F50008000800440049006F006E, len=22
14-07-05 20:02:05 send: AT+CMGS=22
14-07-05 20:02:06 read:
>
14-07-05 20:02:06 send sms:0891683110200005F011000BA13140022042F50008000800440049006F006E, len=62
14-07-05 20:02:08 ping 8.8.8.8 via Cellular
14-07-05 20:02:08 watch read message: module=ping;module_type=wan;interface_type=2;delay_time=354;action=success;msg_end=1
14-07-05 20:02:08 ping successfully
14-07-05 20:02:10 read:
+CMGS: 201

OK
14-07-05 20:02:10 send sms success

2. DI/DO Alarm off

14-07-05 22:48:17 DI_1 alarm off, 1(1)
14-07-05 22:48:17 send sms uing group 1, content=DIoff
14-07-05 22:48:17 will send sms len=5
14-07-05 22:48:17 using sms buffer index=1
14-07-05 22:48:17 ping successfully
14-07-05 22:48:18 modemMonitorTask: has sms to be sent
14-07-05 22:48:18 phoneList=0(0), 13042002245
14-07-05 22:48:18 sendSmsAtComd: sms sending...
14-07-05 22:48:18 sms:0891683110200005F011000BA13140022042F50008000a00440049006F00660066
14-07-05 22:48:18 sms:0891683110200005F011000BA13140022042F50008000a00440049006F00660066, len=24
14-07-05 22:48:18 send: AT+CMGS=24

14-07-05 22:48:19 read:
>
14-07-05 22:48:19 send sms:0891683110200005F011000BA13140022042F50008000a00440049006F00660066, len=66
14-07-05 22:48:21 read:
+CMGS: 209
OK
14-07-05 22:48:21 send sms success

3. SMS Alarm on

R3000# 14-07-05 22:52:04 read:
+CMTI: "SM",1
14-07-05 22:52:04 sms index: 1
14-07-05 22:52:04 send: AT+CMGR=1
14-07-05 22:52:05 read:
+CMGR: 0,"",24
0891683110200005F0040BA13140022042F50000417050222512230 5C467ECED06

OK
14-07-05 22:52:05 pdu:0891683110200005F0040BA13140022042F50000417050222512230 5C467ECED06
14-07-05 22:52:05 udl=5
14-07-05 22:52:05 sca:8613010200500
14-07-05 22:52:05 tpa:13042002245
14-07-05 22:52:05 pid:0
14-07-05 22:52:05 dcs:0
14-07-05 22:52:05 scts:14070522522132
14-07-05 22:52:05 ud:0044004F0031006F006E
14-07-05 22:52:05 len:20
14-07-05 22:52:05 send: AT+CMGD=1
14-07-05 22:52:05 receive from 13042002245
14-07-05 22:52:05 phone munber match.....
14-07-05 22:52:05 caller:13042002245, group=1
14-07-05 22:52:05 phone compare:13042002245<-->13042002245
14-07-05 22:52:05 DO_1 match
14-07-05 22:52:05 **the function type is: 'sms DO control'**
14-07-05 22:52:05 isSmsContentMatch:rcv 0044004F0031006F006E(0044004F0031006F006E)
14-07-05 22:52:05 <0> router: receive sms from 13042002245, content=DO1on
14-07-05 22:52:05 match function: sms DO control, DO_1(alarm on)
14-07-05 22:52:05 send sms to 13042002245, content=1on
14-07-05 22:52:05 will send sms len=3
14-07-05 22:52:05 using sms buffer index=1
14-07-05 22:52:05 sms buffer is full
14-07-05 22:52:05 read:
OK
14-07-05 22:52:06 modemMonitorTask: has sms to be sent

14-07-05 22:52:06 sendSmsAtComd: sms sending...
14-07-05 22:52:06 sms:0891683110200005F011000BA13140022042F5000800060031006F006E
14-07-05 22:52:06 sms:0891683110200005F011000BA13140022042F5000800060031006F006E, len=20
14-07-05 22:52:07 send: AT+CMGS=20
14-07-05 22:52:07 read:
>
14-07-05 22:52:07 send sms:0891683110200005F011000BA13140022042F5000800060031006F006E, len=58
14-07-05 22:52:09 read:
+CMGS: 210

OK
14-07-05 2:52:09 send sms success

4. SMS Alarm off

14-07-05 22:57:26 read:
+CMTI: "SM",1
14-07-05 22:57:26 sms index: 1
14-07-05 22:57:26 send: AT+CMGR=1
14-07-05 22:57:26 read:
+CMGR: 0,"",25
0891683110200005F0040BA13140022042F5000041705022754423 06C467EC6D3603

OK
14-07-05 22:57:26 pdu:0891683110200005F0040BA13140022042F5000041705022754423 06C467EC6D3603
14-07-05 22:57:26 udl=6
14-07-05 22:57:26 sca:8613010200500
14-07-05 22:57:26 tpa:13042002245
14-07-05 22:57:26 pid:0
14-07-05 22:57:26 dcs:0
14-07-05 22:57:26 scts:14070522574432
14-07-05 22:57:26 ud:0044004F0031006F00660066
14-07-05 22:57:26 len:24
14-07-05 22:57:26 send: AT+CMGD=1
14-07-05 22:57:26 receive from 13042002245
14-07-05 22:57:26 phone munber match.....
14-07-05 22:57:26 caller:13042002245, group=1
14-07-05 22:57:26 phone compare:13042002245<-->13042002245
14-07-05 22:57:26 DO_1 match
14-07-05 22:57:26 the function type is: 'sms DO control'
14-07-05 22:57:26 isSmsContentMatch:rcv 0044004F0031006F00660066(0044004F0031006F006E)
14-07-05 22:57:26 isSmsContentMatch:rcv 0044004F0031006F00660066(0044004F0031006F00660066)
14-07-05 22:57:26 match function: sms DO control, DO_1(alarm off)
14-07-05 22:57:26 send sms to 13042002245, content=1off
14-07-05 22:57:26 will send sms len=4

14-07-05 22:57:26 using sms buffer index=1
14-07-05 22:57:26 sms buffer is full
14-07-05 22:57:26 <0> router: receive sms from 13042002245, content=DO1off
14-07-05 22:57:27 read:
OK
14-07-05 22:57:28 modemMonitorTask: has sms to be sent
14-07-05 22:57:28 sendSmsAtComd: sms sending...
14-07-05 22:57:28 sms:0891683110200005F011000BA13140022042F5000800080031006F00660066
14-07-05 22:57:28 sms:0891683110200005F011000BA13140022042F5000800080031006F00660066, len=22
14-07-05 22:57:28 send: AT+CMGS=22
14-07-05 22:57:28 read:
>
14-07-05 22:57:28 send sms:0891683110200005F011000BA13140022042F5000800080031006F00660066, len=62
14-07-05 22:57:32 read:
+CMGS: 213

OK
14-07-05 22:57:32 send sms success

5. Phone Alarm on

14-07-05 23:01:11 caller: 13042002245
14-07-05 23:01:12 send: AT+CHUP
14-07-05 23:01:12 caller:13042002245, group=1
14-07-05 23:01:12 phone compare:13042002245<-->13042002245
14-07-05 23:01:12 DO_1 match
14-07-05 23:01:12 the function type is: 'phone DO control'
14-07-05 23:01:12 match function: phone DO control, DO_1(alarm on)
14-07-05 23:01:12 phone number is match
14-07-05 23:01:12 send sms to 13042002245, content=1on
14-07-05 23:01:12 will send sms len=3
14-07-05 23:01:12 using sms buffer index=1
14-07-05 23:01:12 sms buffer is full
14-07-05 23:01:12 read:
OK
14-07-05 23:01:13 modemMonitorTask: has sms to be sent
14-07-05 23:01:13 sendSmsAtComd: sms sending...
14-07-05 23:01:13 sms:0891683110200005F011000BA13140022042F5000800060031006F006E
14-07-05 23:01:13 sms:0891683110200005F011000BA13140022042F5000800060031006F006E, len=20
14-07-05 23:01:14 send: AT+CMGS=20
14-07-05 23:01:14 read:
>
14-07-05 23:01:14 send sms:0891683110200005F011000BA13140022042F5000800060031006F006E, len=58
14-07-05 23:01:16 read:
+CMGS: 214

OK
14-07-05 23:01:16 send sms success

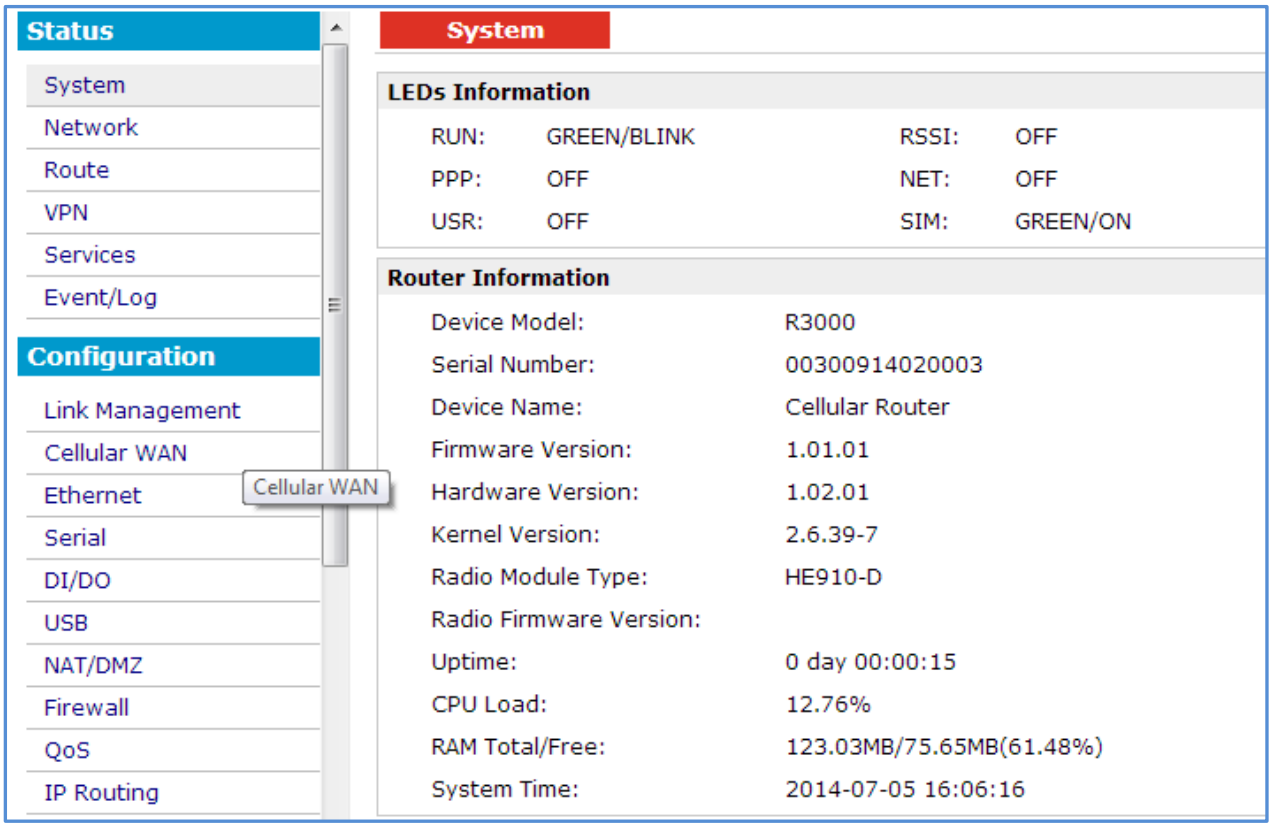
6. Phone Alarm off

R3000# 14-07-05 23:03:08 read:
RING

+CLIP: "13042002245",129,"",128,"",0
14-07-05 23:03:08 caller: 13042002245
14-07-05 23:03:09 send: AT+CHUP
14-07-05 23:03:09 caller:13042002245, group=1
14-07-05 23:03:09 phone compare:13042002245<-->13042002245
14-07-05 23:03:09 DO_1 match
14-07-05 23:03:09 the function type is: 'phone DO control'
14-07-05 23:03:09 match function: phone DO control, DO_1(alarm off)
14-07-05 23:03:09 phone number is match
14-07-05 23:03:09 send sms to 13042002245, content=1off
14-07-05 23:03:09 will send sms len=4
14-07-05 23:03:09 using sms buffer index=1
14-07-05 23:03:09 sms buffer is full
14-07-05 23:03:09 read:
OK
14-07-05 23:03:10 modemMonitorTask: has sms to be sent
14-07-05 23:03:10 sendSmsAtComd: sms sending...
14-07-05 23:03:10 sms:0891683110200005F011000BA13140022042F5000800080031006F00660066
14-07-05 23:03:10 sms:0891683110200005F011000BA13140022042F5000800080031006F00660066, len=22
14-07-05 23:03:11 send: AT+CMGS=22
14-07-05 23:03:11 read:
>
14-07-05 23:03:11 send sms:0891683110200005F011000BA13140022042F5000800080031006F00660066, len=62
14-07-05 23:03:13 read:
+CMGS: 215

OK
14-07-05 23:03:13 send sms success

Chapter 5. Appendix

5.1 Firmware Version

The configuration above was tested on R3000 with firmware version *R3000_S_V1.01.01.fs.*