



Vodafone MachineLink 3G Plus

User Guide

Vodafone
Power to you



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Save our environment

When this equipment has reached the end of its useful life, it must be taken to a recycling centre and processed separately from domestic waste.

The cardboard box, the plastic contained in the packaging, and the parts that make up this device can be recycled in accordance with regionally established regulations. Never dispose of this electronic equipment along with your household waste. You may be subject to penalties or sanctions under the law. Instead, ask for disposal instructions from your municipal government.

Please be responsible and protect our environment.

This user guide covers the following products:

Vodafone MachineLink 3G Plus M2M Router

DOCUMENT VERSION	DATE
1.0 – Initial document release	5 November 2014

Table 1 - Document Revision History

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Overview

Introduction

This document provides you all the information you need to set up, configure and use the Vodafone MachineLink 3G Plus router.

Target audience

This document is intended for system integrators or experienced hardware installers who understand telecommunications terminology and concepts.

Prerequisites

Before continuing with the installation of your MachineLink 3G Plus router, please confirm that you have the following:

- A device with a working Ethernet network adapter.
- A web browser such as Internet Explorer, Mozilla Firefox or Google Chrome.
- A working SIM card if your router was not shipped with one pre-inserted.
- A flathead screwdriver if field terminated power is required.

Notation

The following symbols are used in this user guide:



The following note requires attention.



The following note provides a warning.



The following note provides useful information.

Product introduction

Product overview

- Penta-band 3G with quad-band 2G auto-fallback
- HSPA+ up to 14.4 Mbps DL
- RS232/RS422/RS485 Port and USB 2.0 OTG port
- Built in GPS supporting an active GPS Antenna via external SMA connector
- External antenna connectors (Main & Aux) for 3G
- Three multi-purpose I/O ports
- One dedicated ignition input
- Intelligent, Tri-Colour LED display for clear, easy to read modem status information
- Extensive device management with support for TR-069, Web GUI and full feature management with SMS
- Flexible mounting suitable for in-home use or industrial applications with built-in wall mount and DIN rail mounting options
- Integration with Vodafone GDSP back end
- Roaming algorithm with prioritisation for cost effective, flawless network connection across the globe

Package contents

The Vodafone MachineLink 3G Plus router package consists of:

- 1 x Vodafone MachineLink 3G Plus router
- 2 x 3G antennas
- 1 x 1.5m yellow Ethernet cable 8P8C
- 1 x DIN rail mounting bracket
- 1 x six-way terminal block
- 1 x quick start guide and safety manual

If any of these items are missing or damaged, please contact your Vodafone sales representative immediately.

Product features

The Vodafone MachineLink 3G Plus router is a feature-packed wireless M2M device designed by Vodafone to address the rapid growth in M2M deployments. The first M2M device of its kind, it is designed to deliver state of the art features, versatility and ease of use at an affordable price. Compatible with Vodafone networks worldwide, MachineLink 3G Plus is managed by Vodafone's global M2M platform enabling remote management and support wherever you are. The open management system also allows you to customise your own software applications for scalability, large scale compatibility and an easy path to large deployments across a broad range of industries.

The Vodafone MachineLink 3G Plus meets the global demand for a reliable and cost-effective M2M device that successfully caters to mass deployment across businesses.

Physical dimensions and indicators

Physical dimensions

Below is a list of the physical dimensions of the Vodafone MachineLink 3G Plus router.

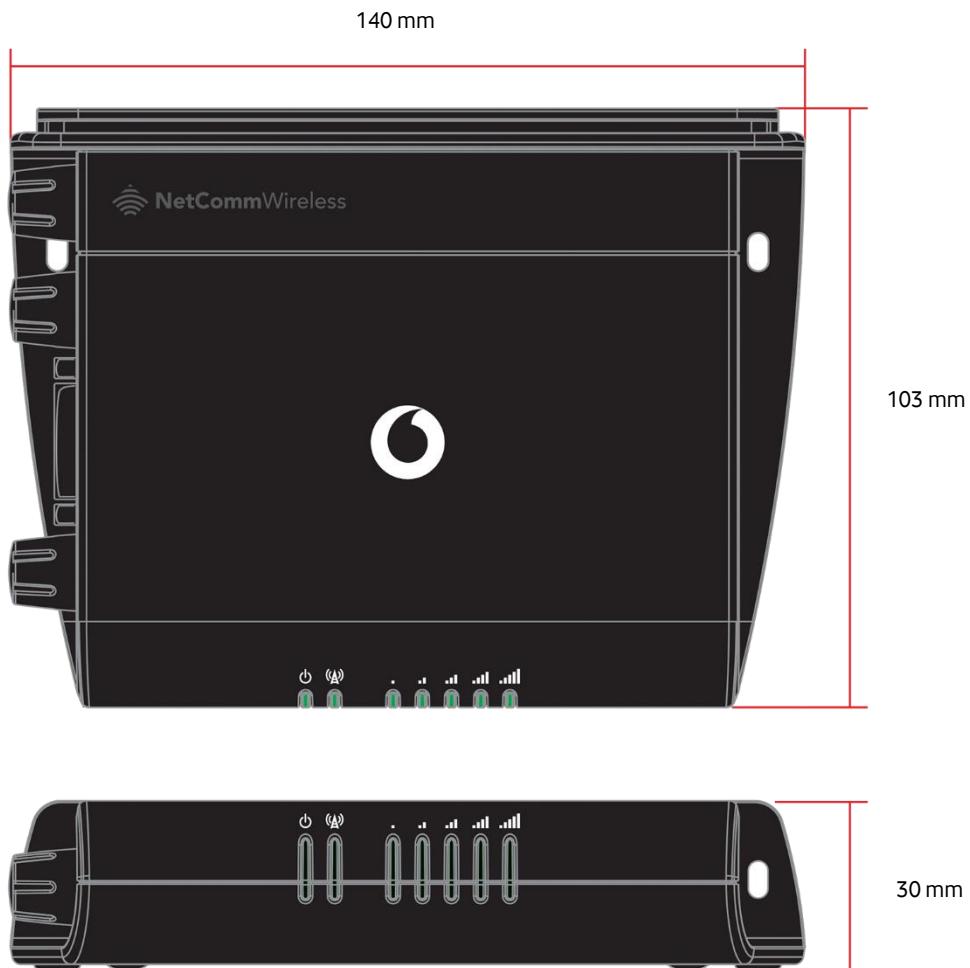


Figure 1 – Vodafone MachineLink 3G Plus M2M Router Dimensions

VODAFONE MACHINELINK 3G PLUS ROUTER	
(WITHOUT EXTERNAL ANTENNAS OR MOUNTING BRACKET ATTACHED)	
Length	140 mm
Depth	103 mm
Height	30 mm
Weight	185 grams

Table 2 - Device Dimensions

LED indicators

The Vodafone MachineLink 3G Plus router uses 7 LEDs to display the current system and connection status.

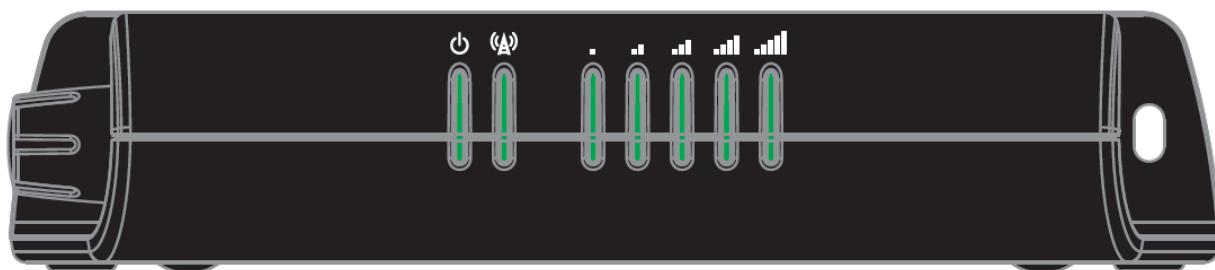


Figure 2 - Vodafone MachineLink 3G Plus router LED Indicators

LED ICON	NAME	COLOUR	STATE	DESCRIPTION
	Power	Off		Power off
			Double flash	Powering up
			On	Power on
			On	Power on in recovery mode
			Slow flashing	Hardware error
	Network		On	Connected via WWAN
			Blinking ¹	Traffic via WWAN
			Slow flashing	Connecting PDP
			On	Registered network
			Slow flashing	Registering network
			Slow flashing	SIM PIN locked
			Fast flashing	SIM PUK locked
			On	Can't connect
	Signal strength		On	3G
			On	2G GPRS
			On	GSM only (no GPRS)

Table 3 - LED Indicators

¹ The term "blinking" means that the LED may pulse, with the intervals that the LED is on and off not being equal. The term "flashing" means that the LED turns on and off at equal intervals.

Signal strength LEDs

The following table lists the signal strength range corresponding with the number of lit signal strength LEDs.

NUMBER OF LIT LEDS	SIGNAL STRENGTH
All LEDs unlit	< -109 dBm
1	-109 dBm to -102 dBm
2	-101 dBm to -92 dBm
3	-91 dBm to -86 dBm
4	-85 dBm to -78 dBm
5	≥ -77 dBm

Table 4 - Signal strength LED descriptions

LED update interval

The signal strength LEDs update within a few seconds with a rolling average signal strength reading. When selecting a location for the router or connected or positioning an external antenna, please allow up to 20 seconds for the signal strength LEDs to update before repositioning.

Ethernet port LED indicators

The Ethernet port of the Vodafone MachineLink 3G Plus router has two LED indicators on it.

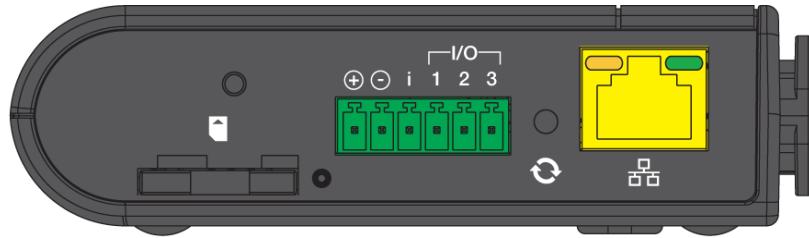


Figure 3 - Ethernet port LED indicators

The table below describes the statuses of each light and their meanings.

LED	STATUS	DESCRIPTION
Green	On	There is a valid network link.
	Blinking	There is activity on the network link.
	Off	No valid network link detected.
Amber	On	The Ethernet port is operating at a speed of 100Mbps.
	Off	The Ethernet port is operating at a speed of 10Mbps or no Ethernet cable is connected.

Table 5 - Ethernet port LED indicators description

Interfaces

The following interfaces are available on the Vodafone MachineLink 3G Plus router:

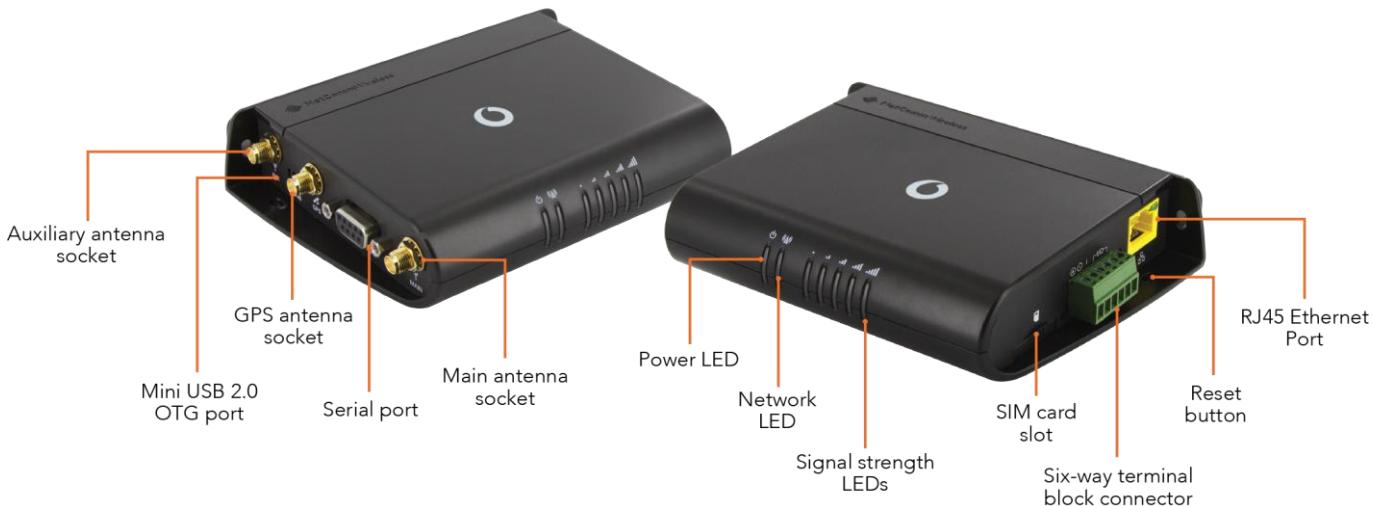


Figure 4 - Interfaces

ITEM	DESCRIPTION
Main antenna socket	SMA female connector for main antenna.
Aux antenna socket	SMA female connector for auxiliary antenna (receive diversity).
GPS antenna socket	SMA female connector for an active GPS antenna.
Six-way terminal block connector	Connect power source, ignition and I/O wires here. Power, ignition and I/O wires may be terminated on optional terminal block and connected to DC input jack. Refer to the diagram and table under the Installation section for correct wiring of the terminal block. Operates in the 8-40V DC range.
Reset button	Press and hold for less than 5 seconds to reboot to normal mode. The LEDs are green and extinguish in sequence to indicate that the router will reboot normally if the button is released during this period. Press and hold for 5 to 15 seconds to reboot to recovery mode. The LEDs are amber and extinguish in sequence to indicate that the router will reboot to recovery mode if the button is released during this period. Press and hold for 15 to 20 seconds to reset the router to factory default settings. The LEDs are red and extinguish in sequence to indicate that the router will reset to factory default settings if the button is released during this period.
SIM card slot	Insert SIM card here.
RJ45 Ethernet port	Connect one or several devices via a network switch here.
Mini USB 2.0 OTG port	Provides connectivity for optional external storage or a USB Ethernet dongle. Supplies up to 0.5A to connected device.
Serial port	Female DB9 port supporting 9-wire RS-232, RS-485 or RS-422 (software selectable).

Table 6 – Interfaces

Placement of the MachineLink 3G Plus router

The two external high-performance antennas supplied with the router are designed to provide optimum signal strength in a wide range of environments. If you find the signal strength is weak, try adjusting the orientation of the antennas. If you are unable to get an acceptable signal, try moving the router to a different place or mounting it differently.



Note: When selecting a location for the router, allow at least 20 seconds for the signal strength LEDs to update before trying a different location.

Mounting options

The Vodafone MachineLink 3G Plus router can be quickly and easily mounted in a variety of locations.

Mounted flat against the wall

When mounted flat against the wall, the Vodafone MachineLink 3G Plus router has a slimline form factor. Use appropriately sized screws in the mounting holes provided on the base of the unit.



Figure 5 - Wall mount - Flat against the wall

Perpendicular to the wall

If a large surface area is not available, there is the option of mounting the router perpendicular to the wall. This gives the router a small wall footprint while remaining securely attached. Use appropriately sized screws in the mounting holes provided on the back of the unit.

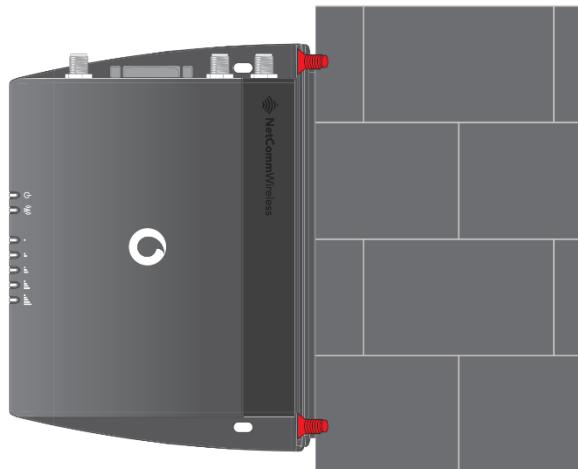


Figure 6 - Wall mount - Perpendicular to the wall

C Section DIN Rail mount

The Vodafone MachineLink 3G Plus router easily slides onto a C Section DIN rail so that it is horizontally mounted. The DIN Rail mounting bracket is not required for C Section DIN rail mounting.

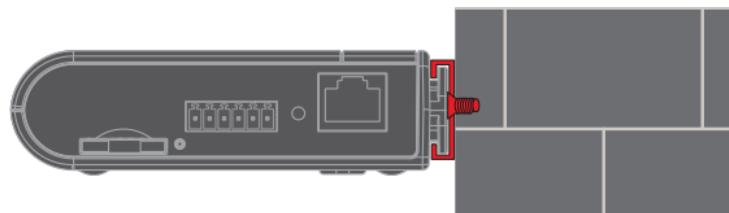


Figure 7 - C Section DIN rail mount

To mount the unit on a C-Section DIN rail, slide it on as illustrated below:

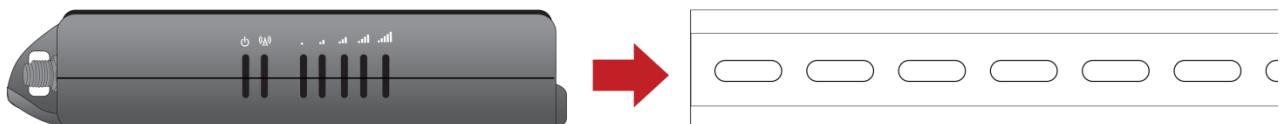


Figure 8 - Mounting the unit on a DIN rail

Mounting bracket

The provided mounting bracket provides additional methods of mounting the Vodafone MachineLink 3G Plus router.

To attach the mounting bracket, slide it onto the rear of the router as shown in the diagram below:



Figure 9 - Sliding on the mounting bracket

To remove the bracket, press the **PUSH** button and slide the router off the bracket:

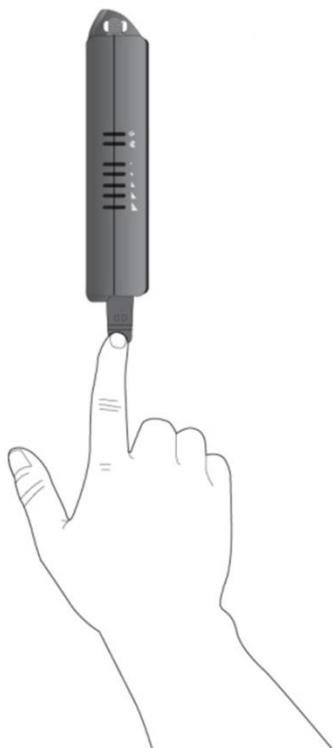


Figure 10 - Removing the mounting bracket

Using the mounting bracket for wall mounting

By first attaching the DIN rail bracket to the wall, the Vodafone MachineLink 3G Plus router can be easily attached and removed from the bracket.

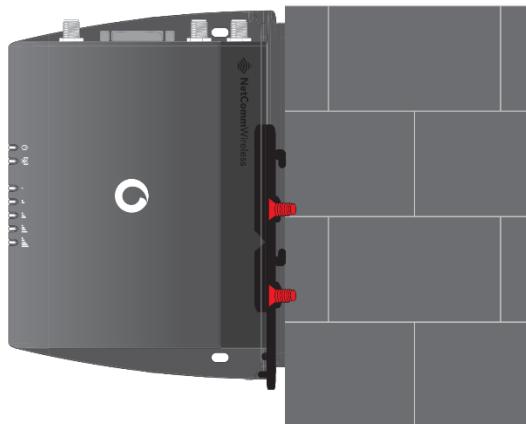


Figure 11 – Wall mount - Mounted via DIN rail bracket

Using the mounting bracket for Top hat DIN rail mounting

The Vodafone MachineLink 3G Plus router may be vertically mounted to the wall with the bracket by sliding the bracket onto a top hat DIN rail

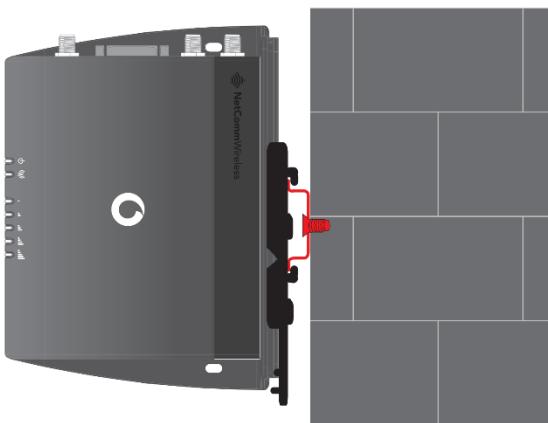


Figure 12 - Top hat DIN rail mount

Alternatively, you can attach it to the DIN Rail by using the V bend in the bracket as illustrated below:

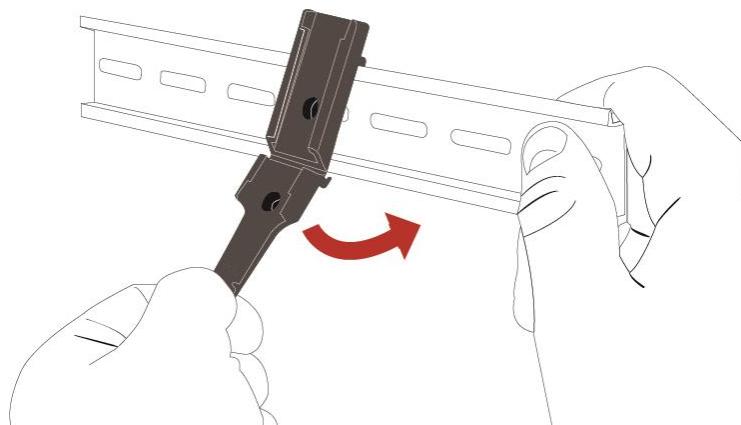


Figure 13 - Attaching the mounting bracket to the DIN rail using the V bend

Desk mount

In situations where wall mounts and DIN rails are not required, you can simply place the Vodafone MachineLink 3G Plus router on a desk using its rubber feet to prevent it from slipping.

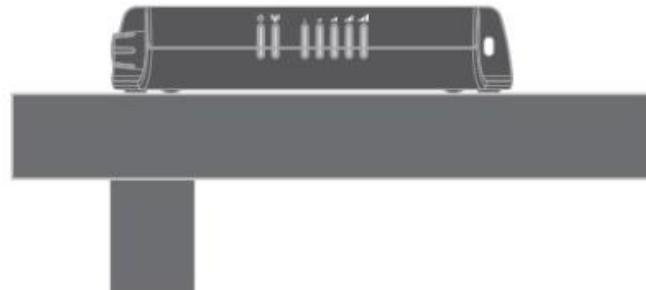


Figure 14 - Desk mount

Installation and configuration of the Vodafone MachineLink 3G Plus

Powering the router

The Vodafone MachineLink 3G Plus router can be powered in one of two ways:

1. DC power input via 6-pin connector (8-40V DC)
2. DC power input via field terminated power source (8-40V DC)

The green power LED on the router lights up when a power source is connected.

DC power via 6-pin connector

The positive and ground terminals on the 6-pin connector can accept power from a separately sold DC power supply. Both a standard temperature range DC power supply and an extended temperature range DC power supply are available to purchase as accessories.

If you have purchased an optional DC power supply, first remove the terminal block from the connector. The terminal block connector uses rising cage clamps to secure the wires and ships with the cages lowered and ready for wire insertion. Inspect the cage clamps and use a flathead screwdriver to lower the cage clamps if they have moved during transportation. Insert the wires into the terminal block as shown below, noting the polarity of the wires, then use a flathead screwdriver to raise the cage clamp to secure the wires in the terminal block. Insert the wired terminal block into the terminal block connector of the router and then connect the adapter to a wall socket.

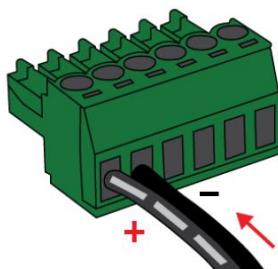


Figure 15 - Terminal block wiring diagram

DC power via field terminated power source

If an existing 8-40V DC power supply is available, you can insert the wires into the supplied terminal block to power your router. Use a flathead screwdriver to tighten the terminal block screws and secure the power wires, making sure the polarity of the wires are correctly matched, as illustrated below.

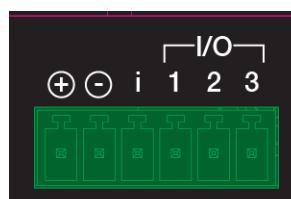


Figure 16 - Locking Power Terminal Block pinout

TERMINAL	DESCRIPTION
+	Positive wire for power.
-	Ground wire.
i	Dedicated terminal for ignition detection.
I/O	Three terminals used for input/output detection (refer to the IO configuration section for more information).

Table 7 - Locking power block pin outs

Viewing power source information

You can view the current power input mode in the **Advanced status** section of the device's web user interface. This is useful for remotely monitoring the device. You can also use the Software Development Kit to access this information for advanced purposes (e.g. configuring SMS alerts to inform you of the power status of the router).

To view the router's power source information, log in to the router and expand the **Advanced status** box on the status page. See the [Status](#) section of this manual for more information on the status page.

Power consumption

To assist with power consumption planning, the following table summarises average power consumption during the various states of the Vodafone MachineLink 3G Plus router under normal usage conditions. It's important to note that this table serves as an indication only as the power consumed by the device is affected by many variables including signal strength, network type, and network activity.

Average power consumption figures

STATE	POWER CONSUMPTION
Powered on, idle and connected to packet data	1.2W
Powered on, connected to packet data with average load	2.0W
Powered on, connected to packet data with heavy traffic	4.0W
Peak power draw at maximum 3G module transmission power	5.0W

Table 8 - Average power consumption figures

Installing the router

After you have mounted the router and connected a power source, follow these steps to complete the installation process.

1. Connect equipment that requires network access to the Ethernet port of your router. This may be your computer for advanced configuration purposes, or your end equipment which requires data access via the Vodafone MachineLink 3G Plus router. You can connect one device directly, or several devices using a network switch.
2. The MachineLink 3G Plus router is shipped with caps on the Main, Auxiliary and GPS antenna sockets. To attach the supplied antennas, first remove the antenna socket caps from the Main and Auxiliary antenna sockets by turning them in an anti-clockwise direction, then screw the antennas onto the sockets by turning them in a clockwise direction. Please refer to the [Interfaces](#) section for the antenna socket layout. If you have purchased a GPS antenna, remove the socket cap from the GPS antenna socket and attach the antenna to the socket in the same manner.



3. If your router does not come with a SIM pre-installed, insert a SIM card into the SIM card slot by pressing the SIM Eject button to eject the SIM card tray. Place the SIM card in the tray and then insert the loaded tray into the SIM slot with the gold side facing up, as shown below.



Figure 17 – Inserting the SIM card

4. Ensure the external power source is switched on and wait 2 minutes for your Vodafone MachineLink 3G to start up and connect to the mobile network. Your router arrives with preconfigured settings that should suit most customers. Your router is now connected. To check the status of your router, compare the LED indicators on the device with those listed in the [LED indicators](#) table.

Advanced configuration

The Vodafone MachineLink 3G Plus router comes with preconfigured settings that should suit most customers. For advanced configuration, log into the web-based user interface of the router.

To log in to the web-based user interface router:

1. Open a web browser (e.g. Internet Explorer, Firefox, Safari), type <http://192.168.1.1> into the address bar and press **Enter**. The web-based user interface log in screen is displayed.

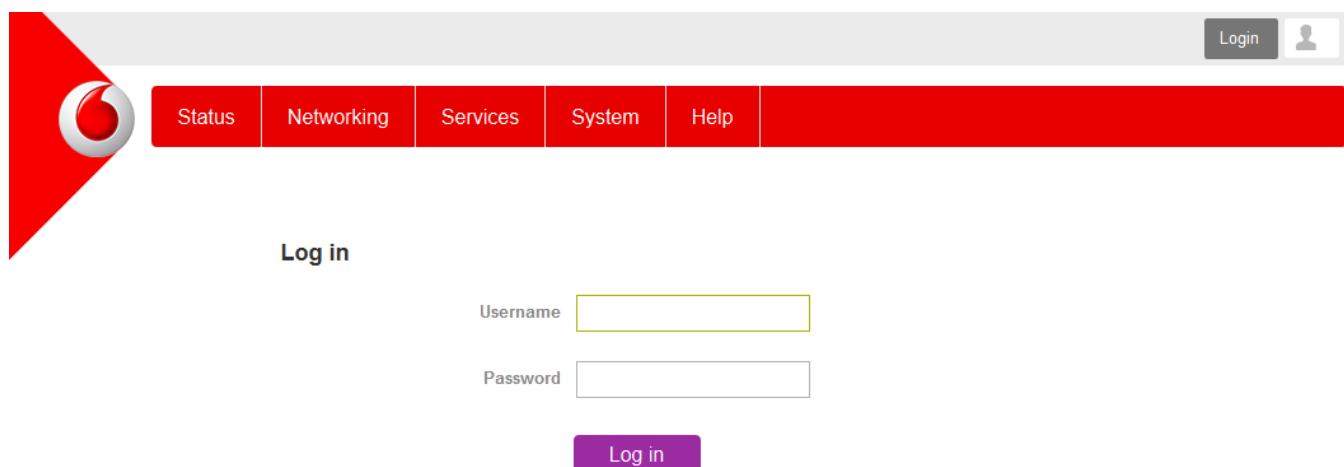


Figure 18 – Log in prompt for the web-based user interface

2. Enter the login username and password. If this is the first time you are logging in or you have not previously configured the password for the “root” or “admin” accounts, you can use one of the default account details to log in.

ROOT MANAGER ACCOUNT	
Username:	root
Password:	admin

Table 9 - Management account login details – Root manager

ADMIN MANAGER ACCOUNT	
Username:	admin
Password:	admin

Table 10 - Management account login details – Admin manager



Note:

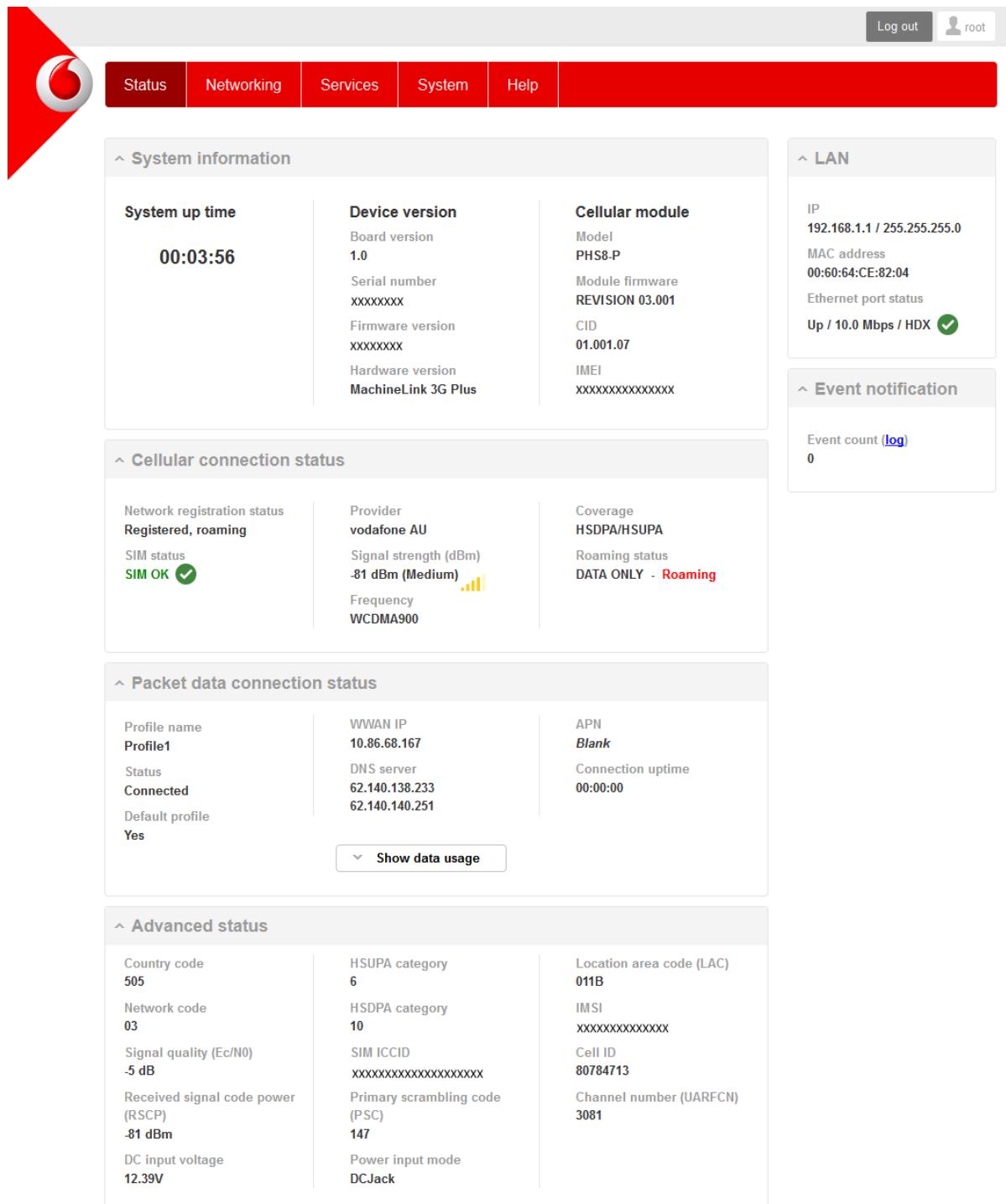
- To access all features of the router, you must use the root manager account.
- For security reasons, we highly recommend that you change the passwords for the root and admin accounts upon initial installation. You can do so by navigating via the menu to the System and then Administration page.

The Status page is displayed when you have successfully logged in.

Status

The status page of the web interface provides system related information and is displayed when you log in to the Vodafone MachineLink 3G Plus router management console. The status page shows System information, LAN details, Cellular connection status, Packet data connection status and Advanced status details. You can toggle the sections from view by clicking the  or  buttons to show or hide them.

Extra status boxes will appear as additional software features are enabled (e.g. VPN connectivity).



The screenshot displays the 'Status' page of the Vodafone MachineLink 3G Plus web interface. The top navigation bar includes links for Status, Networking, Services, System, and Help, along with Log out and user account buttons. Below the navigation, several expandable sections provide detailed system information:

- System information:** Shows System up time (00:03:56), Device version (Board version 1.0, Serial number XXXXXXXX, Firmware version XXXXXXXX, Hardware version MachineLink 3G Plus), and Cellular module (Model PHS8-P, Module firmware REVISION 03.001, CID 01.001.07, IMEI XXXXXXXXXXXXXXXXX).
- LAN:** Displays IP (192.168.1.1 / 255.255.255.0), MAC address (00:60:64:CE:82:04), Ethernet port status (Up / 10.0 Mbps / HDX with a green checkmark), and coverage information (HSDPA/HSUPA).
- Event notification:** Shows Event count (0).
- Cellular connection status:** Details Network registration status (Registered, roaming), SIM status (SIM OK with a green checkmark), Provider (vodafone AU), Signal strength (dBm) (-81 dBm (Medium)), Coverage (HSDPA/HSUPA), Roaming status (DATA ONLY - Roaming), Frequency (WCDMA900), and Coverage (HSDPA/HSUPA).
- Packet data connection status:** Shows Profile name (Profile1), WWAN IP (10.86.68.167), DNS server (62.140.138.233, 62.140.140.251), APN (Blank), and Connection uptime (00:00:00). A 'Show data usage' button is present.
- Advanced status:** Lists Country code (505), Network code (03), Signal quality (Ec/N0) (-5 dB), Received signal code power (RSCP) (-81 dBm), DC input voltage (12.39V), HSUPA category (6), HSDPA category (10), SIM ICCID (XXXXXXXXXXXXXXXXXX), Primary scrambling code (PSC) (147), Power input mode (DCJack), Location area code (LAC) (011B), IMSI (XXXXXXXXXXXXXX), Cell ID (80784713), and Channel number (UARFCN) (3081).

Figure 19 - The Status page

ITEM	DEFINITION
System information	
System up time	The current uptime of the router.
Board version	The hardware version of the router.
Serial Number	The serial number of the router.
Firmware version	The firmware version of the router
Model	The type of phone module and the firmware version of the module.
Module firmware	The firmware revision of the phone module.
CID	Cellular configuration ID.
IMEI	The International Mobile Station Equipment Identity number used to uniquely identify a mobile device.
LAN	
IP	The IP address and subnet mask of the router.
MAC Address	The MAC address of the router.
Ethernet Port Status	Displays the current status of the Ethernet port and its operating speed.
Event notification	
Notification count	Displays the number of event notifications that have been triggered.
Cellular connection status	
SIM status	Displays the activation status of the router on the carrier network.
Signal strength (dBm)	The current signal strength measured in dBm
Network registration status	The status of the router's registration for the current network.
Provider	The current operator network in use.
Roaming status	The roaming status of the router.
Frequency	The current band being used by the router.
Coverage	The type of mobile coverage being received by the router.
Transparent bridge mode (If Transparent bridge is enabled)	
Status	The status of the bridged connection mode.
IP	The IP address and subnet mask of the bridged connection.
APN name	The Access Point Name you have selected for the bridged connection.
Service name	The optional service name you have chosen for the bridged connection.
Packet data connection status	
Profile name	The name of the active profile.
Status	The connection status of the active profile.
Default profile	Indicates whether the current profile in use is the default profile.
WWAN IP	The IP address assigned by the mobile broadband carrier network.
DNS server	The primary and secondary DNS servers for the WWAN connection.
APN	The Access Point Name currently in use.
Connection uptime	The length of time of the current mobile connection session.
Advanced status	
Mobile country code	The Mobile Country Code (MCC) of the network provider.
Mobile network code	The Mobile Network Code (MNC) of the network provider.
Signal quality (Ec/NO)	A measurement of the portion of the received signal that is usable. This is the signal strength minus the signal noise level.
Received signal code power (RSCP)	The power level of the signal on the current connection's particular channel.
Power input mode	Displays the current power source. On the Vodafone MachineLink 3G Plus, this will always display "DCJack" as PoE is not available.
HSUPA category	Displays the HSUPA category (1-6) for the current uplink
HSDPA category	Displays the HSDPA category (1-12) for the current downlink.
SIM ICCID	The Integrated Circuit Card Identifier of the SIM card used with the router, a unique number up to 20 digits in length.
Primary scrambling code (PSC)	The Primary scrambling code for the current signal.
DC input voltage	Displays the current voltage of the power input source provided via the DC Input jack

Location area code (LAC)	The ID of the cell tower grouping the current signal is broadcasting from.
IMSI	The International Mobile Subscriber Identity is a unique identifier of the user of a cellular network.
Cell ID	A unique code that identifies the base station from within the location area of the current mobile network signal.
Channel number (UARFCN)	The channel number of the current 3G/2G connection.

Table 11 - Status page item details

Networking

The Networking section provides configuration options for Wireless WAN, LAN, Routing and VPN connectivity.

Wireless WAN

Data connection

The data connection has two modes of operation:

Transparent bridge (PPPoE) ON

- In this mode the router does not manage the status of the connection to the packet data network. The status of the connection is instead managed by a client device connected behind the router via a PPPoE session. Certain functions of the router are unavailable when running in transparent bridge mode such as Connect on demand, Routing, VPN, TR-069, Router firewall and Remote access. As the responsibility of maintaining the connection is passed to a client machine, only that device will have network access.

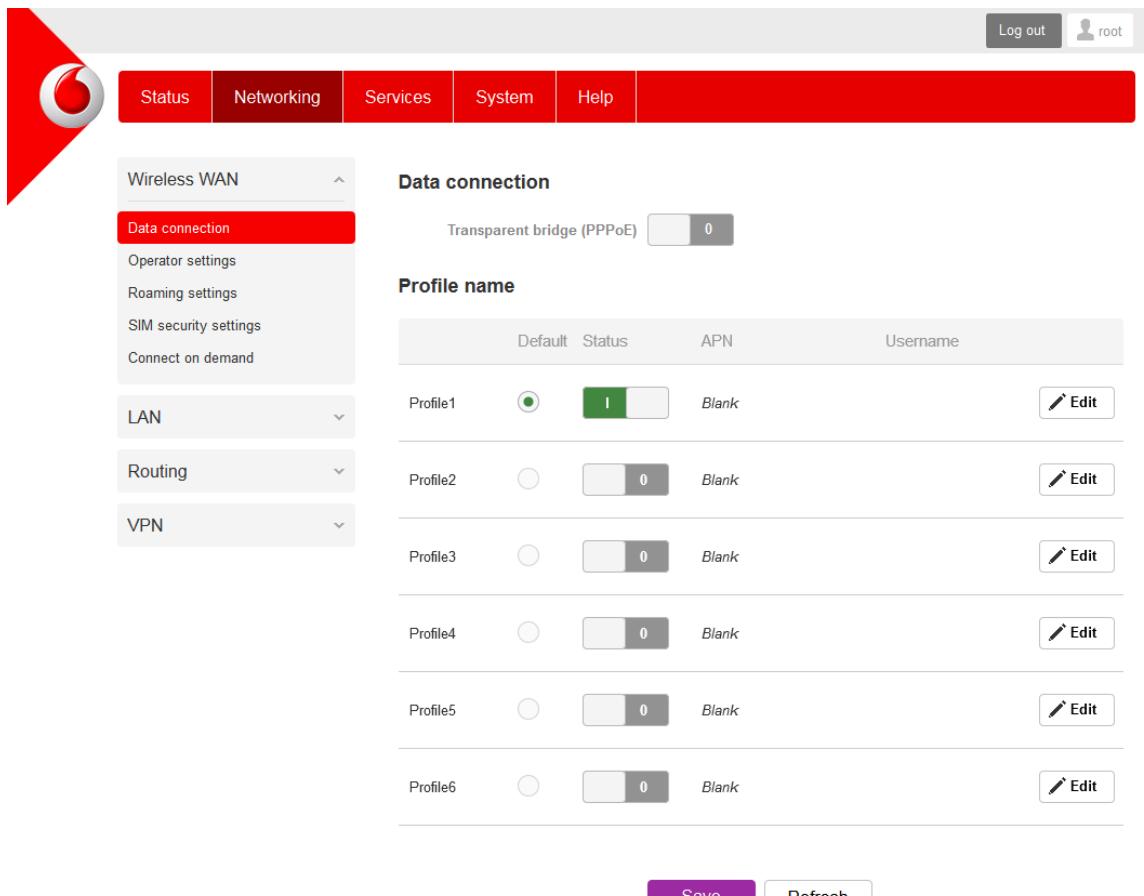
Transparent bridge (PPPoE) OFF

- This is the default mode of operation. When transparent bridging is turned off, the router manages the status of the connection allowing Connect on demand, Routing, VPN, TR-069, Router firewall and Remote access.

The data connection page allows you to configure and enable/disable up to six connection profiles or to alternatively bridge the data connection via a PPPoE session.

Each profile refers to a set of configuration items which are used by the router to activate a Packet Data (PDP) context. Under normal scenarios, you may have a single profile enabled. Multiple profiles can be used for simple fast-switching of PDP settings such as APN, or for advanced networking configuration where multiple simultaneous PDP contexts may be required.

When the transparent bridge function is off, you can configure the connection profiles by clicking the **Edit** button to the right of each row.



	Default	Status	APN	Username	
Profile1	<input checked="" type="radio"/>	<input checked="" type="checkbox"/>	Blank		
Profile2	<input type="radio"/>	<input type="checkbox"/>	0	Blank	
Profile3	<input type="radio"/>	<input type="checkbox"/>	0	Blank	
Profile4	<input type="radio"/>	<input type="checkbox"/>	0	Blank	
Profile5	<input type="radio"/>	<input type="checkbox"/>	0	Blank	
Profile6	<input type="radio"/>	<input type="checkbox"/>	0	Blank	

Figure 20 – Data connection settings

ITEM	DEFINITION
Data connection	
Transparent bridge (PPPoE)	Toggles the transparent bridge function on and off.
Profile name list	
Default	Sets the corresponding profile to be the default gateway for all outbound traffic except traffic for which there are configured static route rules or profile routing settings.
Status	Toggles the corresponding profile on and off. If your carrier supports it, two profiles may be turned on simultaneously.
APN	The APN configured for the corresponding profile.
Username	The username used to log on to the corresponding APN.

Table 12 - Data connection item details

Connecting to the mobile broadband network

The router supports the configuration of up to six APN profiles; these profiles allow you to configure the settings that the router will use to connect to the 2G/3G network and switch easily between different connection settings.

For advanced networking purposes, you may activate a maximum of two profiles simultaneously (dependent on network support). When activating two connection profiles, you should avoid selecting two profiles with the same APN as this can cause only one profile to connect. Similarly, activating two profiles which are both configured to automatically determine an APN can cause a conflict and result in neither profile establishing a connection. We recommend that the two active connection profiles have differing, manually configured APNs to avoid connection issues and ensure smooth operation.

Using a Vodafone Global SIM

When using a Vodafone Global SIM, the router is pre-configured with the APN field blank. A blank APN setting allows the network to determine the correct APN.

Data connection profile settings

Profile

Profile name	<input type="text" value="Profile1"/>
APN	<input type="text"/>
Username	<input type="text"/>
Password	<input type="text"/>
Authentication type <input checked="" type="radio"/> CHAP <input type="radio"/> PAP	
Reconnect delay	<input type="text" value="30"/> (30-65535) seconds
Reconnect retries	<input type="text" value="0"/> (0-65535, 0=Unlimited)
Metric	<input type="text" value="20"/> (0-65535)
MTU	<input type="text" value="1340"/> (1-1500)
NAT masquerading	<input checked="" type="button" value="1"/>

Profile routing settings

You may route only particular traffic via this connection profile by specifying the network address and mask below of the destination network. Blank values will route all traffic via this profile. Please leave these settings blank if you are unsure.

Network address . . .

Network mask . . .

Figure 21 - Data connection profile settings - Vodafone Global SIM

Using a non-Vodafone Global SIM

When using a non-Vodafone Global SIM, the MachineLink 3G Plus router gives you the option of turning Automatic APN selection on or off. By default, Profile 1 is configured with **Profile1** and **Automatic APN** set to **ON**.

When Automatic APN selection is turned on, the router selects an appropriate APN from an internal database of known APNs. If the SIM you have inserted into the router is not of a known carrier, you may need to manually enter an APN to obtain a network connection. See [manually configuring a connection profile](#) for details on entering an APN manually.

To see the automatically selected APN, view the Status page.

Data connection profile settings

Profile	<input checked="" type="button" value="1"/> <input type="button" value="2"/>
Profile name	<input type="text" value="Profile1"/>
Automatic APN selection	<input checked="" type="button" value="1"/> <input type="button" value="0"/>
Authentication type	<input checked="" type="radio"/> CHAP <input type="radio"/> PAP
Reconnect delay	<input type="text" value="30"/> (30-65535) seconds
Reconnect retries	<input type="text" value="0"/> (0-65535, 0=Unlimited)
Metric	<input type="text" value="20"/> (0-65535)
MTU	<input type="text" value="1358"/> (1358-1460)
NAT masquerading	<input checked="" type="button" value="1"/> <input type="button" value="0"/>

Profile routing settings

You may route only particular traffic via this connection profile by specifying the network address and mask below of the destination network. Blank values will route all traffic via this profile. Please leave these settings blank if you are unsure.

Network address	<input type="text"/> . <input type="text"/> . <input type="text"/> . <input type="text"/>
Network mask	<input type="text"/> . <input type="text"/> . <input type="text"/> . <input type="text"/>

Figure 22 - Data connection profile settings –Non-Vodafone Global SIM - Automatic APN settings

Manually configuring a connection profile

To manually configure a connection profile:

1. Click the **Edit** button corresponding to the Profile that you wish to modify. The data connection profile settings page is displayed.

Data connection profile settings

Profile	<input type="button" value="0"/> <input checked="" type="button" value="1"/>
Profile name	<input type="text" value="Profile2"/>
Automatic APN selection	<input type="button" value="0"/> <input checked="" type="button" value="1"/>

Figure 23 - Data connection profile settings

2. Click the **Profile** toggle key to turn the profile on.

Data connection profile settings

Profile

Profile name

Automatic APN selection 0

APN	<input type="text"/>
Username	<input type="text"/>
Password	<input type="text"/>

Authentication type CHAP PAP

Reconnect delay (30-65535) seconds

Reconnect retries (0-65535, 0=Unlimited)

Metric (0-65535)

MTU (1358-1460)

NAT masquerading

Profile routing settings

You may route only particular traffic via this connection profile by specifying the network address and mask below of the destination network. Blank values will route all traffic via this profile. Please leave these settings blank if you are unsure.

Network address · · ·

Network mask · · ·

Figure 24 - Data connection settings - Profile turned on



Note: The Automatic APN toggle key is not available when using a Vodafone Global SIM.

3. In the **Profile name** field, enter a name for the profile. This name is only used to identify the profile on the router.
4. When using a SIM other than a Vodafone Global SIM, ensure that the **Automatic APN selection** toggle key is set to off. If it is not, click it to toggle it to the off position.
5. In the **APN** field, enter the APN Name (Access Point Name) and if required, use the **Username** and **Password** fields to enter your login credentials (if required).
6. Next to **Authentication** type, select the either CHAP or PAP depending on the type of authentication used by your provider.
7. The **Reconnect delay** field specifies the number of seconds to wait between connection attempts. The default setting of 30 seconds is sufficient in most cases but you may modify it to wait up to 65535 seconds if you wish.
8. The **Reconnect retries** field specifies the number of times to attempt to connect to the network if the router fails to establish a connection. It is set to 0 by default which causes the router to attempt to reconnect indefinitely.
9. The **Metric** value is used by router to prioritise routes (if multiple are available) and is set to 20 by default. This value is sufficient in most cases but you may modify it if you are aware of the effect your changes will have on the service.

10. Use the **NAT masquerading** toggle key to turn NAT Masquerading on or off. NAT masquerading, also known simply as NAT is a common routing feature which allows multiple LAN devices to appear as a single WAN IP via network address translation. In this mode, the router modifies network traffic sent and received to inform remote computers on the internet that packets originating from a machine behind the router actually originated from the WAN IP address of the router's internal NAT IP address. This may be disabled if a framed route configuration is required and local devices require WAN IP addresses.
11. For advanced networking such as using dual simultaneous PDP contexts, you may wish to configure a particular profile to route only certain traffic via that profile by configuring a custom address and mask of traffic to send via that profile. To do this, in the Profile routing settings section, enter the **Network address** and **Network mask** of the remote network If you do not enter any profile routing settings, the profile will be active but no traffic will be routed through it. For more information on configuring Profile routing settings, see the [Setting a default gateway with two active connection profiles](#) example.
12. Click the **Save** button when you have finished entering the profile details.

Confirming a successful connection

After configuring the packet data session, and ensuring that it is enabled, click on the Status menu item at the top of the page to return to the Status page. When there is a mobile broadband connection, the **Packet data connection status** section is expanded showing the details of the connection and the Status field displays **Connected**. To see details on the connected session, you can click the **Show data usage** button.

Packet data connection status

Profile name Profile1	WWAN IP 10.86.68.167	APN Blank
Status Connected	DNS server 62.140.138.233 62.140.140.251	Connection uptime 01:16:10
Default profile Yes	Show data usage	

Figure 25 - Packet data connection status section

Checking data usage

On the Status page, each packet data connection profile has a **Show data usage** button which displays the amount of data received, sent and a total data usage figure.

To show the data use for a connected profile, click the **Show data usage** button. The data usage for the last 10 sessions is displayed in addition to the current session.

Packet data connection status				
Profile name Profile1	WWAN IP 10.86.68.167	APN Blank		
Status Connected	DNS server 62.140.138.233	Connection uptime 01:17:17		
Default profile Yes			Hide data usage	Show duration
Session start	Session end time	Data received (bytes)	Data sent (bytes)	Total data (bytes)
16/10/2014 23:30:20 BST	Current session	4,329,151	1,272,365	5,601,516

Figure 26 - Data usage

Click the **Show duration** link to toggle the display to show the duration of each session rather than the start and end times.

Packet data connection status				
Profile name Profile1	WWAN IP 10.86.68.167	APN Blank		
Status Connected	DNS server 62.140.138.233	Connection uptime 01:18:16		
Default profile Yes			Hide data usage	Show end time
Session start	Session duration	Data received (bytes)	Data sent (bytes)	Total data (bytes)
16/10/2014 23:30:20 BST	01:18:16	4,330,930	1,274,428	5,605,358

Figure 27 - Data usage with connection duration

Transparently bridging the mobile broadband connection via PPPoE

If desired, you can have a client device connected to the Ethernet port initiate the mobile broadband connection using a PPPoE session. This is particularly useful in situations where you wish to provide Wireless WAN data access to an existing router which you want to have full public WAN IP access and have control over routing functionality.

To enable transparent bridging via PPPoE:

1. Click the **Networking** menu item from the top menu bar.
2. On the Data connection page, click the **Transparent bridge (PPPoE)** toggle key so that it is ON.

Data connection

Transparent bridge (PPPoE)

In this mode the unit acts as an Ethernet Bridge instead of as an IP Router. This is facilitated by PPPoE which forwards the WAN IP/DNS information to a downstream LAN device and facilitates transparent network connectivity. To use this feature, you need to initiate a PPPoE client connection from a downstream device (such as a Ethernet Router or computer) which is then accepted by the MachineLink 3G Plus. The MachineLink 3G Plus operates a PPPoE server and will activate a PDP context using the username/password from the PPPoE client connection and the APN configured on this page. This allows control over the PDP context activation by the downstream device. Once enabled in this mode, some router functionality will no longer be applicable and will cease to function (e.g Connect on demand, routing, VPN, TR-069, Router firewall, remote access, and others). Only a single downstream device is permitted Wireless WAN connectivity and all traffic is forwarded to that device. Please note in this mode, the downstream device is responsible for all network security as the built-in firewall has no effect.

Transparent bridge mode configuration

APN name	<input type="text"/>
Service name <input type="text"/>	
<input type="button" value="Save"/> <input type="button" value="Refresh"/>	

Figure 28 - Transparent bridge configuration

3. In the **APN name** field, enter the APN that you wish to use for the mobile broadband connection. If using a Vodafone Global SIM card, you may leave this blank or use any of the Vodafone assigned APNs.
4. (Optional) In the **Service name** field, enter a name that allows you to easily identify the connection.
5. Click the **Save** button to confirm the settings.
6. Click the **Status** menu item from the top menu bar to see the transparent bridging status.

^ Transparent bridge mode

Status
ENABLED
IP
0.0.0.0 / 255.255.255.255
APN name
Blank
Service name
Blank

Figure 29 - Transparent bridge mode status

7. Next you must configure your downstream device connected via Ethernet to the Vodafone MachineLink 3G Plus router to initiate a network connection using a PPPoE client. The username and password used by the downstream device for the PPPoE session will be passed on and used by the Vodafone MachineLink 3G Plus router as the packet data (PDP) context authentication settings.

Operator settings

The Operator settings page enables you to select which frequency band you will use for your connection and enables you to scan for available network operators in your area.

Band settings

Change band

Figure 30 - Band settings



Note: Band settings and Operator settings do not take effect until you click the **Apply** button.

You may want to do this if you're using the router in a country with multiple frequency networks that may not all support High Speed Packet Access (HSPA). You can select the router to only connect on the network frequencies that suit your requirements.

Use the **Change band** drop down list to select the band you wish to use.

The following band settings options are available:

- All Bands
- GSM All
- WCDMA All
- GSM 850
- GSM 900
- GSM 1800
- GSM 1900
- WCDMA 850
- WCDMA 900
- WCDMA 800
- WCDMA 1900
- WCDMA 2100

It is not necessary to change the default setting of **All bands** in most cases. In fact, locking to a particular band can cause connection difficulties if the device is moved to a location where the forced band selection is no longer available.

When **All bands** is selected, the router attempts to find the most suitable band based on the available networks for the inserted SIM card.

The GSM All and the WCDMA all options allow you to force the device to lock to either 2G networks only, or 3G networks only.

Click the **Save** button to save and apply your selection.

Operator settings

The operator settings feature allows you to select whether to allow the router to automatically select a network or to manually scan for a network to which the router is locked.

Using a Vodafone GDSP SIM

When a GDSP SIM is inserted and the operator mode is set to **Automatic**, you are provided with further options to configure cost effective mode and network access technology preference. When **Cost effective mode** is turned on, the router selects the best carrier's 3G network (according to the PLMN list) and if that fails, it selects the 2G network of the same carrier. If connection to that network fails, the router then attempts to connect to the next best carrier's 3G network and so on.

Operator settings

Select operator mode Automatic Manual

Cost effective mode

Network access technology preference 3G 2G

Current operator registration vodafone AU

Figure 31 - Operator settings (using Vodafone GDSP SIM)

Using a non-Vodafone GDSP SIM

When a non-Vodafone GDSP SIM is inserted and operator mode is set to Automatic, the router attempts to connect to the best network (3G or 2G) of the carrier that provided the SIM

Operator settings

Select operator mode Automatic Manual

Current operator registration XXXXXXXX

Figure 32 - Operator settings (using non-Vodafone GDSP SIM)

To scan for available networks, set the **Select operator mode** from **Automatic** to **Manual** then click the scan button. This operation can take a few minutes and requires that the packet data session be disconnected prior to scanning.

A list of the detected 3G service carriers in your area is displayed.

Operator name list	MCC	MNC	Operator status	Network type
<input type="radio"/> vodafone AU	505	03	Available	GSM (2G)
<input checked="" type="radio"/> vodafone AU	505	03	Current	UMTS (3G)
<input type="radio"/> Telstra	505	01	Available	GSM (2G)
<input type="radio"/> YES OPTUS	505	02	Available	GSM (2G)
<input type="radio"/> Telstra	505	01	Available	UMTS (3G)
<input type="radio"/> YES OPTUS	505	02	Available	UMTS (3G)

Figure 33 - Detected operator list

Select the most appropriate 3G/2G service from the list shown and click **Apply**.

When **Select operator mode** is set to **Automatic**, the router selects the most appropriate operator based on the inserted SIM card. This is the default option and is sufficient for most users.

Roaming settings

When the **Allow data roaming** toggle key is set to **ON**, the router will allow local devices to access the Wireless WAN network when it is roaming onto a foreign network. When set to **OFF**, the router will deny network access to data services when roaming onto a foreign network. This setting is **OFF** by default.

Roaming settings (Vodafone GDSP SIMs only)

The roaming settings page provides the ability to configure the Advanced Vodafone network (PLMN) selection feature. This feature provides a specialized algorithm which the router uses to select the best network to connect to from a prioritized list of networks which are stored on the router.

Roaming settings

Advanced Vodafone network (PLMN) selection

Validate PDP context activation

Best network retry period

(10-2880, 0=disabled) minutes

Show advanced settings

PRL list

PRL list in use IMSI range [20404], Version [14.09.15.20404]

In Use	IMSI range	Version	Action
✓	20404	14.09.15.20404	Default
	90128	14.09.15.90128	Default

System log filtered for roaming entries

The system log viewer below shows the standard system log messages as per the System tab, except it is filtered on this page to show only entries relating to the device's network selection and roaming using Vodafone GDSP SIM cards.

There are no roaming entries in the log

Figure 34 - Roaming settings

ITEM	DEFINITION
Advanced Vodafone network (PLMN) selection	Switches the advanced network selection on or off. When on, the router will follow the advanced network selection algorithm designed by Vodafone to connect to the best network according to a priority ranked list stored on the router. If this is switched off, the router will revert to a standard connection methodology following the PLMN list stored on the SIM Card. It is recommended to leave advanced network selection enabled, unless there is a particular reason to disable it.
Validate PDP context activation	When this is turned on, the router verifies the default profile's username and password entered on the Profile settings page by activating a PDP context with each scanned network during advanced network selection process. This helps the router to avoid connecting to networks that are inaccessible by only allowing registration to a network if a PDP context was able to be established successfully. When this option is turned off, the router does not perform any validation of the PDP context activation and will register to a network even if it then cannot establish a PDP context.
Best network retry period	Sets the period for which the router will attempt to establish a connection to the best network listed in the preferred roaming list. This only takes place if the router is not already connected to the best network. By default this is set to 30 minutes. The best network retry period must be a value in minutes between 10 and 2880. Setting this option to 0 disables the router from retrying a connection to the best network.

Table 13 - Roaming settings options

The **PRL list** displays the Preferred Roaming Lists that are loaded on the router. The PRL lists are labelled according to the first 5 digits of the range of IMSI numbers that they cover. The list also indicates which list is in use, the version number of the list and an option to delete custom lists.



Note: Vodafone in The Netherlands uses IMSI range 20404, therefore regular Vodafone (non-GDSP) SIMs issued by Vodafone Netherlands may be detected as Vodafone GDSP SIMs. If using a Vodafone Netherlands issued SIM, please disable the **Advanced Vodafone network (PLMN) selection** option to avoid any problems.

Advanced settings

When the **Show advanced settings** option is selected, you are presented with the ability to customise the RSSI threshold.

Show advanced settings

RSSI threshold

105

Enter a positive numeric value between 105 and 95, which will be processed as a negative figure between -105 to -95 dBm.

Apply

Figure 35 – Advanced roaming settings

The Received Signal Strength Indicator (RSSI) threshold specifies the value in decibel-milliwatts that the signal strength must fall below for a total of 15 seconds without any traffic passing through before the router attempts to connect to the next network in the PRL list. RSSI values on cellular networks typically range between -113dBm (weak) and -51dBm (strong). As the RSSI approaches 0, the signal strength becomes stronger. The value that you enter into this field should be expressed as a positive integer but the router will process it as a negative value. The default RSSI threshold is -105dBm.



Warning: Adjusting the RSSI roaming threshold incorrectly or without proper testing and validation may adversely affect network acquisition. Establishing a value different from the default, 105 (-105 dBm), will eliminate network registration attempts with any network observed to have a signal lower than the established threshold. Selecting a higher threshold may also eliminate available low cost networks resulting in higher data costs. It is recommended to consult your Vodafone technical contact prior to adjusting this parameter.

When you have made the desired change, click the **Apply** button. The router displays the above warning message. If you are sure you wish to proceed, select the “**I have read and understand the risk**” checkbox then click the **OK** button. The new RSSI threshold is applied immediately.

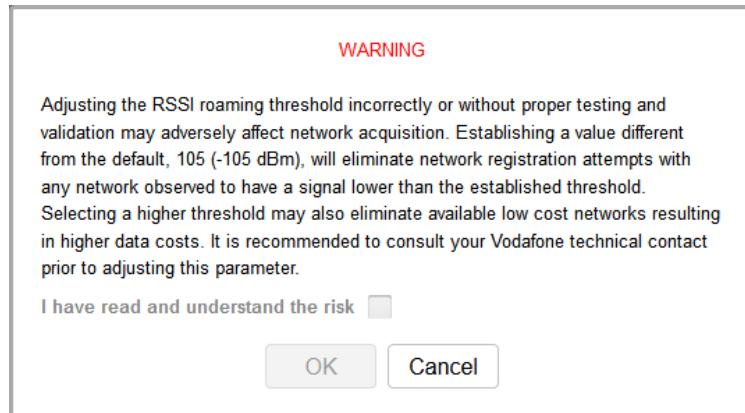


Figure 36 - RSSI threshold warning

The **System log filtered for roaming entries** section displays system log messages as per the System tab, except they are filtered to show only the entries related to the device's network selection and roaming using Vodafone GDSP SIM cards. You may use the **Download** button to download a filtered log file containing only messages related to the advanced network selection algorithm. The **Clear** button removes all System log records, including those records unrelated to the advanced network selection.

SIM security settings

The SIM security settings page can be used for authenticating SIM cards that have been configured with a security PIN.

Unlocking a PIN locked SIM

If the SIM card is locked, you will receive a notice when you access the Status page after which you will be directed to the PIN settings page to enter the PIN. The PIN settings page lists the status of the SIM at the top of the page.

If you are not redirected to the PIN settings page, to unlock the SIM:

1. Click on the **Networking** menu from the top menu bar, and then click **SIM security settings**.

PIN settings

! SIM is PIN locked - remaining attempt(s) 3

Current PIN

Confirm current PIN

Remember PIN

Save

Figure 37 - SIM security settings - SIM PIN locked

2. Enter the PIN in the **Current PIN** field and then enter it again in the **Confirm current PIN** field to confirm the PIN.
3. If you are placing the router in a remote, unattended location, you may wish to check the **Remember PIN** option. This feature allows the router to automatically send the PIN to the SIM each time the SIM asks for it (usually at power up). This enables the SIM to be PIN locked (to prevent unauthorised re-use of the SIM elsewhere), while still allowing the router to connect to the cellular service.

When this feature is enabled, the PIN you enter when setting the **Remember PIN** feature is encrypted and stored locally on the router. The next time the SIM asks the router for the PIN, the router decrypts the PIN and automatically sends it to the SIM without user intervention.

When this feature is disabled and the SIM is PIN locked, the PIN must be manually entered via the router's configuration interface. In situations where the router will be unattended, this is not desirable.



Note: Select **Remember PIN** if you do not want to enter the PIN code each time the SIM is inserted.

4. Click the **Save** button. If successful, the router displays the following screen:

✓ **Success!**
 The SIM unlock was successful

PIN settings

SIM OK ✓

PIN remembered

PIN protection

|

[Change PIN](#)

Current PIN

••••

Confirm current PIN

••••

Remember PIN

[Save](#)

Figure 38 - SIM security settings - SIM unlock successful

Enabling/Disabling SIM PIN protection

The security PIN protection can be turned on or off using the **PIN protection** toggle key.

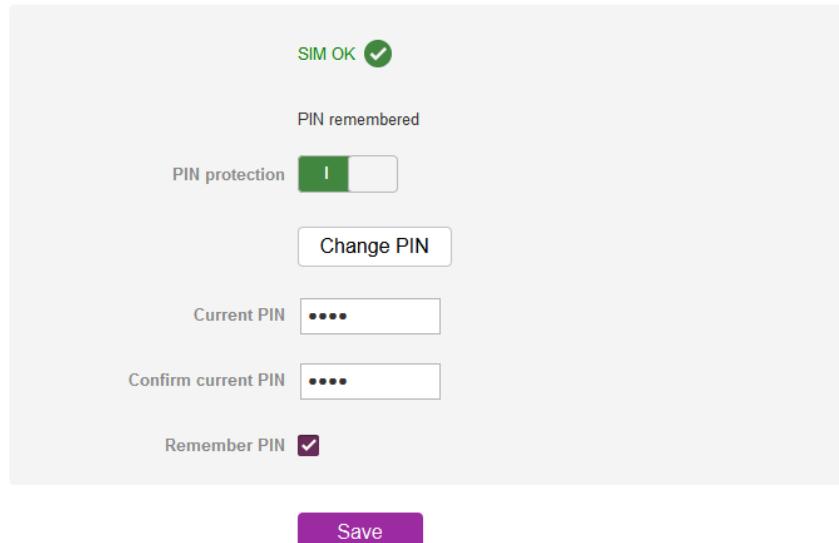


Figure 39 - PIN protection toggle key

Changing the SIM PIN code

If you would like to change the PIN, click the **Change PIN** button and enter the current PIN into the **Current PIN** and **Confirm current PIN** fields, then enter the desired PIN into the **New PIN** and **Confirm new PIN** fields and click the **Save** button.

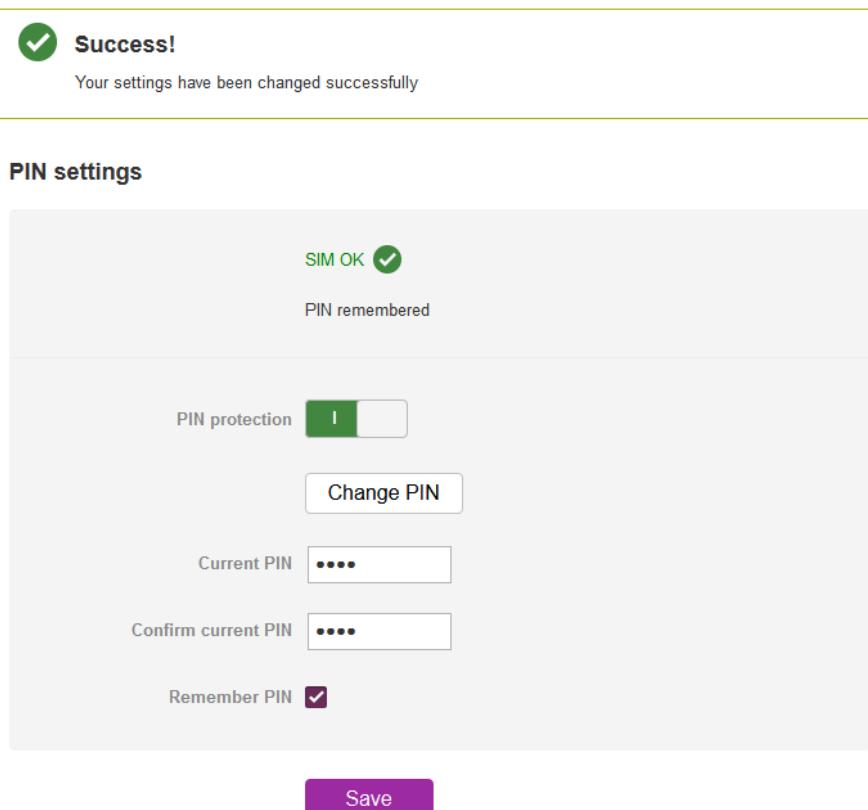
PIN settings



The screenshot shows the 'PIN settings' page. At the top, a green 'SIM OK' status bar with a checkmark is displayed. Below it, a message says 'PIN remembered'. A 'PIN protection' toggle switch is turned on, indicated by a green bar. A large 'Change PIN' button is centered. Below the button are two input fields: 'Current PIN' containing '****' and 'Confirm current PIN' also containing '****'. A 'Remember PIN' checkbox is checked. At the bottom is a purple 'Save' button.

Figure 40 - PIN settings - Change PIN

When the PIN has been changed successfully, the following screen is displayed:



The screenshot shows a success message box with a green checkmark icon and the text 'Success! Your settings have been changed successfully'. Below this, the 'PIN settings' page is shown again. It includes the 'SIM OK' status bar, 'PIN remembered' message, 'PIN protection' toggle (on), 'Change PIN' button, 'Current PIN' and 'Confirm current PIN' fields both showing '****', and the 'Remember PIN' checkbox. A purple 'Save' button is at the bottom.

Figure 41 - SIM security settings – PIN change successful

Unlocking a PUK locked SIM

After three incorrect attempts at entering the PIN, the SIM card becomes PUK (Personal Unblocking Key) locked and you are requested to enter a PUK code to unlock it.

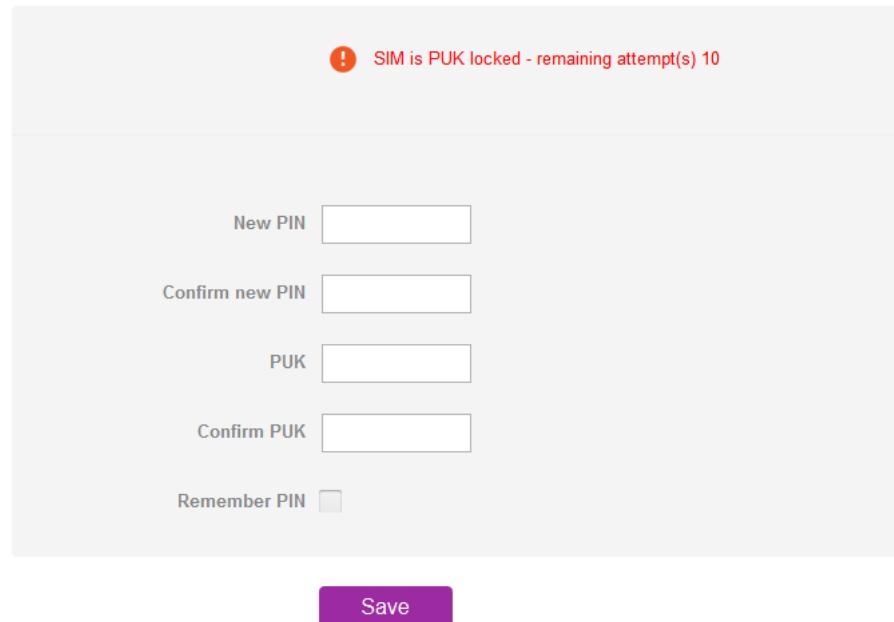


Note: To obtain the PUK unlock code, you must contact your service provider.

You will be issued a PUK to enable you to unlock the SIM and enter a new PIN. Enter the new PIN and PUK codes.

Click the **Save** button when you have finished entering the new PIN and PUK codes.

PIN settings



SIM is PUK locked - remaining attempt(s) 10

New PIN

Confirm new PIN

PUK

Confirm PUK

Remember PIN

Save

Figure 42 - SIM security - SIM PUK locked

Connect on demand

The connect on demand feature keeps the Packet Data Protocol (PDP) context deactivated by default while making it appear to locally connected devices that the router has a permanent connection to the mobile broadband network. When a packet of interest arrives or an SMS wake-up command is received, the router attempts to establish a mobile broadband data connection. When the data connection is established, the router monitors traffic and terminates the link when it is idle.



Note: When interesting packets arrive, the recovery time for the wireless WAN connection is approximately 20-30 seconds.

Configuring Connect on demand

To configure Connect on demand:

1. Click the **Networking** menu item from the top menu bar.
2. On the **Connect on demand** page, click the **Connect on demand** toggle key so that it is **ON**. Extra options appear. Note that the **Selected profile** drop down list is greyed out and is used to display the currently selected default profile for which the Connect on demand feature will apply. See the following sub-sections for further instructions.

Connect on demand

The connect on demand feature keeps the PDP context deactivated by default while making it appear that the router has permanent connection to WWAN and locally connected devices. When interesting packets arrive or an SMS wake-up command is received, the router will attempt to establish a WWAN data connection. The router will monitor traffic once the data connection is established and will terminate it when the link is idle.

Figure 43 - Connect on demand configuration options

Setting the router to dial a connection when traffic is detected on specific ports

In some situations, you may wish to have the internet connection disabled except at times when outbound traffic to a particular external host's port or group of ports is sent to the router. To use this feature, click **Enable dial port filter** and enter the port number or list of port numbers separated by commas. When you select this option, all outbound TCP/UDP packets to any remote host on the specified port(s) will trigger the connection to dial. Note that when this feature is enabled, the options to ignore specific packet types are not available.

Data activity triggered connection
Connect only when traffic appears to these UDP/TCP destination ports. You can specify multiple ports by separating them with a comma (eg 21, 23, 53).

Figure 44 – Connect on demand - Data activity triggered connection

You can allow Microsoft network awareness (NCSI) traffic through but if you prefer that they do not trigger the connection, click the **Ignore Microsoft network awareness (NCSI) traffic** toggle key to set it to **ON**.

Connect on data activity except when activity matches these applications

Figure 45 - Connect on demand - Ignore NCSI traffic

Excluding certain packet types from triggering the connection to dial

Depending on your environment, you might prefer to exclude certain types of traffic passing through the router from triggering the data connection. You can tell the router to ignore outbound TCP, UDP or ICMP packets. When any of these options are checked the router will not dial a connection when that type of outbound destined data packet reaches the router from a locally connected device.

Connect on data activity except when activity matches these IP protocols

Ignore ICMP	<input checked="" type="checkbox"/>
Ignore TCP	<input type="checkbox"/>
Ignore UDP	<input type="checkbox"/>

Figure 46 – Connect on demand - Excluding IP protocols

Excluding certain application types from triggering the connection to dial

Some devices may generate general traffic as a part of normal operation which you may not want to trigger the data connection. You can set the router to ignore Domain Name System (DNS), Network Time Protocol (NTP) or Microsoft network awareness (NCSI) traffic from devices behind the router. When you check the box for these options, it tells the router to ignore the request from that application type and will not dial a connection when this data type is received.

Connect on data activity except when activity matches these applications

Ignore DNS	<input checked="" type="checkbox"/>
Ignore NTP	<input checked="" type="checkbox"/>
Ignore Microsoft network awareness (NCSI) traffic	<input type="checkbox"/>

Figure 47 - Connect on demand - Excluding application types

Setting timers for connection and disconnection

The router has a number of timer settings which let you determine when a connection is dialled and when it is disconnected.

Connect and disconnect timers	Periodic connect schedule
On data activity, stay online for at least	<input type="text" value="20 minutes"/> ▼
After connecting, stay online for at least	<input type="text" value="20 minutes"/> ▼
After hanging up, don't redial for	<input type="text" value="5 seconds"/> ▼
Disconnect regardless of traffic after	<input type="text" value="never"/> ▼
Connect regularly, every	<input type="text" value="never"/> ▼
Randomize connect frequency by up to	<input type="text" value="never"/> ▼

Figure 48 – Connect on demand - Connect and disconnect timers

OPTION	DESCRIPTION
On data activity, stay online for at least	When traffic as per the configured settings above appear, the router will either continue to stay online, or dial a connection and will not disconnect it for the specified time period (min. 1 minute, max. 1 hour). This timer is continuously reset throughout the duration of a dial-up session, whenever data activity is detected matching the rules above.
After connecting, stay online for at least	This timer configures the router to not hang-up the connection for the specified time period after initially dialling the connection. This setting cannot be less than the keep online period above. This timer affects the connection only once per dial up session, at the beginning of the session.
After hanging up, don't redial for	After a connection has been disconnected, you can tell the router to rest for a period of time before re-dialling.
Disconnect regardless of traffic after	Forces the router to disconnect the connection regardless of the traffic passing through it. The default setting is <i>never</i> .
Connect regularly, every / Randomise connect frequency by up to	If you want to have the router dial a connection at regular intervals, use Connect regularly, every to specify the interval between dials. Setting this to <i>never</i> effectively disables this option. The router also features the ability to randomise the time at which the first dial action is performed. This is useful in situations such as where you have numerous routers in an area where a power outage has occurred. Setting a random dial time helps to reduce network congestion when all the routers are powered on so they do not all try to connect simultaneously. When Connect regularly, every is set to at least 2 minutes, you are able to configure the router to randomise the time it begins to dial. The randomised dial timer only affects the initial dial after the unit powers on or after the settings are saved. For example, if you configure the router to dial every 2 minutes with a randomised dial starting time of 1 minute, the router waits for the Connect regularly, every time (2 minutes) and then randomly selects a time less than or equal to the Randomise connect frequency by up to time (1 minute). After the randomly selected time has elapsed, the router dials the connection. After the first dial, the router dials the connection every 2 minutes, ignoring the Randomise connect frequency by up to time.

Table 14 - Connect on demand - Connect and disconnect timers descriptions

Verbose mode

The router provides the option of logging all the data activity which matches the settings for the Connect on demand feature for advanced troubleshooting purposes. To enable the recording of detailed logs, click the **Enable verbose mode** toggle key to switch it **ON**. See the System log section for more information.

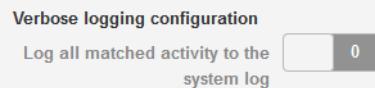


Figure 49 – Connect on demand - Verbose logging configuration

Manually connecting/disconnecting

There may be times when you need to either force a connection to be made or force a disconnection manually. You can use the **Manual connect** and **Manual disconnect** buttons to do this whenever necessary. The online status of the connection is displayed above the buttons.

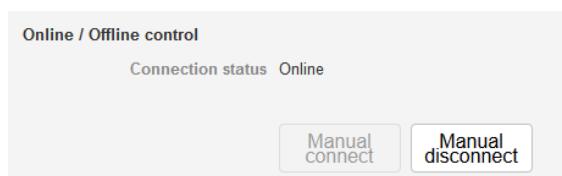


Figure 50 - Connect on demand - Online/Offline control

When you have finished configuring the options for the Connect on demand feature, click the **Save** button at the bottom to save your changes.

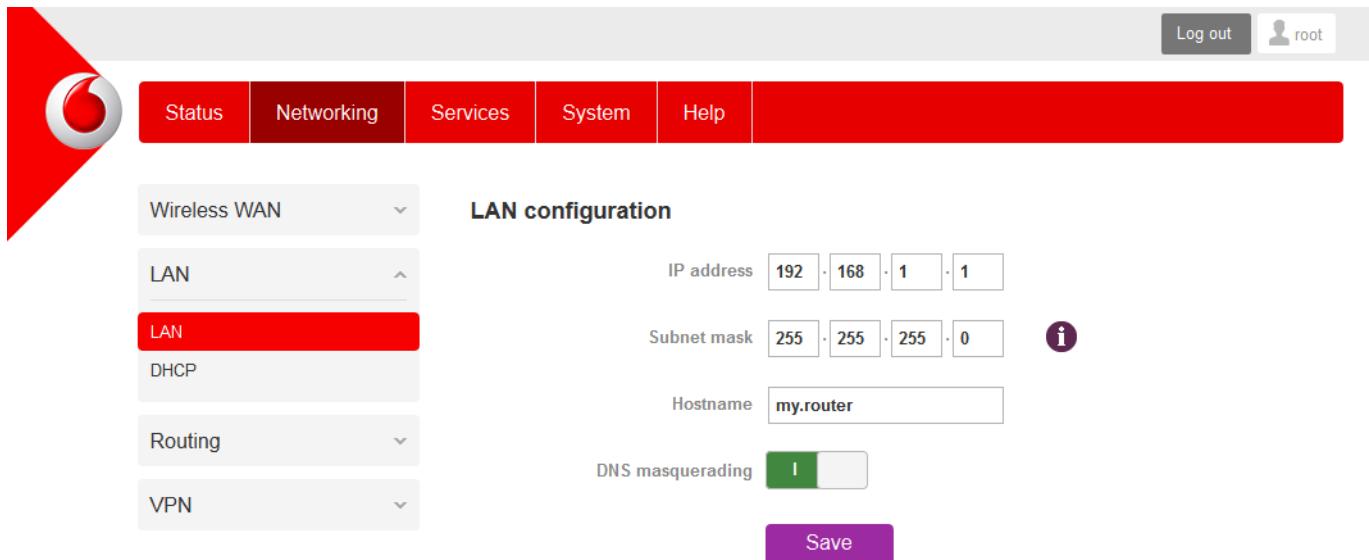
SMS Wake up

The router can also be woken up by means of an SMS message using the SMS diagnostics feature by sending a zero byte class 1 flash SMS. See the Diagnostics section for details on using the SMS Wake up function.

LAN

LAN configuration

The LAN configuration page is used to configure the LAN settings of the router and to enable or disable DNS Masquerading.



Wireless WAN

LAN configuration

IP address: 192 · 168 · 1 · 1

Subnet mask: 255 · 255 · 255 · 0

Hostname: my.router

DNS masquerading:

Save

Figure 51 – LAN configuration settings

The default IP of the Ethernet port is 192.168.1.1 with subnet mask 255.255.255.0. To change the IP address or Subnet mask, enter the new IP Address and/or Subnet mask and click the **Save** button.



Note: If you change the IP address, remember to refresh the Ethernet interface of your device or set an appropriate IP address range, then enter the new IP address into your browser address bar to access the router.

DNS masquerading

DNS masquerading allows the router to proxy DNS requests from LAN clients to dynamically assigned DNS servers. When enabled, clients on the router's LAN can then use the router as a DNS server without needing to know the dynamically assigned cellular network DNS servers.

With DNS masquerading **ON**, the DHCP server embedded in the Vodafone MachineLink 3G Plus router hands out its own IP address (e.g. 192.168.1.1) as the DNS server address to LAN clients. The downstream clients then send DNS requests to the Vodafone MachineLink 3G Plus router which proxies them to the upstream DNS servers.

With DNS masquerading **OFF**, the DHCP server hands out the upstream DNS server IP addresses to downstream clients directly, so that downstream clients send DNS requests directly to the upstream DNS servers without being proxied by the Vodafone MachineLink 3G Plus router.

You may also override the DNS Masquerading option by specifying custom DNS Server IP addresses in the DHCP Server configuration mentioned in the next section of this guide. In this case the DHCP server assigns downstream devices the manually configured addresses and the DNS Masquerading option is ignored.

In most cases, it is not necessary to disable DNS masquerading but if you need to, click the **DNS masquerading** toggle key to turn it **OFF** and then click the **Save** button.

DHCP

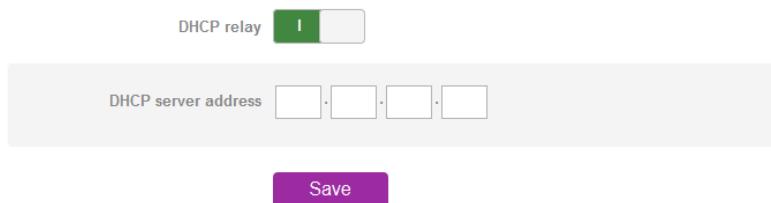
The DHCP page is used to adjust the settings used by the router's built in DHPC Server which assigns IP addresses to locally connected devices.

DHCP relay configuration

In advanced networks configurations where the Vodafone MachineLink 3G Plus router should not be responsible for DHCP assignment, but instead an existing DHCP server is located on the Wireless WAN or LAN connections, the clients behind the Vodafone MachineLink 3G Plus router are able to communicate with the DHCP server when DHCP relay is enabled. This enables the Vodafone MachineLink 3G Plus router to accept client broadcast messages and to forward them onto another subnet.

To configure the router to act as a DHCP relay agent click the **DHCP relay** toggle key to turn it **ON** and enter the DHCP server address into the **DHCP server address** field. DHCP relay is disabled by default.

DHCP relay configuration



DHCP relay

DHCP server address . . .

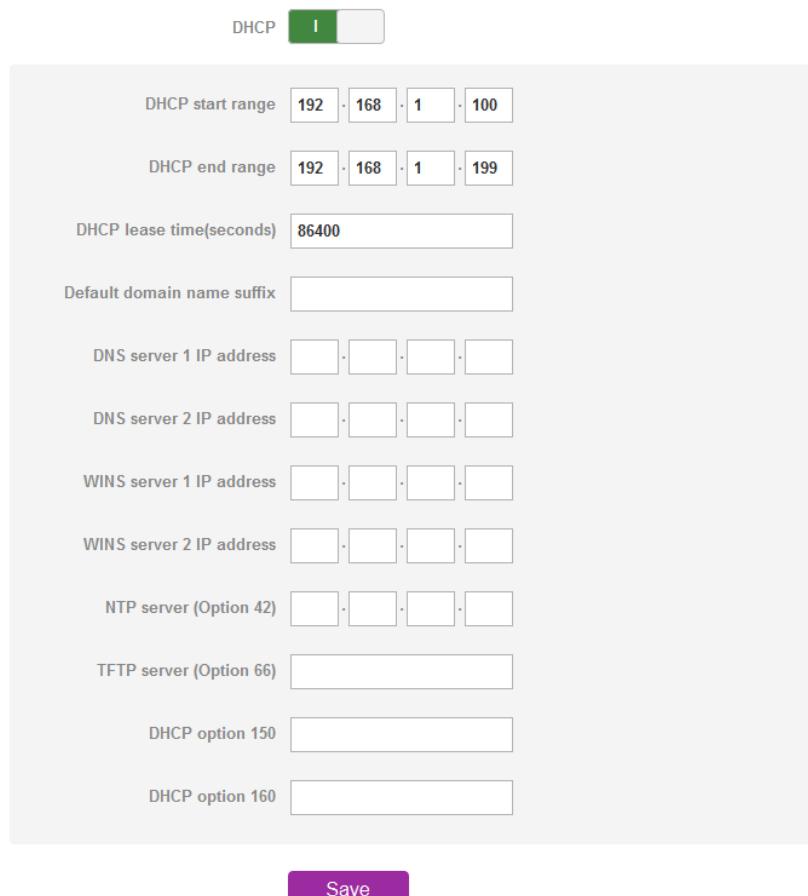
Save

Figure 52 – DHCP relay configuration

DHCP configuration

You can manually set the start and end address range to be used to automatically assign addresses within, the lease time of the assigned address, the default domain name suffix, primary and secondary DNS server, the primary and secondary WINS server, as well as the advanced DHCP settings such as NTP, TFTP and Option 150/Option 160 (VoIP options).

DHCP configuration



DHCP

DHCP start range . . .

DHCP end range . . .

DHCP lease time(seconds) 86400

Default domain name suffix

DNS server 1 IP address . . .

DNS server 2 IP address . . .

WINS server 1 IP address . . .

WINS server 2 IP address . . .

NTP server (Option 42) . . .

TFTP server (Option 66)

DHCP option 150

DHCP option 160

Save

Figure 53 - DHCP configuration

OPTION	DESCRIPTION
DHCP start range	Sets the first IP address of the DHCP range
DHCP end range	Sets the last IP address of the DHCP range
DHCP lease time (seconds)	The length of time in seconds that DHCP allocated IP addresses are valid
Default domain name suffix	Specifies the default domain name suffix for the DHCP clients. A domain name suffix enables users to access a local server, for example, server1, without typing the full domain name server1.domain.com
DNS server 1 IP address	Specifies the primary DNS (Domain Name System) server's IP address.
DNS server 2 IP address	Specifies the secondary DNS (Domain Name System) server's IP address.
WINS server 1 IP address	Specifies the primary WINS (Windows Internet Name Service) server IP address
WINS server 2 IP address	Specifies the secondary WINS (Windows Internet Name Service) server IP address
NTP server (Option 42)	Specifies the IP address of the NTP (Network Time Protocol) server
TFTP Server (Option 66)	Specifies the TFTP (Trivial File Transfer Protocol) server
DHCP option 150	This is used to configure Cisco IP phones. When a Cisco IP phone starts, if it is not pre-configured with the IP address and TFTP address, it sends a request to the DHCP server to obtain this information. Specify the string which will be sent as a reply to the option 150 request.
DHCP option 160	This is used to configure Polycom IP phones. When a Polycom IP phone starts, if it is not pre-configured with the IP address and TFTP address, it sends a request to the DHCP server to obtain this information. Specify the string which will be sent as a reply to the option 160 request.

Enter the desired DHCP options and click the **Save** button.

Address reservation list

DHCP clients are dynamically assigned an IP address as they connect, but you can reserve an address for a particular device using the address reservation list.

Address reservation list
+ Add

Computer name	MAC address	IP address	Enable
<input type="text"/>	<input type="text"/>	<input type="text"/> · <input type="text"/> I <input type="button" value="x"/>	<input type="checkbox"/>
<input style="background-color: #800080; color: white; padding: 5px; border-radius: 5px; font-weight: bold; width: 100px;" type="button" value="Save"/>			

Figure 54 – DHCP – Address reservation list

To add a device to the address reservation list:

1. Click the **+Add** button.
2. In the **Computer Name** field enter a name for the device.
3. In the **MAC Address** field, enter the device's MAC address.
4. In the **IP Address** fields, enter the IP address that you wish to reserve for the device.
5. If the **Enable** toggle key is not set to **ON**, click it to switch it to the **ON** position.
6. Click the **Save** button to save the settings.

Dynamic DHCP client list

The Dynamic DHCP client list displays a list of the DHCP clients. If you want to reserve the current IP address for future use, click the **Clone** button and the details will be copied to the address reservation list fields. Remember to click the **Save** button under the **Address reservation list** section to confirm the configuration.

Dynamic DHCP client list

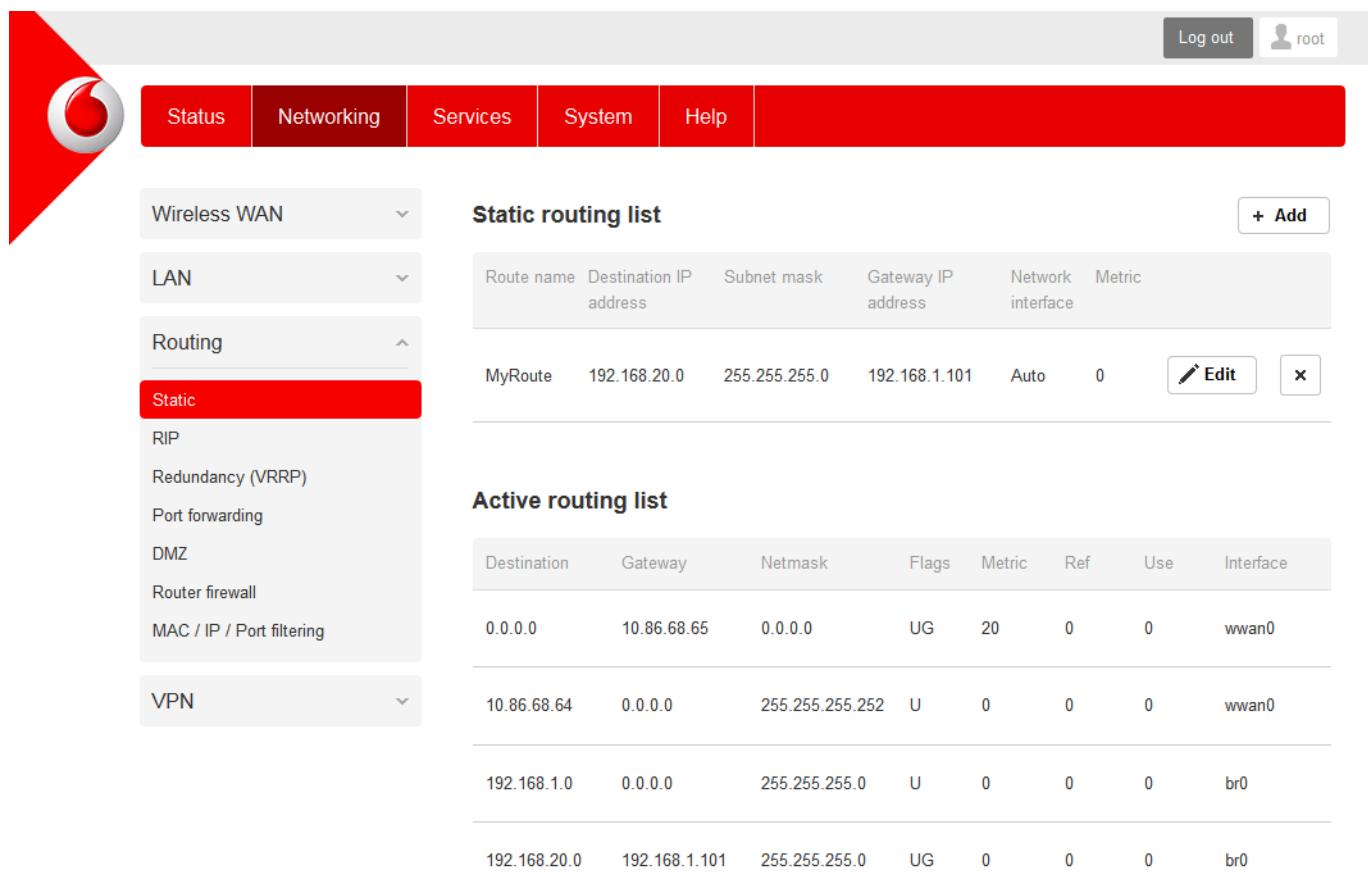
Computer name	MAC address	IP address	Expiry time	
computer	00:02:19:0e:3a:19	192.168.1.129	15/8/2014 2:08:07 pm	 Clone

Figure 55 - Dynamic DHCP client list

Routing

Static

Static routing is the alternative to dynamic routing used in more complex network scenarios and is used to facilitate communication between devices on different networks. Static routing involves configuring the routers in your network with all the information necessary to allow the packets to be forwarded to the correct destination. If you change the IP address of one of the devices in the static route, the route will be broken.



Route name	Destination IP address	Subnet mask	Gateway IP address	Network interface	Metric
MyRoute	192.168.20.0	255.255.255.0	192.168.1.101	Auto	0

Destination	Gateway	Netmask	Flags	Metric	Ref	Use	Interface
0.0.0.0	10.86.68.65	0.0.0.0	UG	20	0	0	wwan0
10.86.68.64	0.0.0.0	255.255.255.252	U	0	0	0	wwan0
192.168.1.0	0.0.0.0	255.255.255.0	U	0	0	0	br0
192.168.20.0	192.168.1.101	255.255.255.0	UG	0	0	0	br0

Figure 56 - Static routing list

Some routes are added by default by the router on initialization such as the Ethernet subnet route for routing to a device on the Ethernet subnet.

Adding Static Routes

To add a new route to the static routing list, click the **+Add** button. The Static routes page appears.

1. In the **Route name** field, type a name for the route so that it can be identified in the static routing list.
2. From the **Network interface** drop down list, select the interface for which you would like to create a static route.
3. In the **Destination IP address** field, enter the IP address of the destination of the route.
4. In the **Destination subnet mask** field, enter the subnet mask of the route.
5. In the **Gateway IP address** field, enter the IP address of the gateway that will facilitate the route.
6. In the **Metric** field enter the metric for the route. The metric value is used by the router to prioritise routes. The lower the value, the higher the priority. To give the route the highest priority, set it to 0.
7. Click the **Save** button to save your settings.

Static routes

Route name:

Network interface:

Destination IP address: · · ·

Destination subnet mask: · · ·

Gateway IP address: · · ·

Metric: (0-65535)

Figure 57 - Adding a static route

Setting a default gateway with two active connection profiles

When two connection profiles are active, all outbound traffic will be sent via the profile configured as the default gateway (See [Data connection](#)). If you wish to configure traffic to a network to go through a particular gateway, there are two methods available:

1. Use the static routing method described above.
2. Add the details of the remote network to the connection profile configuration.

For example:

Profile name

	Default	Status	APN	Username
Profile1	<input checked="" type="radio"/>	<input style="background-color: #008000; color: white; border: 1px solid #ccc; width: 20px; height: 20px; vertical-align: middle;" type="button" value="I"/>	Automatic	<input type="button" value="Edit"/>
Profile2	<input type="radio"/>	<input style="background-color: #008000; color: white; border: 1px solid #ccc; width: 20px; height: 20px; vertical-align: middle;" type="button" value="I"/>	xxxxxxxx	<input type="button" value="Edit"/>

Packet data connection status

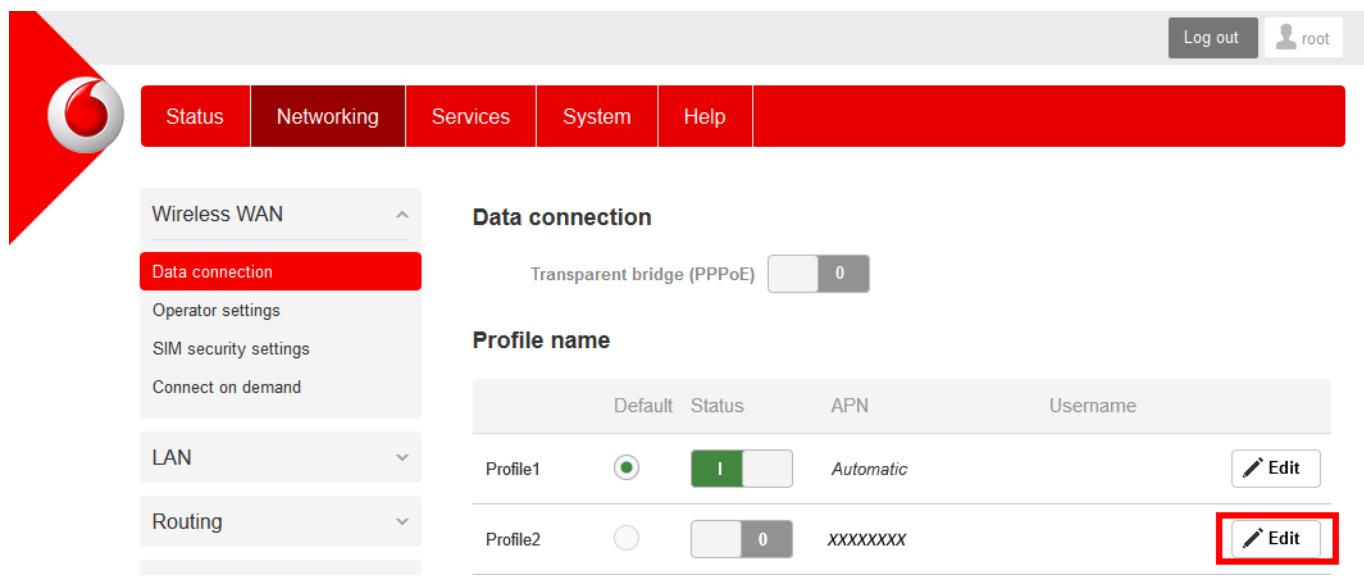
Profile name Profile1 Status Connected Default profile Yes	WWAN IP 10.100.42.172 DNS server 10.4.81.103 10.4.182.20	APN xxxxxxxx Connection uptime 00:05:15
<input type="button" value="Show data usage"/>		
Profile name Profile2 Status Connected Default profile No	WWAN IP 120.157.85.128 DNS server 10.4.182.20 10.4.81.103	APN xxxxxxxx Connection uptime 00:00:00
<input type="button" value="Show data usage"/>		

Figure 58 – Routing - Default gateway with two active connection profiles

In the example configuration above, Profile 1 and Profile 2 are both active and Profile 1 is configured as the default gateway. All outbound traffic is sent via Profile 1.

To specify that outbound traffic to remote network 123.121.120.X goes via Profile 2:

1. Click the **Networking** menu at the top of the screen and then click the **Edit** button next to Profile 2.



	Default	Status	APN	Username
Profile1	<input checked="" type="radio"/>	<input type="button" value="I"/>	Automatic	<input type="button" value="Edit"/>
Profile2	<input type="radio"/>	<input type="button" value="0"/>	XXXXXXXX	<input type="button" value="Edit"/>

Figure 59 – Routing - Edit Profile 2

2. Scroll to the bottom of the window and in the **Profile routing settings** section, enter the address of the remote network and the subnet mask. A subnet is an identifiably separate part of a network and a subnet mask is the notation used to denote the subnet.

Profile routing settings

You may route only particular traffic via this connection profile by specifying the network address and mask below of the destination network. Blank values will route all traffic via this profile. Please leave these settings blank if you are unsure.

Network address	123	·	121	·	120	·	0
Network mask	255	·	255	·	255	·	0
<input type="button" value="Save"/> <input type="button" value="Cancel"/>							

Figure 60 - Routing - adding remote network address and mask

3. Click the **Save** button to save the settings. All outbound traffic to 123.121.120.X addresses are now routed through Profile 2.

Active routing list

Static routes are displayed in the Active routing list.

Active routing list

Destination	Gateway	Netmask	Flags	Metric	Ref	Use	Interface
0.0.0.0	10.100.205.249	0.0.0.0	UG	20	0	0	wwan0
10.100.205.248	0.0.0.0	255.255.255.248	U	0	0	0	wwan0
123.121.120.0	192.168.1.1	255.255.255.0	UG	0	0	0	br0
192.168.1.0	0.0.0.0	255.255.255.0	U	0	0	0	br0

Figure 61 - Active routing list

Deleting static routes

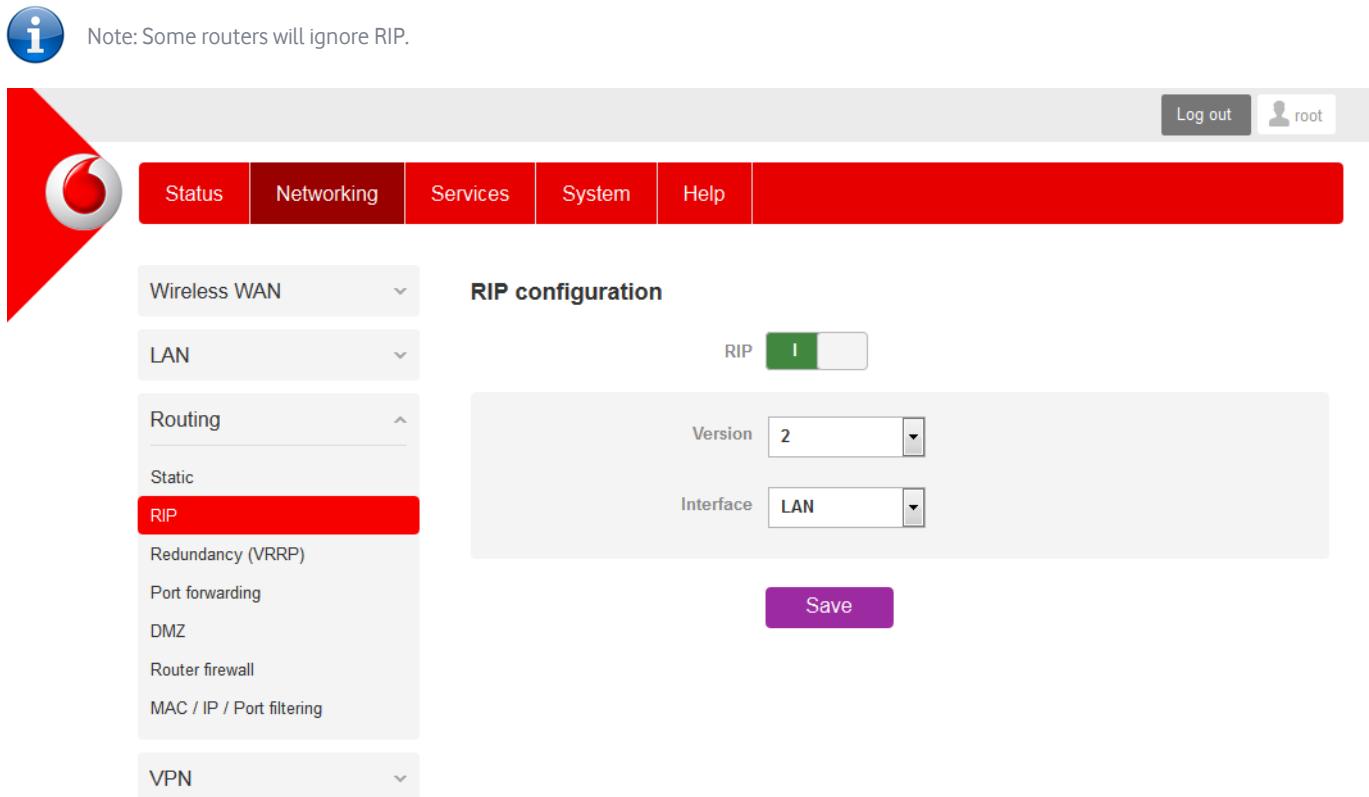
From the static routing list, click the  icon to the right of the entry you wish to delete.

Static routing list						+ Add
Route name	Destination IP address	Subnet mask	Gateway IP address	Network interface	Metric	
MyRoute	192.168.20.0	255.255.255.0	192.68.1.101	Auto	0	 Edit 

Figure 62 - Deleting a static route

RIP

RIP (Routing Information Protocol) is used for advertising routes to other routers. Thus all the routes in the router's routing table will be advertised to other nearby routers. For example, the route for the router's Ethernet subnet could be advertised to a router on the WAN interface side so that a router on this network will know how to route to a device on the router's Ethernet subnet. Static routes must be added manually according to your requirements. See [Adding Static Routes](#).



Note: Some routers will ignore RIP.

Figure 63 - RIP configuration

To enable Routing Information Protocol (RIP)

1. Click the **RIP** toggle key to switch it to the **ON** position.
2. Using the **Version** drop down list, select the version of RIP that you would like to use.
3. Select the interface for which you want RIP to apply. You can choose the **LAN** interface, the **WWAN** interface or **Both**.
4. Click the **Save** button to confirm your settings.

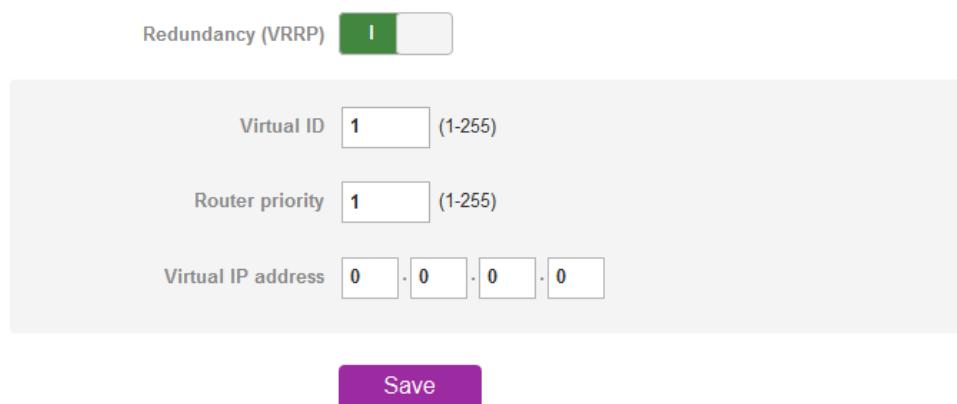
Redundancy (VRRP)

Virtual Router Redundancy Protocol (VRRP) is a non-proprietary redundancy protocol designed to increase the availability of the default gateway servicing hosts on the same subnet. This increased reliability is achieved by advertising a “virtual router” (an abstract representation of master and backup routers acting as a group) as a default gateway to the host(s) instead of one physical router. Two or more physical routers are then configured to stand for the virtual router, with only one doing the actual routing at any given time. If the current physical router that is routing the data on behalf of the virtual router fails, an arrangement is made for another physical router to automatically replace it. The physical router that is currently forwarding data on behalf of the virtual router is called the master router.

Master routers have a priority of 255 and backup router(s) can have a priority between 1 and 254.

A virtual router must use 00-00-5E-00-01-XX as its (MAC) address. The last byte of the address (XX) is the Virtual Router Identifier (VRID), which is different for each virtual router in the network. This address is used by only one physical router at a time, and is the only way that other physical routers can identify the master router within a virtual router.

Redundancy (VRRP) configuration



The screenshot shows a configuration interface for VRRP. At the top, there is a toggle switch labeled "Redundancy (VRRP)" with the value "1" highlighted in green. Below the switch are three input fields: "Virtual ID" set to "1" (with a note "(1-255)", "Router priority" set to "1" (with a note "(1-255)", and "Virtual IP address" set to "0 . 0 . 0 . 0". At the bottom is a purple "Save" button.

Figure 64 - VRRP configuration

To configure VRRP, configure multiple devices as follows and connect them all via an Ethernet network switch to downstream devices.

1. Click the **Redundancy (VRRP)** toggle key to activate VRRP.
2. In the **Virtual ID** field, enter an ID between 1 and 255. This is the VRRP ID which is different for each virtual router on the network.
3. In the **Router priority** field, enter a value for the priority – a higher value is a higher priority.
4. The **Virtual IP address** field is used to specify the VRRP IP address – this is the virtual IP address that both virtual routers share.
5. Click the **Save** button to save the new settings.



Note: Configuring VRRP changes the MAC address of the Ethernet port and therefore if you want to resume with the web configuration you must use the new IP address (VRRP IP) or on a command prompt type:
`arp -d <ip address>` (i.e. `arp -d 192.168.1.1`) to clear the arp cache. (Old MAC address).

Port forwarding

The Port forwarding list is used to configure the Network Address Translation (NAT) rules currently in effect on the router.

Port forwarding list					+ Add
Protocol	Source IP address	Incoming port	Destination IP address	Destination port	
ALL	192.168.1.1	3389 - 3389	192.168.1.150	3389 - 3389	 Edit 

Figure 65 – Port forwarding list

The purpose of the port forwarding feature is to allow mapping of inbound requests to a specific port on the WAN IP address to a device connected on the Ethernet interface.

Adding a port forwarding rule

To create a new port forwarding rule:

1. Click the **+Add** button. The port forwarding settings screen is displayed.
2. Use the **Protocol** drop down list to select the type of protocol you want to use for the rule. The protocols selections available are **TCP**, **UDP** and **All**.
3. In the **Source IP Address** field, enter a “friendly” address that is allowed to access the router or a wildcard IP address (0.0.0.0) that allows all IP addresses to access the router.
4. The **Source Port Range (From)** and **(To)** fields are used to specify the port(s) on the source side that are to be forwarded. This allows you to send a range of consecutive port numbers by entering the first in the range in the **(From)** field and the last in the range in the **(To)** field. To forward a single port, enter the port in the **(From)** field and repeat it in the **(To)** field.
5. In the **Destination IP address** field, enter the IP address of the client to which the traffic should be forwarded.
6. The **Destination Port Range (From)** and **(To)** fields are used to specify the port(s) on the destination side that are to be forwarded. If the Source port range specifies a single port then the destination port may be configured to any port. If the Source port range specifies a range of port numbers then the Destination port range must be the same as the Source port range.
7. Click the **Save** button to confirm your settings.

Port forwarding settings

Protocol	TCP						
Original IP address	192	.	68	.	1	.	1
Original port range (From)	3389	(1-65535)	(To)	3389	(1-65535)		
Destination IP address	192	.	168	.	1	.	150
Destination port range (From)	3389	(1-65535)	(To)	3389	(1-65535)		
<input type="button" value="Save"/> <input type="button" value="Reset"/> <input type="button" value="Cancel"/>							

Figure 66 - Port forwarding settings

To delete a port forwarding rule, click the  button on the Port forwarding list for the corresponding rule that you would like to delete.

DMZ

The Demilitarised Zone (DMZ) allows you to configure all incoming traffic on all protocols to be forwarded to a selected device behind the router. This feature can be used to avoid complex port forwarding rules, but it exposes the device to untrusted networks as there is no filtering of what traffic is allowed and what is denied.

The DMZ configuration page is used to specify the IP Address of the device to use as the DMZ host.

DMZ configuration



DMZ

DMZ IP address . . .

Save

Figure 67 - DMZ configuration

1. Click the **DMZ** toggle key to turn the DMZ function **ON**.
2. Enter the IP Address of the device to be the DMZ host into the **DMZ IP address** field.
3. Click the **Save** button to save your settings.

Router firewall

The Router firewall page is used to enable or disable the in-built firewall on the router. When enabled, the firewall performs stateful packet inspection on inbound traffic from the wireless WAN and blocks all unknown services, that is, all services not listed on the Services configuration page of the router.

With respect to the other Routing options on the Networking page, the firewall takes a low priority. The priority of the firewall can be described as:

DMZ > MAC/IP/Port filtering rules > MAC/IP/Port filtering default rule > Router firewall rules

In other words, the firewall is of the lowest priority when compared to other manual routing configurations. Therefore, a MAC/IP/Port filtering rule takes priority in the event that there is a conflict of rules. When DMZ is enabled, MAC/IP/Port filtering rules and the router firewall are ignored but the router will still honour the configuration of the Remote router access control settings listed under Administration Settings.

Router firewall



Enable router firewall

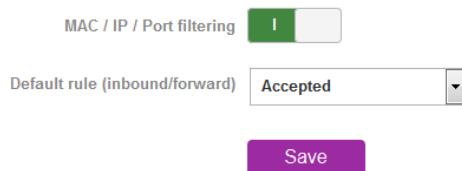
Save

Figure 68 - Router firewall toggle key

MAC / IP / Port filtering

The MAC/IP/Port filter feature allows you apply a policy to the traffic that passes through the router, both inbound and outbound, so that network access can be controlled. When the filter is enabled with a default rule of "Accepted", all connections will be allowed except those listed in the "Current MAC / IP / Port filtering rules in effect" list. Conversely, when the default rule is set to "Dropped", all connections are denied except for those listed in the filtering rules list.

MAC / IP / Port filtering



MAC / IP / Port filtering

Default rule (inbound/forward)

Save

Figure 69 - MAC / IP / Port filtering



Note: When enabling MAC / IP / Port filtering and setting the default rule to "Dropped", you should ensure that you have first added a filtering rule which allows at least one known MAC/IP to access the router, otherwise you will not be able to access the user interface of the router without resetting the router to factory default settings.

Creating a MAC / IP / Port filtering rule

To create a filtering rule:

1. Click the **MAC / IP / Port filtering** toggle key to switch it to the **ON** position.
2. Using the **Default Rule (inbound/forward)** drop down list, select the default action for the router to take when traffic reaches it. By default, this is configured to **Accepted**. If you change this to **Dropped**, you should first configure a filter rule that allows at least one device access to the router, otherwise you will effectively be locked out of the router.
3. Click the **Save** button to confirm the default rule.
4. In the Current MAC / IP / Port filtering rules in effect section, click the **+Add** button.

Current MAC / IP / Port filtering rules in effect

Index	Bound	Action	Comment
MAC / IP / Port filtering rule is empty			

Figure 70 - Current MAC / IP / Port filtering rules in effect

5. Enter the details of the rule in the section that is displayed and click the **Save** button.

MAC / IP / Port filter settings

Bound	Forward
Protocol	All
Source MAC address	00:40:F4:CE:FA:1E
Source IP address	192 . 168 . 1 . 1 / 32
Destination IP address	192 . 168 . 1 . 150 / 32
Action	Drop
Comment	DemonstrationRule
<input type="button" value="Save"/> <input type="button" value="Cancel"/>	

Figure 71 - MAC / IP / Port filtering settings

OPTION	DESCRIPTION
Bound	Use the drop down list to select the direction of the traffic for which you want to apply to the rule. Inbound refers to all traffic that is entering the router including data entering from the WAN and the LAN. Outbound refers to all traffic exiting the router including traffic leaving in the direction of the WAN and traffic leaving in the direction of the LAN. Forward specifies traffic that enters on the LAN or WAN side and is forwarded to the opposite end.
Protocol	Use the drop down list to select the protocol for the rule. You can have the rule apply to All protocols, TCP , UDP , UDP/TCP or ICMP .
Source MAC Address	Enter the MAC address in six groups of two hexadecimal digits separated by colons (:). e.g. 00:40:F4:CE:FA:1E
Source IP Address	Enter the IPv4 address that the traffic originates from and the subnet mask using CIDR notation.
Destination IP Address	Enter the IPv4 address that the traffic is destined for and the subnet mask using CIDR notation.
Action	Select the action to take for traffic which meets the above criteria. You can choose to Accept or Drop packets. When the default rule is set to Accept , you cannot create a rule with an Accept action since the rule is redundant. Likewise, if the default rule is set to Dropped you cannot create a rule with a Drop action.
Comment	[Optional] Use this field to enter a comment as a meaningful description of the rule.

Table 15 - Current MAC / IP / Port filtering rules in effect

6. The new rule is displayed in the filtering rules list. You can edit the rule by clicking the  button or delete the rule by clicking the  button.

Current MAC / IP / Port filtering rules in effect

	Index	Bound	Action	Comment		
	1	Forward	Drop	Demonstration		

Figure 72 - Completed filtering rule

VPN

A Virtual Private Network (VPN) is a tunnel providing a private link between two networks or devices over a public network. Data to be sent via a VPN needs to be encapsulated and as such is generally not visible to the public network.

The advantages of a VPN connection include:

- Data Protection
- Access Control
- Data Origin Authentication
- Data Integrity

Each VPN connection has different configuration requirements. The following pages detail the configuration options available for the different VPN connection types.



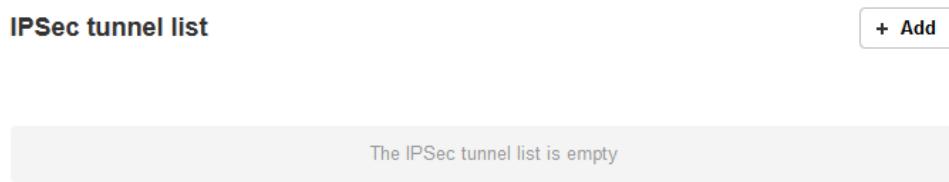
Note: The following descriptions are an overview of the various VPN options available. More detailed instructions are available in separate whitepapers on the NetComm Wireless website.

IPSec

IPSec operates on Layer 3 of the OSI model and as such can protect higher layered protocols. IPSec is used for both site to site VPN and Remote Access VPN. The Vodafone MachineLink 3G Plus router supports IPsec end points and can be configured with Site to Site VPN tunnels with third party VPN routers.

Configuring an IPSec VPN

From the menu at the top of the screen, click **Networking** and under the VPN section, click **IPSec**. A list of configured IPSec VPN connections is displayed.



The IPSec tunnel list is empty

Figure 73 - IPSec VPN List

Click the **+Add** button to begin configuring an IPSec VPN connection.

IPSec profile edit

IPSec profile

Profile name

Remote IP Sec address

Remote LAN address . . .

Remote LAN subnet mask . . .

Local LAN address . . .

Local LAN subnet mask . . .

Encapsulation type ESP

IKE mode Main

PFS On

IKE encryption Any

IKE hash Any

IPSec encryption Any

IPSec hash Any

DH group Any

DPD action Hold

DPD keep alive time 10 secs

DPD timeout 60 secs

IKE re-key time 3600 (0-78400, 0=Unlimited) secs

SA life time 28800 (0-78400, 0=Unlimited) secs

Key mode Pre-shared keys

Pre-shared key

Remote ID (xy.sample.com or blank)

Local ID (xy.sample.com or blank)

Figure 74 – IPSec profile edit

The following table describes each of the fields of the IPSec VPN Connection Settings page.

ITEM	DEFINITION
IPSec profile	Enables or disables the VPN profile.
Profile name	A name used to identify the VPN connection profile.
Remote IPSec address	The IP address or domain name of the IPSec server.
Remote LAN address	Enter the IP address of the remote network for use on the VPN connection.
Remote LAN subnet mask	Enter the subnet mask in use on the remote network.
Local LAN address	Enter the IP address of the local network for use on the VPN connection.
Local LAN subnet mask	Enter the subnet mask in use on the local network.
Encapsulation type	Select the encapsulation protocol to use with the VPN connection. You can choose ESP , AH or Any .
IKE mode	Select the IKE mode to use with the VPN connection. You can choose Main , Aggressive or Any .
PFS	Choose whether Perfect Forward Secrecy is ON or OFF for the VPN connection.
IKE encryption	Select the cipher type to use for the Internet Key Exchange.
IKE hash	Select the IKE Hash type to use for the VPN connection. The hash is used for authentication of packets for the key exchange.
IPSec encryption	Select the IPSec encryption type to use with the VPN connection.
IPSec hash	Select the IPSec hash type to use for the VPN connection. The hash is used for authentication of packets for the VPN connection.
DH group	Select the desired Diffie-Hellman group to use. Higher groups are more secure but also require longer to generate a key.
DPD action	Select the desired Dead Peer Detection action. This is the action to take when a dead Internet Key Exchange Peer is detected.
DPD keep alive time	Enter the time in seconds for the interval between Dead Peer Detection keep alive messages.
DPD timeout	Enter the time in seconds of no response from a peer before Dead Peer Detection times out.
IKE re-key time	Enter the time in seconds between changes of the encryption key. To disable changing the key, set this to 0.
SA life time	Enter the time in seconds for the security association lifetime.
Key mode	Select the type of key mode in use for the VPN connection. You can select from: <ul style="list-style-type: none"> • Pre Shared Key • RSA keys • Certificates
Pre-shared key	The pre-shared key is the key that peers used to authenticate each other for Internet Key Exchange.
Remote ID	Specifies the domain name of the remote network.
Local ID	Specifies the domain name of the local network.
Update Time	Displays the last time the key was updated.
Local RSA Key Upload	Select the RSA key file for the local router here by clicking the Upload button.
Remote RSA Key Upload	Select the RSA key file for the remote router here by clicking the Upload button.
Private key Passphrase	The Private key passphrase of the router is the passphrase used when generating the router's private key using OpenSSL CA.
Key / Certificate	Select the type of key or certificate to use for authentication. You can select Local private key , Local public certificate , Remote public certificate , CA certificate , CRL certificate .
IPSec Certificate Upload	Select the IPSec certificate to upload by clicking the Choose a file button.

Table 16 - IPSec Configuration Items

OpenVPN

OpenVPN is an open source virtual private network (VPN) program for creating point-to-point or server-to-multi-client encrypted tunnels between host computers. It can traverse network address translation (NAT) and firewalls and allows authentication by certificate, pre-shared key or username and password. OpenVPN works well through proxy servers and can run over TCP and UDP transports. Support for OpenVPN is available on several operating systems, including Windows, Linux, Mac OS, Solaris, OpenBSD, FreeBSD, NetBSD and QNX.

Configuring an Open VPN server

From the menu at the top of the screen, click **Networking** and from the VPN section on the left, click **OpenVPN**. A list of configured OpenVPN VPN connections is displayed.

OpenVPN server list

+ Add

The OpenVPN server list is empty

OpenVPN client list

+ Add

The OpenVPN client list is empty

OpenVPN P2P list

+ Add

The OpenVPN P2P list is empty

Figure 75 - OpenVPN VPN List

Click the **+Add** button for the type of OpenVPN server/client you would like to configure.

OpenVPN Server

To configure an OpenVPN Server:

1. Click the **OpenVPN profile** toggle key to switch it to the **ON** position.
2. Type a name for the OpenVPN server profile you are creating.
3. Select OpenVPN connection type (TUN/TAP). Default is **TUN**.
4. Use the **Server port** field to select a port number and then use the drop down list to select a protocol to use for your OpenVPN Server. The default OpenVPN port is 1194 and default protocol is UDP.
5. In the **VPN network address** and **VPN network subnet mask** fields, enter the IP address and network subnet mask to assign to your VPN. This is ideally an internal IP address which differs from your existing address scheme.
6. Select the server key size. The available options are 1024, 2048 and 4096. The default value is 1024 bit.
7. Next to Diffie-Hellman parameters, select appropriate encryption key size then click the **Generate DH** button. This will create an encryption key to secure your OpenVPN connection. Default key size is (1024) bit.
8. Under **Server certificates**, enter the required details. All fields must be completed. The **Country** field must consist of two characters only. When the details have been entered, click the **Generate CA certificate** button to generate the Certificate Authority (CA) certificate based on this information.
9. Under the **Server certificates** section, select the **Authentication type** that you would like to use for the OpenVPN Server.



Note: Because the Diffie-Hellman parameters are generated randomly and largely affected by the chosen key size, the time it takes to generate the parameters may differ. It may take a few minutes or a few hours where larger key sizes are selected. Please be patient.

Certificate Authentication

- In the **Certificate management** section, enter the required details to create a client certificate. All fields are required. When you have finished entering the details, click the **Generate** button.

Certificate management

Certificate	<input type="button" value="New..."/>
Name	<input type="text"/>
Country	<input type="text"/>
State	<input type="text"/>
City	<input type="text"/>
Organisation	<input type="text"/>
Email	<input type="text"/>
<input type="button" value="Generate"/> <input type="button" value="Revoke"/>	
<input type="button" value="Download P12"/> <input type="button" value="Download TGZ"/>	
Remote network address <input type="text" value="0"/> · <input type="text" value="0"/> · <input type="text" value="0"/> · <input type="text" value="0"/>	
Remote network subnetmask <input type="text" value="0"/> · <input type="text" value="0"/> · <input type="text" value="0"/> · <input type="text" value="0"/>	
<input type="button" value="Set network information"/>	

Figure 76 - OpenVPN server configuration – Certificate management

- When it is done, you can click the **Download P12** button or the **Download TGZ** button to save the certificate file depending on which format you would like. If for some reason the integrity of your network has been compromised, you can return to this screen and use the Certificate drop down list to select the certificate and then press the **Revoke** button to disable it.
- To inform the OpenVPN server of the network address scheme of the currently selected certificate, enter the network address and network subnet mask in the respective fields and click the **Set network information** button. If you do not enter the remote subnet here, any packet requests from the server to the client will not be received by the client network because it is not aware of the remote client's subnet.

OpenVPN server edit

OpenVPN profile

Profile name

Type

Server port

VPN network address . . .

VPN network subnet mask . . .

Diffie-Hellman parameters

Server key size 1024 2048 4096

Server certificates

Not before N/A

Not after N/A

Country

State

City

Organisation

Email

Authentication type Certificate Username / Password

Certificate management

Certificate

Name

Country

State

City

Organisation

Email

Remote network address . . .

Remote network subnetmask . . .

Figure 77 – OpenVPN server profile settings

Username / Password Authentication

- a) In the Username/Password section, enter the username and password you would like to use for authentication on the OpenVPN Server. Click the **Download CA certificate or Download CA TGZ depending on file format** button to save the **ca.crt** file. This file will need to be provided to the client.



Note: If you wish to have more than one client connect to this OpenVPN server, you must use Certificate authentication mode as Username/Password only allows for a single client connection.

Username / Password

Username

Password

[Download CA TGZ](#)

[Download CA certificate](#)

Remote network address . . .

Remote network subnetmask . . .

[Set network information](#)

Figure 78 - OpenVPN Server – Username / Password section

- b) To inform the OpenVPN server of the network address scheme of the currently selected certificate, enter the network address and network subnet mask in the respective fields and click the **Set Network Information** button. If you do not enter the remote subnet here, any packet requests from the server to the client will not be received by the client network because it is not aware of the remote client's subnet.
- c) When you have finished entering all the required information, click **Save** to finish configuring the OpenVPN server.

Configuring an OpenVPN Client

1. Click the **OpenVPN profile** toggle key to switch it to the **ON** position.
2. In the **Profile name** field, type a name for the OpenVPN client profile you are creating.
3. In the **Server IP address** field, type the WAN IP address/host domain name of the OpenVPN server.
4. Select OpenVPN connection type (TUN/TAP). Default is **TUN**.
5. Use the **Server port** field to select a port number and then use the drop down list to select a protocol to use for the OpenVPN server. The default OpenVPN port is 1194 and default protocol is UDP.
6. If the **Default gateway** option is applied on the OpenVPN client page, the OpenVPN server will enable connections to be made to other client networks connected to it. If it is not selected, the OpenVPN connection allows for secure communication links between this router and the remote OpenVPN server only.
7. Use the **Authentication type** options to select the Authentication type that you would like to use for the OpenVPN client.

Certificate Authentication

In the Certificate upload section at the bottom of the screen, click the **Choose a file** button and locate the certificate file you downloaded when you configured the OpenVPN server. When it has been selected, click the **Upload** button to send it to the router.

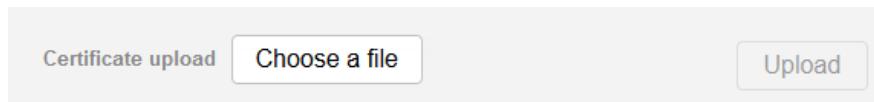


Figure 79 - OpenVPN client - Certificate upload

Username / Password Authentication

- Enter the username and password to authenticate with the OpenVPN server.

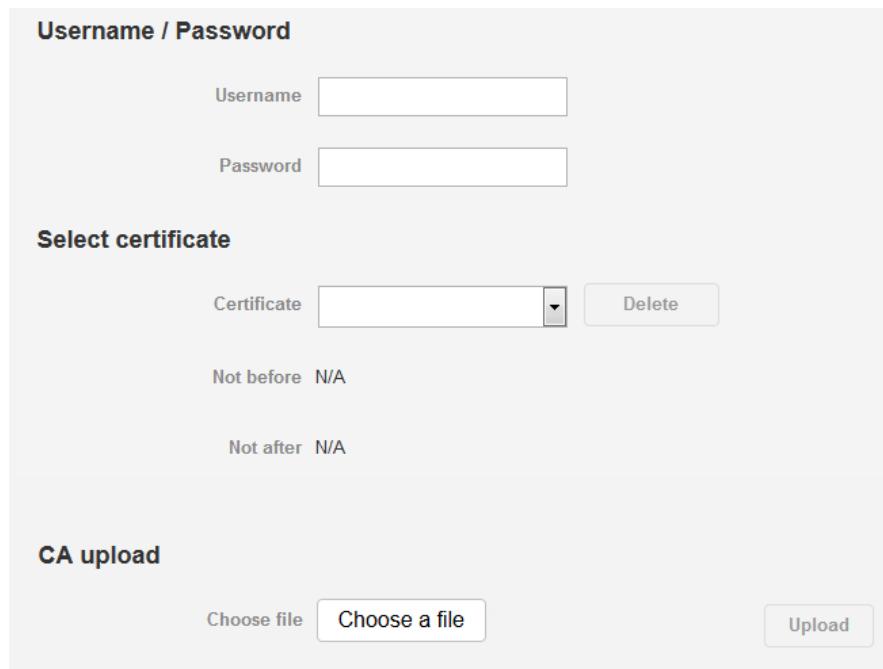


Figure 80 - OpenVPN Client - Username/Password section

- Use the **Choose a file** button to locate the CA certificate file you saved from the OpenVPN Server and then press the **Upload** button to send it to the router.
- Click the **Save** button to complete the OpenVPN Client configuration.

Certificate and Username / Password Authentication

This is a combination of both the Certificate and Username / Password authentication methods providing additional levels of security since the client must know the username / password combination and be in possession of the certificate.

Configuring an OpenVPN P2P Connection

To configure an OpenVPN peer-to-peer connection:

- Set the **OpenVPN** profile toggle key to switch it to the **ON** position.
- In the **Profile name** field, type a name for the OpenVPN P2P profile you are creating.
- On the router designated as the server, leave the **Server IP address** field empty. On the router designated as the client, enter the **WAN IP address/host domain name** of the server.

OpenVPN peer edit

OpenVPN profile

Profile name

Server IP address
(leave empty if it's a peer-to-peer server)

Server port **Protocol**

Local IP address · · ·

Remote IP address · · ·

Remote network

Address · · ·

Subnet mask · · ·

Server secret key

Update time N/A

Client secret key

Update time N/A

Client secret key upload

Figure 81 - OpenVPN P2P mode settings

4. Use the **Server port** field to select a port number and then use the drop down list to select a protocol type to use for the OpenVPN server. The default OpenVPN port is 1194 and default protocol type is UDP.
5. In the **Local IP Address** and **Remote IP Address** fields, enter the respective local and remote IP addresses to use for the OpenVPN tunnel. The client should have the reverse settings of the server.
6. Under the **Remote network** section, enter the network **Address** and network **Subnet mask**. The Network Address and Network Mask fields inform the server node of the LAN address scheme of the client.
7. Press the **Generate** button to create a secret key to be shared with the client. When the timestamp appears, you can click the **Download** button to save the file to exchange with the other router.
8. When you have saved the secret key file on each router, use the **Choose a file** button to locate the secret key file for the master and then press the **Upload** button. Perform the same for the other router, uploading the client's secret key file to the server.
9. When they are uploaded click the **Save** button to complete the peer-to-peer OpenVPN configuration.

PPTP client

The Point-to-Point Tunneling Protocol (PPTP) is a method for implementing virtual private networks using a TCP and GRE tunnel to encapsulate PPP packets. PPTP operates on Layer 2 of the OSI model and is included on Windows computers.

Configuring the PPTP client

To configure the PPTP client:

1. From the menu bar at the top of the screen, click **Networking** and then from the **VPN** section on the left side of the screen, click **PPTP client**. The PPTP client list is displayed.

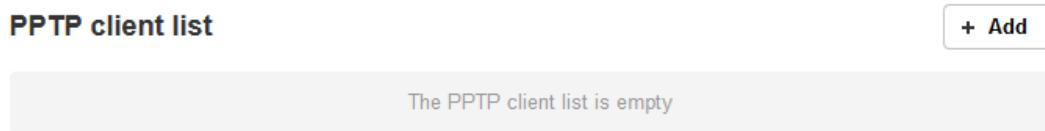
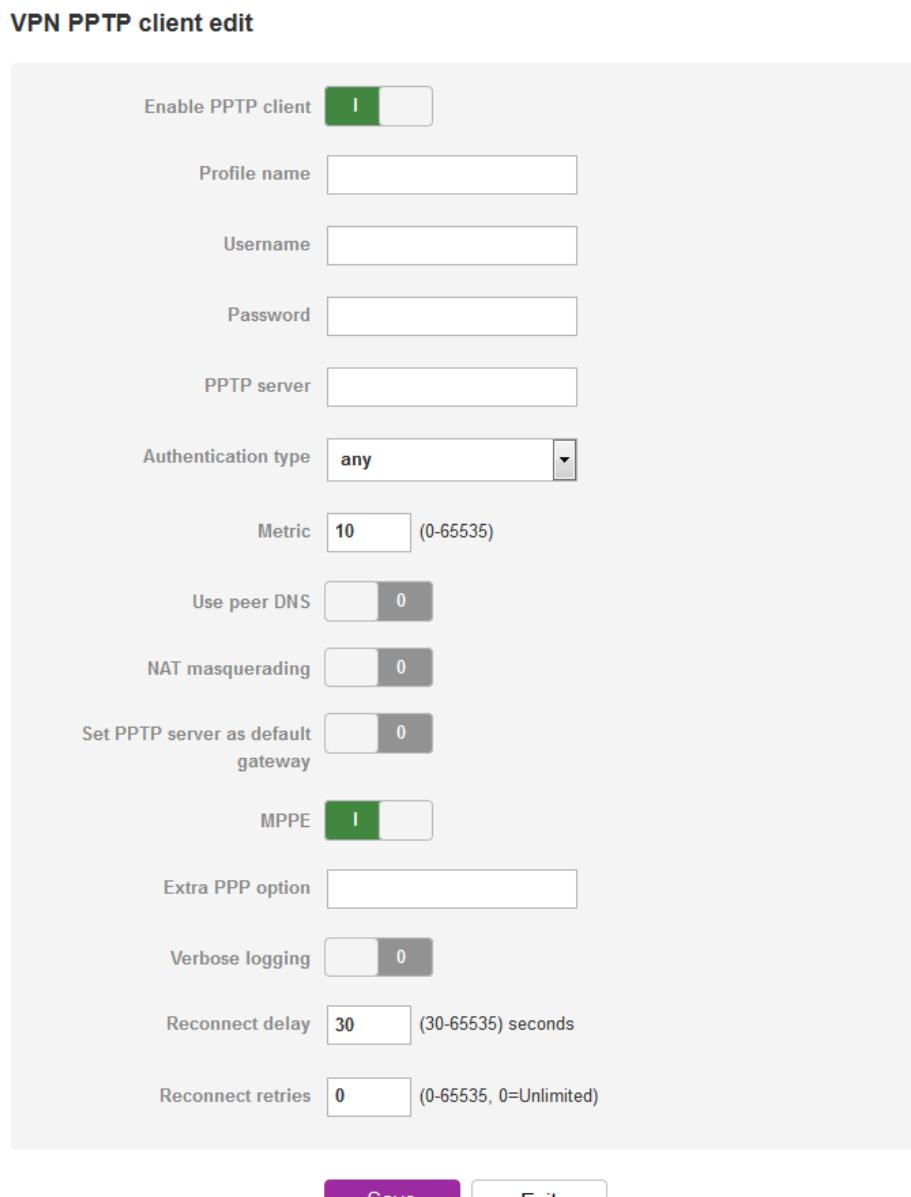


Figure 82 - PPTP client list

2. Click the **+Add** button to begin configuring a new PPTP client profile. The PPTP client edit screen is displayed.



The screenshot shows a window titled "VPN PPTP client edit". It contains various configuration options:

- Enable PPTP client: A toggle switch set to "I" (Enabled).
- Profile name: An empty text input field.
- Username: An empty text input field.
- Password: An empty text input field.
- PPTP server: An empty text input field.
- Authentication type: A dropdown menu set to "any".
- Metric: A numeric input field set to "10" with a range of "(0-65535)".
- Use peer DNS: A toggle switch set to "0".
- NAT masquerading: A toggle switch set to "0".
- Set PPTP server as default gateway: A toggle switch set to "0".
- MPPE: A toggle switch set to "I" (Enabled).
- Extra PPP option: An empty text input field.
- Verbose logging: A toggle switch set to "0".
- Reconnect delay: A numeric input field set to "30" with a range of "(30-65535) seconds".
- Reconnect retries: A numeric input field set to "0" with a range of "(0-65535, 0=Unlimited)".

At the bottom of the screen are two buttons: "Save" (purple background) and "Exit".

Figure 83 - VPN PPTP client edit

3. Click the **Enable PPTP client** toggle key to switch it to the **ON** position.
4. In the **Profile name** field, enter a profile name for the tunnel. This may be anything you like and is used to identify the tunnel on the router.
5. Use the **Username** and **Password** fields to enter the username and password for the PPTP account.
6. In the **PPTP server** field, enter the IP address/host domain name of the PPTP server.
7. From the **Authentication type** drop down list, select the Authentication type used on the server. If you do not know the authentication method used, select **any** and the router will attempt to determine the correct authentication type for you. There are 5 authentication types you can choose from:
 - CHAP – uses a three way handshake to authenticate the identity of a client.
 - MS-CHAP v1 – This is the Microsoft implementation of the Challenge Handshake Authentication Protocol for which support was dropped in Windows® Vista.
 - MS-CHAP v2 - This is the Microsoft implementation of the Challenge Handshake Authentication Protocol which was introduced in Windows® NT 4.0 and is still supported today.
 - PAP – The Password Authentication Protocol uses a password as a means of authentication and as such, is commonly supported. PAP is not recommended because it transmits passwords unencrypted and is not secure.
 - EAP – Extensible Authentication Protocol. An Authentication protocol commonly used in wireless networks.
8. The **metric** value helps the router to prioritise routes and must be a number between 0 and 65535. The default value is 10 and should not be modified unless you are aware of the effect your changes will have.
9. The **Use peer DNS** option allows you to select whether the remote clients will use the Domain Name Server of the PPTP server. Click the toggle key to set this to ON or OFF as required.
10. **NAT masquerading** allows the router to modify the packets sent and received to inform remote computers on the internet that packets originating from a machine behind the router actually originated from the WAN IP address of the router's internal NAT IP address. Click the toggle key to switch this to the ON position if you want to use this feature.
11. Set **PPTP server as default gateway** sets all outbound data packets to go out through the PPTP tunnel. Click the toggle key to switch this to the ON position if you want to use this feature.
12. The **Verbose logging** option sets the router to output detailed logs regarding the PPTP connection in the **System Log** section of the router interface.
13. The **Reconnect delay** is the time in seconds that the router will wait before attempting to connect to the PPTP server in the event that the connection is broken. The minimum time to wait is 30 seconds so as to not flood the PPTP server with connection requests, while the maximum time to wait is 65335 seconds.
14. The **Reconnect retries** is the number of connection attempts that the router will make in the event that the PPTP connection goes down. If set to 0, the router will retry the connection indefinitely, otherwise the maximum number of times to retry cannot be greater than 65335.
15. Click the **Save** button to save the changes. The VPN will attempt to connect after your click Save. Click the **Status** button at the top left of the interface to return to the status window and monitor the VPN's connection state.

GRE tunneling

The Generic Route Encapsulation (GRE) protocol is used in addition to Point-to-Point Tunneling Protocol (PPTP) to create VPNs (virtual private networks) between clients and servers or between clients only. Once a PPTP control session establishes the VPN tunnel GRE is used to securely encapsulate the data or payload.

Configuring GRE tunneling

To configure GRE tunneling:

1. From the menu bar at the top of the screen, click **Networking** and then from the **VPN** section on the left side of the screen, click **GRE tunneling**. The GRE client list is displayed.

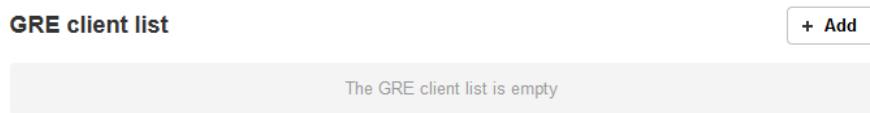
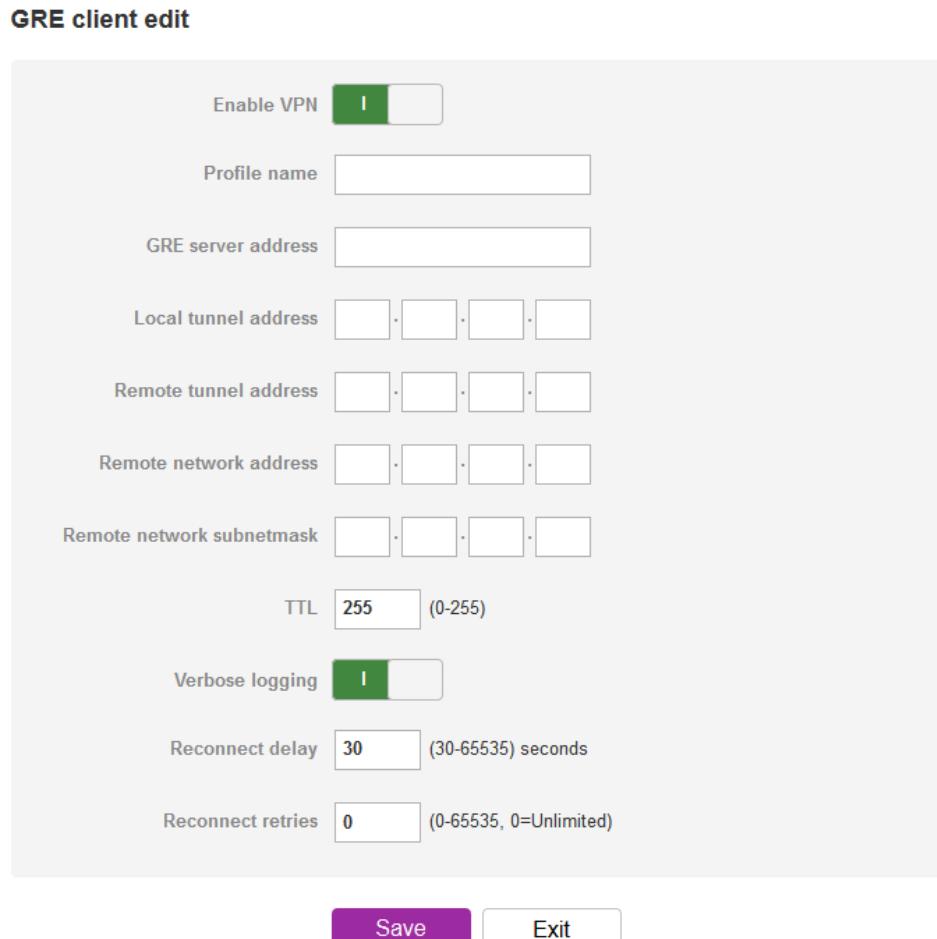


Figure 84 - GRE client list

2. Click the **+Add** button to begin configuring a new GRE tunneling client profile. The GRE Client Edit screen is displayed.



Enable VPN	<input checked="" type="checkbox"/>
Profile name	<input type="text"/>
GRE server address	<input type="text"/>
Local tunnel address	<input type="text"/> · <input type="text"/> · <input type="text"/> · <input type="text"/>
Remote tunnel address	<input type="text"/> · <input type="text"/> · <input type="text"/> · <input type="text"/>
Remote network address	<input type="text"/> · <input type="text"/> · <input type="text"/> · <input type="text"/>
Remote network subnetmask	<input type="text"/> · <input type="text"/> · <input type="text"/> · <input type="text"/>
TTL	255 (0-255)
Verbose logging	<input checked="" type="checkbox"/>
Reconnect delay	30 (30-65535) seconds
Reconnect retries	0 (0-65535, 0=Unlimited)
<input type="button" value="Save"/> <input type="button" value="Exit"/>	

Figure 85 – GRE client edit

3. Click the **Enable GRE Tunnel** toggle key to switch it to the **ON** position.
4. In the **Profile name**, enter a profile name for the tunnel. This may be anything you like and is used to identify the tunnel on the router.
5. In the **GRE server address** field, enter the IP address or domain name of the GRE server.
6. In the **Local tunnel address** field, enter the IP address you want to assign the tunnel locally.
7. In the **Remote tunnel address** field, enter the IP address you want to assign to the remote tunnel.

8. In the **Remote network address** field, enter the IP address scheme of the remote network.
9. In the **Remote network subnetmask** field, enter the subnet mask of the remote network.
10. The **TTL** (Time To Live) field is an 8-bit field used to remove an undeliverable data packet from a network to avoid unnecessary network traffic across the internet. The default value of 255 is the upper limit on the time that an IP datagram can exist. The value is reduced by at least one for each hop the data packet takes to the next router on the route to the datagram's destination. If the TTL field reaches zero before the datagram arrives at its destination the data packet is discarded and an error message is sent back to the sender.
11. The **Verbose logging** option sets the router to output detailed logs regarding the GRE tunnel in the **System Log** section of the router interface.
12. The **Reconnect delay** is the time in seconds that the router will wait before attempting to connect to the GRE server in the event that the connection is broken. The minimum time to wait is 30 seconds so as to not flood the GRE server with connection requests, while the maximum time to wait is 65335 seconds.
13. The **Reconnect retries** is the number of connection attempts that the router will make in the event that the GRE connection goes down. If set to 0, the router will retry the connection indefinitely, otherwise the maximum number of times to retry cannot be greater than 65335.
14. Click the **Save** button to save the changes. The VPN will attempt to connect after your click Save.

Services

Dynamic DNS

The DDNS page is used to configure the Dynamic DNS feature of the router. A number of Dynamic DNS hosts are available from which to select.

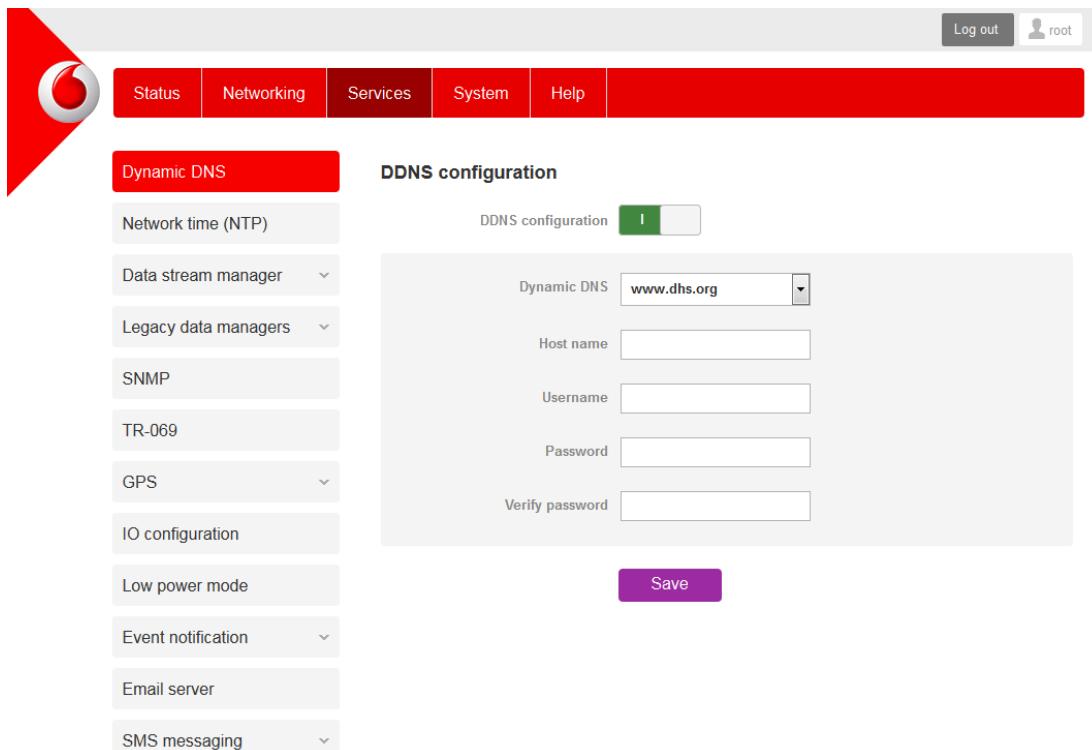


Figure 86 – Dynamic DNS settings

Dynamic DNS provides a method for the router to update an external name server with the current WAN IP address.

To configure dynamic DNS:

1. Click the **DDNS configuration** toggle key to switch it to the ON position.
2. From the **Dynamic DNS** drop down list, select the Dynamic DNS service that you wish to use. The available DDNS services available are:
 - www.dhs.org
 - www.dyndns.org
 - www.dyns.cx
 - www.easydns.com
 - www.justlinux.com
 - www.no-ip.com
 - www.ods.org
 - www.tzo.com
 - www.zoneedit.com
3. Enter a hostname in **Host name** field.
4. In the **Username** and **Password** fields, enter the logon credentials for your DDNS account. Enter the password for the account again in the **Verify password** field.
5. Click the **Save** button to save the DDNS configuration settings.

Network time (NTP)

The NTP (Network Time Protocol) settings page allows you to configure the Vodafone MachineLink 3G Plus router to synchronize its internal clock with a global Internet Time server and specify the time zone for the location of the router. This provides an accurate timekeeping function for features such as System Log entries and Firewall settings where the current system time is displayed and recorded.

Any NTP server available publicly on the internet may be used. The default NTP server is 0.netcomm.pool.ntp.org.

Timezone settings

Current time Fri Aug 15 05:50:53 BST 2014

Timezone **(GMT) England**

[Daylight savings time schedule](#)

NTP settings

Network time (NTP) **I**

NTP service **0.netcomm.pool.ntp.org**

Synchronisation on WWAN connection **I**

Daily synchronisation **I**

Save

Figure 87 - NTP settings

Configuring Timezone settings

To configure time zone settings:

1. The **Current time** field shows the time and date configured on the router. If this is not accurate, use the **Timezone** drop down list to select the correct time zone for the router. If the selected zone observes daylight savings time, a [Daylight savings time schedule](#) link appears below the drop down list. Click the link to see the start and end times for daylight savings.
2. When you have selected the correct time zone, click the **Save** button to save the settings.

Configuring NTP settings

To configure NTP settings:

1. Click the **Network time (NTP)** toggle key to switch it to the **ON** position.
2. In the **NTP service** field, enter the address of the NTP server you wish to use.
3. The **Synchronization on WWAN connection** toggle key enables or disables the router from performing a synchronization of the time each time a mobile broadband connection is established.
4. The **Daily synchronisation** toggle key enables or disables the router from performing a synchronization of the time each day.
5. When you have finished configuring NTP settings, click the **Save** button to save the settings.

Data stream manager

The data stream manager provides you with the ability to create mappings between two endpoints on the router. These endpoints may be physical or virtual, for example, the built-in serial port could be configured as an endpoint or you could configure a TCP Server as an endpoint. You can then configure a virtual data tunnel or “stream” between the endpoints.

The data stream manager provides a wide range of possibilities and expands upon simple PAD functionality to include the forwarding and translation of data between any of the endpoints. For example, you could send the GPS data received by the module (in NMEA format) through a serial port (by means of a USB-to-Serial cable). In each case, the logical flow of data is from Endpoint A to Endpoint B.

Customers interested in developing their own applications to create custom endpoints and streams can contact NetComm Wireless about our Software Development Kit.

Endpoints

The first thing to be done in order to create a data stream is to define the endpoints. There are 10 types of endpoint that may be configured:

- Serial port (generic)
- TCP Server
- TCP Client
- UDP Server
- UDP Client
- GPS Data (for devices with GPS receiver)
- User defined executable
- RS232 port
- RS422 port
- RS 485 port

Endpoints list		
Name	Type	Summary
TCPserver	TCP server	<pre>keep_alive: 0 keepcnt: keepidle: keepintvl: max_children: 5 port_number: 6000</pre>
GPSdata	GPS data	<pre>raw_mode: 0</pre>

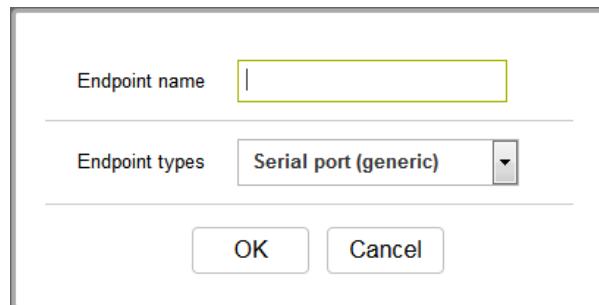
+ Add

Save
Cancel

Figure 88 - Endpoints list

To create an endpoint:

1. Click the **+Add** button on the right side of the page. A pop-up window appears.



The dialog box for creating an endpoint has the following fields:

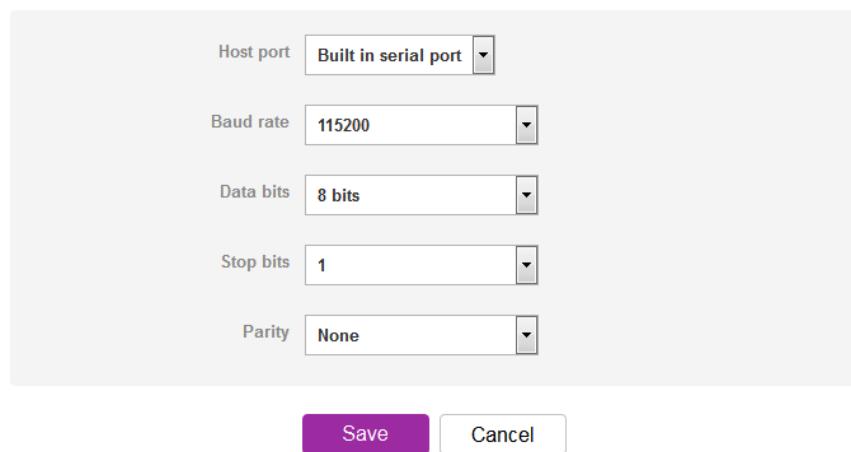
- Endpoint name:** An input field with a placeholder for a name.
- Endpoint types:** A dropdown menu set to "Serial port (generic)".
- OK** and **Cancel** buttons at the bottom.

Figure 89 - Creating an endpoint

2. In the **Endpoint name** field, type a name for this endpoint. The name can contain alphanumeric characters only i.e. A-Z, a-z, 0-9.
3. Use the **Endpoint types** drop down list to select the type of endpoint to configure.

Serial port (generic): This creates a generic serial port as an endpoint defaulting to the commonly used settings as shown below.

Serial port (generic) endpoint (Serialport)



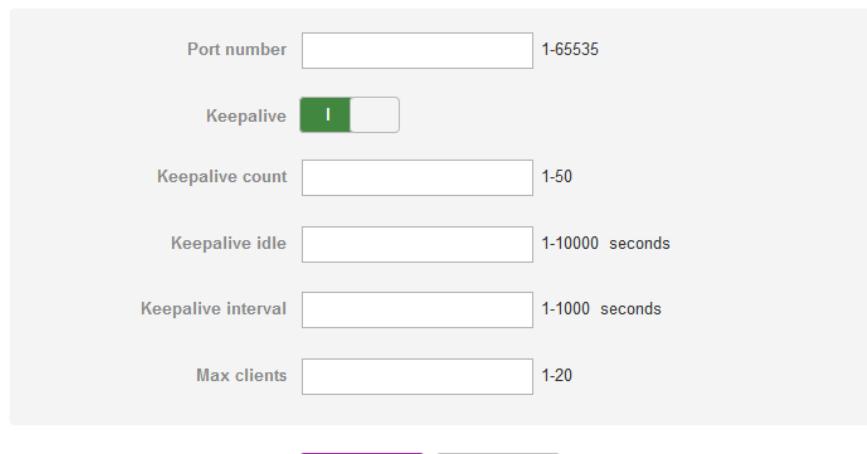
The configuration dialog for a Serial port (generic) endpoint includes the following settings:

- Host port:** Set to "Built in serial port".
- Baud rate:** Set to "115200".
- Data bits:** Set to "8 bits".
- Stop bits:** Set to "1".
- Parity:** Set to "None".
- Save** and **Cancel** buttons at the bottom.

Figure 90 - Serial port (generic) endpoint configuration

TCP server: This creates a TCP server endpoint with the following options available.

TCP server endpoint (TCPserver)



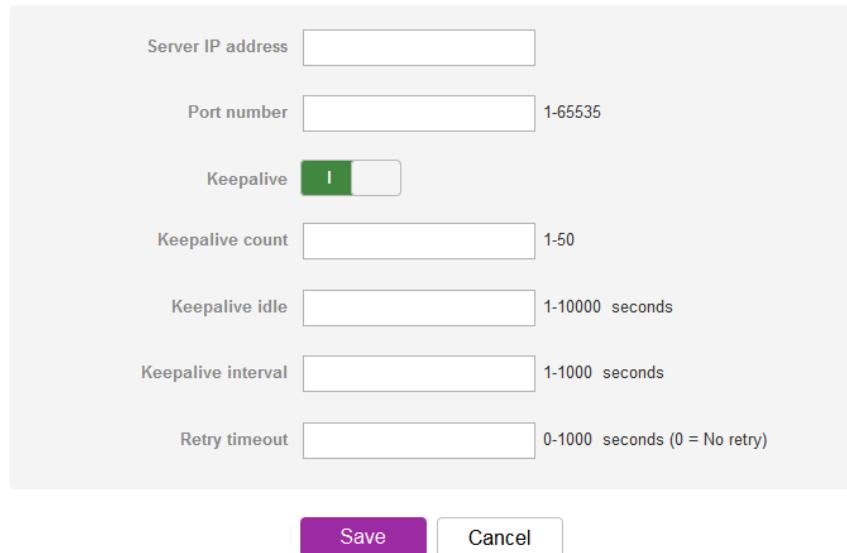
The configuration dialog for a TCP server endpoint includes the following settings:

- Port number:** Set to "1-65535".
- Keepalive:** A switch is turned on (green).
- Keepalive count:** Set to "1-50".
- Keepalive idle:** Set to "1-10000 seconds".
- Keepalive interval:** Set to "1-1000 seconds".
- Max clients:** Set to "1-20".
- Save** and **Cancel** buttons at the bottom.

Figure 91 - TCP server endpoint configuration

TCP client: This creates a TCP client endpoint with the following options available. The retry timeout period specifies the number of seconds to wait between attempts to re-establish a connection in the event that it is lost. The client will attempt re-connection indefinitely at the interval defined in the Retry timeout field.

TCP client endpoint (TCPclient)



This screenshot shows the configuration interface for a TCP client endpoint. It includes fields for Server IP address, Port number (set to 1-65535), Keepalive (switched on), Keepalive count (set to 1-50), Keepalive idle (set to 1-10000 seconds), Keepalive interval (set to 1-1000 seconds), and Retry timeout (set to 0-1000 seconds). There are Save and Cancel buttons at the bottom.

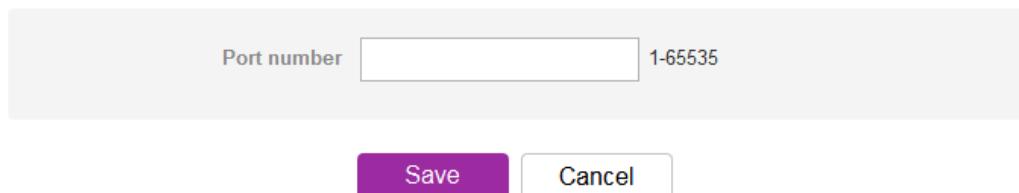
Server IP address	<input type="text"/>
Port number	1-65535
Keepalive	<input checked="" type="checkbox"/>
Keepalive count	1-50
Keepalive idle	1-10000 seconds
Keepalive interval	1-1000 seconds
Retry timeout	0-1000 seconds (0 = No retry)

Save **Cancel**

Figure 92 - TCP client endpoint configuration

UDP server: This creates a UDP server endpoint with the following options available.

UDP server endpoint (UDPServer)



This screenshot shows the configuration interface for a UDP server endpoint. It includes a Port number field set to 1-65535, and Save and Cancel buttons at the bottom.

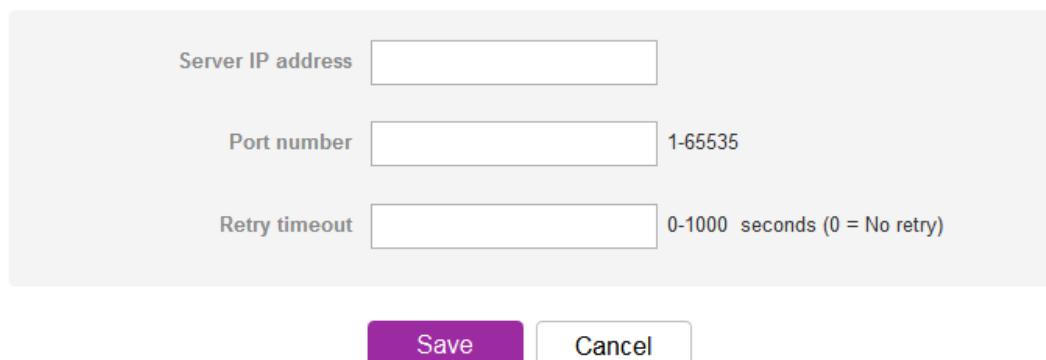
Port number	1-65535
-------------	---------

Save **Cancel**

Figure 93 - UDP server endpoint configuration

UDP client: This creates a UDP client endpoint with the following options available. The retry timeout period specifies the number of seconds to wait between attempts to re-establish a connection in the event that it is lost. The client will attempt re-connection indefinitely at the interval defined in the Retry timeout field.

UDP client endpoint (UDPclient)



This screenshot shows the configuration interface for a UDP client endpoint. It includes fields for Server IP address, Port number (set to 1-65535), and Retry timeout (set to 0-1000 seconds), along with Save and Cancel buttons at the bottom.

Server IP address	<input type="text"/>
Port number	1-65535
Retry timeout	0-1000 seconds (0 = No retry)

Save **Cancel**

Figure 94 - UDP client endpoint configuration

GPS data: This creates a GPS data endpoint.

GPS data endpoint (GPSdata)

Figure 95 - GPS data endpoint configuration

User defined executable: Allows you to specify an executable command and parameters to be used as an endpoint. For example, the following executable reads the phone module temperature every second.

```
while true; do wwan.0.radio.temperature; sleep 1; done
```

The temperature can then be sent to another endpoint.

User defined executable endpoint (user_defined_exec)

Command

Figure 96 – User defined executable endpoint configuration

RS232 / RS485 / RS422 port: These endpoint types all use the built-in serial port. When one of these endpoints is used to create a stream, the necessary hardware switches to accommodate the chosen serial communication interface are made.

RS232 port endpoint (RS232port)

Host port

Baud rate

Data bits

Stop bits

Parity

Figure 97 – RS232 / RS485 / RS422 port configuration options

4. Click the **OK** button. The router displays a screen with configuration options for your chosen endpoint type.
5. Enter the options for your endpoint as required.
6. Click the **Save** button. The Endpoints list is displayed with the newly created endpoint listed and a summary of the settings you configured.

Endpoints list

[+ Add](#)

Name	Type	Summary
TCPserver	TCP server	<pre>keep_alive: 0 keepcnt: keepidle: keepintvl: max_children: 5 port_number: 6000</pre>

[Save](#)
[Cancel](#)

Figure 98 - Endpoints list

Streams

When you have created the required endpoints, you can then proceed to set up a data stream. A data stream sends data from one endpoint to another. When a stream is added, an underlying process on the router checks the validity of the stream, checking for conflicts and illogical configurations.



Notes on data stream operation:

- Serial ports (whether built-in or connected via USB) can only be used in one stream. If two streams exist using the same serial port or USB device, they will be in conflict and will cause both streams to fail.
- When any changes to the Data stream manager configuration are detected, all data streams are stopped and restarted as per the new configuration.
- Multiple Modbus clients cannot connect simultaneously to Modbus serial slaves connected to the router.

Every stream requires two endpoints, Endpoint A and Endpoint B. In all cases, the flow of data is from Endpoint A to Endpoint B.

To create a new stream:

- Click the **+Add** button on the right side of the page.

Data stream list

[+ Add](#)

The endpoints list is empty

Figure 99 - Data stream list

The Edit data stream page is displayed.

2. In the **Data stream name** field, enter a name for the Data stream.
3. Under Endpoint A, use the **Endpoint name** drop down list to select one of the endpoints you created previously. This endpoint should be the starting point of the stream. Use the **Mode** drop down list to select the mode of operation of the endpoint. With respect to serial port endpoints including RS232, RS485 and RS422, all modes other than “Raw” encapsulate the data in the chosen form as it leaves this endpoint. For example, if Endpoint A type is Serial port (generic), the Mode can be set to various Modbus server and client types. This means that upon arrival at Endpoint A, the data will be encapsulated into the chosen Modbus format, ready to be sent to Endpoint B.
4. Under Endpoint B, use the **Endpoint name** drop down list to select one of the endpoints you created previously. This endpoint should be the destination of the stream. The screenshot below shows a configuration sending GPS data out of the built-in serial port. Use the **Mode** drop down list to select the mode of operation of the endpoint.

Edit data stream

Activate

Data stream name

Endpoint A

Endpoint name GPS data

Mode

Endpoint B

Endpoint name Serial port (generic)

Mode

Save **Cancel**

Figure 100 - Edit data stream

5. Click the **Save** button. The new stream appears in the Data stream list.

Data stream list

Name	Endpoint A	Mode	Endpoint B	Mode	Enabled	Status	+ Add
GPSToSerial	GPSdata	Raw	Serialport	Raw	Enabled	Running	 Edit 

Save **Cancel**

Figure 101 - Data stream list

Legacy data managers

The Legacy data managers section provides the option to configure the built-in serial port to function with legacy equipment.



Note:

- Modem emulator and PAD Daemon may not be configured to use an external serial port such as one connected via USB.
- Because they may only use the built-in serial port, only one legacy data manager may be configured for use at any particular time. Additionally, when one of these legacy data managers is configured, any user-created data streams involving the built-in serial port endpoint will cause a conflict and result in all streams failing until the conflict is removed.
- The priority of the built-in serial port is (from highest to lowest): Data stream endpoints, PAD Daemon, Modem emulator

Modem emulator

Modem emulator allows you to connect legacy equipment such as an RTU or PLC to the serial port of the router in place of a traditional dial-up modem. The MachineLink 3G Plus router emulates the dial-up modem's behaviour and passes the serial data over the IP network.

Modem emulator

Activate

Serial port name `/dev/ttyAPP4`

Serial port status **No conflicts**

Modem Settings

Baud rate

Inter character timeout (0-65535) milliseconds

Id

Ignore string

Connection settings

Connect to

DTR action

DCD action

Flow control

RI action

Circuit auto answer rings

Auto dial number

Profile-specific settings

Profile

Remote Host

Port (1-65535)

Local encoding

Mode

Auto answer

Save

Figure 102 - Modem emulator

ITEM	DESCRIPTION
Modem emulator	
Activate	Turns on or off the modem emulator function of the router.
Serial port name	The device name of the serial port.
Serial port status	The configuration status of the serial port. This will display whether there are any conflicts with the serial port preventing modem emulator from working properly.
Modem settings	
Baud rate	The serial (V.24) port baud rate. By default the serial line format is 8 data bits, No parity, 1 Stop bit. Refer to the AT (V.250) AT Command Manual if you need to change the serial line format.
Inter character timeout	The Modem emulator buffers any bytes received from the serial port until either 512 bytes have been received or no bytes have been received for "Inter Character Timeout" milliseconds, it will then send any bytes in the buffer to the remote host.
Id	When the ID field is not blank (empty) the defined ID will be sent to the remote host as follows: For UDP the 1st <n> bytes of each datagram sent will be set to the contents of the ID field, data follows immediately after the ID for TCP the ID is transmitted once immediately after the connection is established
Ignore string	When the "Ignore String" field is not blank (empty) the router will strip any character sequence that matches the "Ignore String" from the data stream received from the serial port.
Connection settings	
Connect to	Determines how the router behaves when it receives an "ATD" command on the serial port. <ul style="list-style-type: none"> • Profile - Connect using "Data Connection Profile" • Circuit - Establish a circuit switched data connection • Packet - Connect to cellular packet network in PPP pass through mode • DialString - Examine the dialed digits and connect to Profile, Circuit or Packet as appropriate
DTR action	Determines how the router responds to change of state of the serial port DTR line <ul style="list-style-type: none"> • Ignore - Take no action • Command - High to Low transition of DTR causes the router to enter command mode (does not end call). • Hangup - High to Low transition of DTR causes the router to end call and enter command mode. • High AutoDial - Low to High transition of DTR causes the router to dial the Auto Dial Number, High to Low transition of DTR causes the router to end call and enter command mode. • Low AutoDial - High to Low transition of DTR causes the router to dial the Auto Dial Number, Low to High transition of DTR causes the router to end call and enter command mode. • Low Pass To AT Port - When DTR is low pass all AT commands directly to internal cellular data engine.
Flow control	<ul style="list-style-type: none"> • Off - Serial port flow control off • Hardware - Serial port uses RTS/CTS flow control
RI action	Determines how the router controls the state of the serial port RI line <ul style="list-style-type: none"> • Always On - RI is always on • Incoming Ring - RI is on when an incoming connection request is received. • Always Off - RI is always off
Circuit auto answer rings	Sets the number of incoming rings after which the router will answer incoming circuit switched data calls.
Auto dial number	Sets the number the router will dial if DTR Auto Dial is enabled ad DTR changes state.
Profile-specific settings (these items may be configured separately for each of the 4 connection profiles)	
Profile	Choose the profile that you want to configure.
Remote Host	In client mode (router connects to host) this is the remote host to which the router will connect. In server mode (remote host connects to router) the router will only accept incoming connections from the specified host. If you specify 0.0.0.0 the router will accept incoming connections from any host.
Port	TCP/UDP port number to use
Local encoding	Refer to the AT (V.250) Command Manual for details of this parameter, this is normally disabled.
Mode	Selects the mode of operation for the chosen profile. Mode may be TCP, UDP.
Auto answer	When enabled the router accepts incoming connections (enables server mode)

Table 17 - Modem emulator options

PADD

PAD Daemon is a tool used to encapsulate raw serial data into a TCP packet to be transported over IP to another end point. The server receiving the TCP packets unpacks the data and the original raw serial data is passed out of its serial port to the attached device, thereby creating an invisible IP network to the two serial devices.

The PAD Daemon runs as a background process which can be accessed via the web configuration interface. The PADD configuration page is located under “**Services > Legacy data managers > PADD**”. The PADD is used usually with multiple connections or when redundant connections are needed. The PADD has two modes: the PADD TCP/IP Server mode and PADD TCP/IP Client Mode. When PADD is enabled, both the PADD server mode and PADD client mode can be run at the same time.

The PADD configuration page is shown below.

PADD

Activate

Serial port status **No conflicts**

Debug level **0** (0-2)

Serial port settings

Host port **Built in serial port**

Baud rate **115200**

Data bits **8 bits**

Stop bits **1**

Parity **None**

Flow control **0**

Inter character timeout **1** (x100ms)

End-of-line character ASCII code

Start of line timestamps 0 YYYYMMDDHHMMSS

TCP/IP Server

Listening port **1516** 1-65535

Incoming connection is Exclusive Shared

TCP/IP Client

Connect to First available All available

Remote Host 1 Server:Port

Remote Host 2 Server:Port

Remote Host 3 Server:Port

Remote Host 4 Server:Port

Network

Remote server retry period **10** 1-65535 seconds

TCP Keepalive Probes **60** 0-65535 seconds (0=disabled)

Number of probe failures before disconnect **4** 1 - 20

Save

Figure 103 – PADD

SNMP

SNMP configuration

The SNMP page is used to configure the SNMP features of the router.

SNMP configuration

SNMP

Read-only community name	public
Read-write community name	private
Download MIB File	Download (This is a brief version of the MIB file only)

Save

Figure 104 - SNMP configuration

SNMP (Simple Network Management Protocol) is used to remotely monitor the router for conditions that may warrant administrative attention. It can be used to retrieve information from the router such as the signal strength, the system time and the interface status.

To configure SNMP:

1. Click the **SNMP** toggle key to switch it to the **ON** position.
2. Enter **Read-only community name** and **Read-write community name** which are used for client authentication.



Community names are used as a type of security to prevent access to reading and/or writing to the routers configuration. It is recommended that you change the Community names to something other than the default settings when using this feature.

3. Click the **Save** button to save any changes to the settings.

The **Download** button displays the Management Information Base (MIB) of the router. The MIB displays all the objects of the router that can have their values set or report their status. The MIB is formatted in the SNMP-related standard RFC1155.

SNMP traps

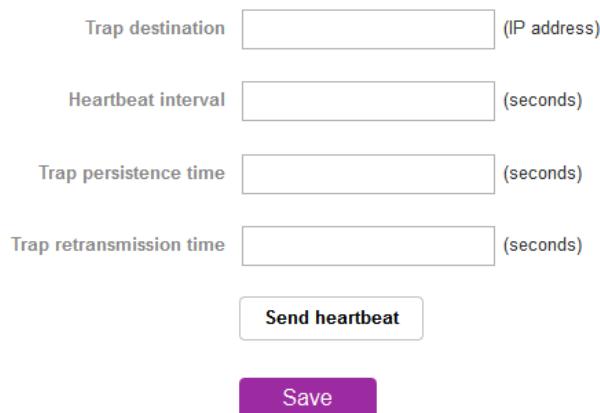
SNMP traps are messages from the router to the Network Management System sent as UDP packets. They are often used to notify the management system of any significant events such as whether the link is up or down.

Configuring SNMP traps

To configure SNMP traps:

1. In the **Trap destination** field, enter the IP address to which SNMP data is to be sent.
2. In the **Heartbeat interval** field, enter the number of seconds between SNMP heartbeats.
3. Use the **Trap persistence time** field to specify the time in seconds that an SNMP trap persists.
4. Use the **Trap retransmission time** to specify the length of time in seconds between SNMP trap retransmissions.

SNMP traps



Trap destination (IP address)

Heartbeat interval (seconds)

Trap persistence time (seconds)

Trap retransmission time (seconds)

Send heartbeat

Save

Figure 105 - SNMP traps

To send a manual SNMP Heartbeat, click the **Send heartbeat** button. When you have finished configuring the SNMP traps, click the **Save** button to save the settings.



Note: When a factory reset is performed via SNMP, the SNMP settings are not preserved. Ensure that you have physical access to the router if you plan to perform a factory reset.

TR-069

To access the TR-069 configuration page, click the **Services** menu item, then select the TR-069 menu item on the left.

TR-069 configuration

<input checked="" type="checkbox"/> Enable TR-069	 ACS URL <input type="text"/> ACS username <input type="text" value="acs"/> ACS password <input type="password" value="***"/> Verify ACS password <input type="password" value="***"/> Connection request username <input type="text" value="cpe"/> Connection request password <input type="password" value="***"/> Verify connection request password <input type="password" value="***"/> <input checked="" type="checkbox"/> Enable periodic ACS informs												
Inform period <input type="text" value="600"/> (30-2592000) secs													
Last inform status <table border="0" style="width: 100%;"> <tr> <td style="width: 15%;">Start at</td> <td><input type="text"/></td> </tr> <tr> <td>End at</td> <td><input type="text"/></td> </tr> </table>		Start at	<input type="text"/>	End at	<input type="text"/>								
Start at	<input type="text"/>												
End at	<input type="text"/>												
TR-069 DeviceInfo <table border="0" style="width: 100%;"> <tr> <td style="width: 15%;">Manufacturer</td> <td>NetComm Wireless Limited</td> </tr> <tr> <td>ManufacturerOUI</td> <td>006064</td> </tr> <tr> <td>ModelName</td> <td>vdf_nwl12</td> </tr> <tr> <td>Description</td> <td>NetComm NWL Series Cellular Router</td> </tr> <tr> <td>ProductClass</td> <td>NWL12 Series</td> </tr> <tr> <td>SerialNumber</td> <td>B2D422</td> </tr> </table>		Manufacturer	NetComm Wireless Limited	ManufacturerOUI	006064	ModelName	vdf_nwl12	Description	NetComm NWL Series Cellular Router	ProductClass	NWL12 Series	SerialNumber	B2D422
Manufacturer	NetComm Wireless Limited												
ManufacturerOUI	006064												
ModelName	vdf_nwl12												
Description	NetComm NWL Series Cellular Router												
ProductClass	NWL12 Series												
SerialNumber	B2D422												
<input type="button" value="Save"/>													

Figure 106 - TR-069 configuration

The TR-069 (Technical Report 069) protocol is a technical specification also known as CPE WAN Management Protocol (CWMP). It is a framework for remote management and auto-configuration of end-user devices such as customer-premises equipment (CPE) and Auto Configuration Servers (ACS). It is particularly efficient in applying configuration updates across networks to multiple CPEs.

TR-069 uses a bi-directional SOAP/HTTP-based protocol based on the application layer protocol and provides several benefits for the maintenance of a field of CPEs:

- Simplifies the initial configuration of a device during installation
- Enables easy restoration of service after a factory reset or replacement of a faulty device
- Firmware and software version management
- Diagnostics and monitoring



Note:

- You must have your own compatible ACS infrastructure to use TR-069.
- When a factory reset of the router is performed via TR-069, the TR-069 settings are preserved.

TR-069 configuration

To configure TR-069:

1. Click the **Enable TR-069** toggle key to switch it to the **ON** position.
2. In the **ACS URL** field, enter the Auto Configuration Server's full domain name or IP address.
3. Use the **ACS username** field to specify the username for the Auto Configuration Server.
4. In the **ACS password** and **Verify ACS password** fields, enter the Auto Configuration Server password.
5. In the **Connection request username** field, enter the username to use for the connection requests.
6. In the **Connection request password** and Verify password fields, enter the connection request password.
7. The inform message acts as a beacon to inform the ACS of the existence of the router. Click the **Enable periodic ACS informs** toggle key to turn on the periodic ACS inform messages.
8. In the **Inform period** field, enter the number of seconds between the inform messages.
9. Click the **Save** button to save the settings.

GPS

The built-in GPS module allows you to use location-based services, monitor field deployed hardware or find your current location. The GPS Status window provides up to date information about the current location and the current GPS signal conditions (position dilution of precision (PDOP), horizontal dilution of precision (HDOP) and vertical dilution of precision (VDOP)) of the router.

NMEA support

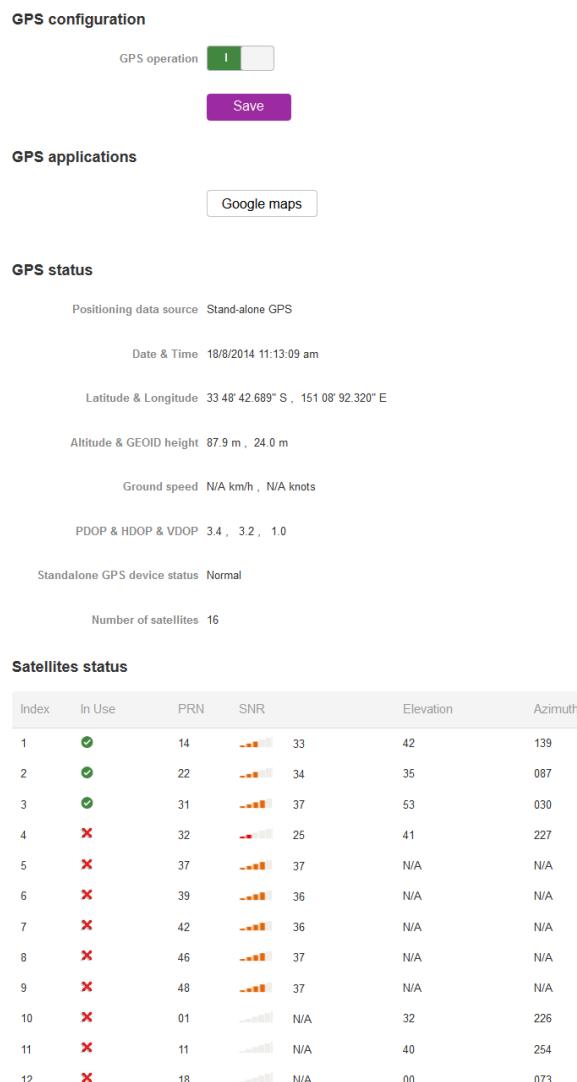
The router supports the National Marine Electronics Association NMEA-0183 compatible (V2.3) standard of sending GPS data. The standard includes “sentences” used to identify the type of data being sent and therefore defines the way the data is interpreted. The supported GPS related sentences are listed below:

- GPGGA – Global Positioning System Fix Data, Time, Position and fix related data for a GNSS receiver
- GPRMC – Recommended minimum data for GPS
- GPGSV – Detailed satellite data
- GPGSA – Overall satellite data
- GPVTG – Vector track and speed over the Ground

GPS configuration

To access the GPS configuration screen, select the **Services** item from the top menu bar then the **GPS** item on the left. Finally, select the **GPS configuration** menu item.

To use the GPS function, set the **GPS operation** toggle key to **ON** and click the **Save** button.



GPS configuration

GPS operation Save

GPS applications

Google maps

GPS status

Positioning data source Stand-alone GPS

Date & Time 18/8/2014 11:13:09 am

Latitude & Longitude 33 48° 42.689" S , 151 08° 92.320" E

Altitude & GEOID height 87.9 m , 24.0 m

Ground speed N/A km/h , N/A knots

PDOP & HDOP & VDOP 3.4 , 3.2 , 1.0

Standalone GPS device status Normal

Number of satellites 16

Satellites status

Index	In Use	PRN	SNR	Elevation	Azimuth
1	✓	14	██████	42	139
2	✓	22	██████	35	087
3	✓	31	██████	53	030
4	✗	32	██████	41	227
5	✗	37	██████	N/A	N/A
6	✗	39	██████	N/A	N/A
7	✗	42	██████	N/A	N/A
8	✗	46	██████	N/A	N/A
9	✗	48	██████	N/A	N/A
10	✗	01	██████	32	226
11	✗	11	██████	40	254
12	✗	18	██████	00	073

Figure 107 – GPS configuration

The **Google maps** button provides a quick short cut to show your router's current position on a map.

Mobile Station Based Assisted GPS configuration

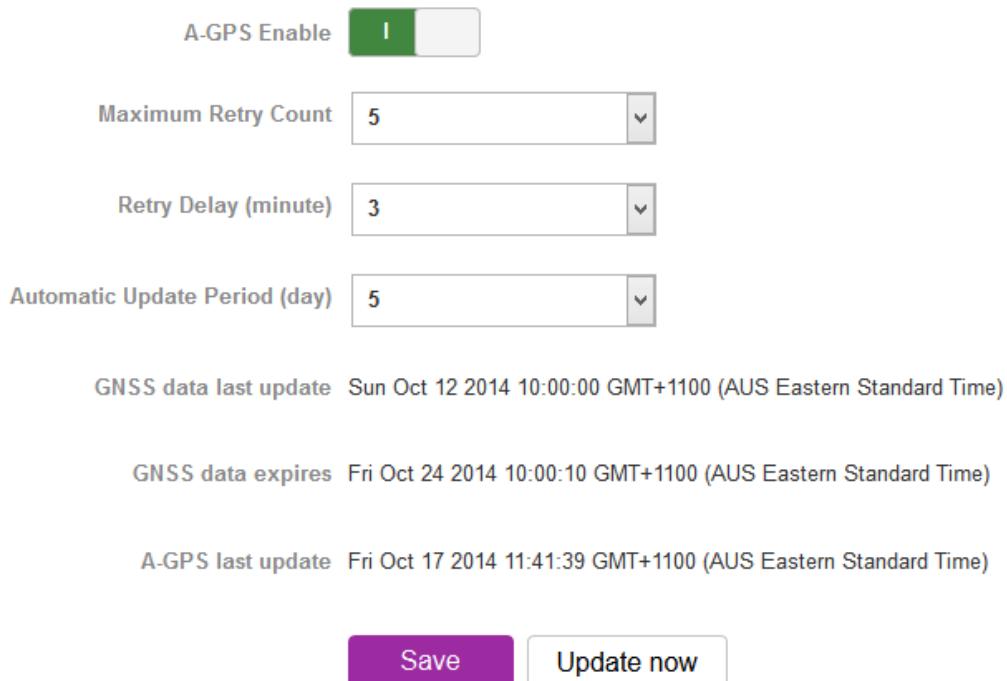
To access the Mobile Station Based Assisted GPS configuration screen, select the **Services** item from the top menu bar then the **GPS** item on the left. Finally, select the **MSB (A-GPS)** menu item.

Mobile Station Based Assisted GPS (MSB A-GPS) enables your router to download GNSS data which supplies orbital data to the GPS receiver, enabling it to lock to the satellites more rapidly. The GNSS data is stored on the router to assist the GPS in locating the router.

To set up automatic updates of GNSS data, set the **A-GPS Enable** toggle key to the **ON** position and use the drop down lists to configure the automatic retry options. Each retry, the router checks for an updated GNSS data file and downloads the GNSS data if newer than the currently stored data.

 Note: When new GNSS data is available and the router performs an update, up to 40MB of data may be downloaded. Please keep this in mind if your mobile broadband plan has usage restrictions.

Mobile Station Based Assisted GPS configuration



A-GPS Enable

Maximum Retry Count

Retry Delay (minute)

Automatic Update Period (day)

GNSS data last update Sun Oct 12 2014 10:00:00 GMT+1100 (AUS Eastern Standard Time)

GNSS data expires Fri Oct 24 2014 10:00:10 GMT+1100 (AUS Eastern Standard Time)

A-GPS last update Fri Oct 17 2014 11:41:39 GMT+1100 (AUS Eastern Standard Time)

Save **Update now**

Figure 108 - Mobile Stations Based Assisted GPS configuration options

ITEM	DESCRIPTION
A-GPS Enable	Enables or disables the mobile station based assisted GPS function.
Maximum Retry Count	Sets the maximum number of times the router should attempt to triangulate its position.
Retry delay (minute)	Sets the number of minutes the router should wait between attempts to triangulate its position.
Automatic Update Period (day)	Sets the number of days that the router should automatically update the A-GPS data. The maximum update period is 7 days.

Table 18 - Mobile Station Based Assisted GPS configuration options

The **GNSS data last update** field represents the time that the GNSS data file was created while the **GNSS data expires** field indicates the time that this data is valid until. The **A-GPS last update** field specifies the last time the router attempted to retrieve an update to the GNSS data.

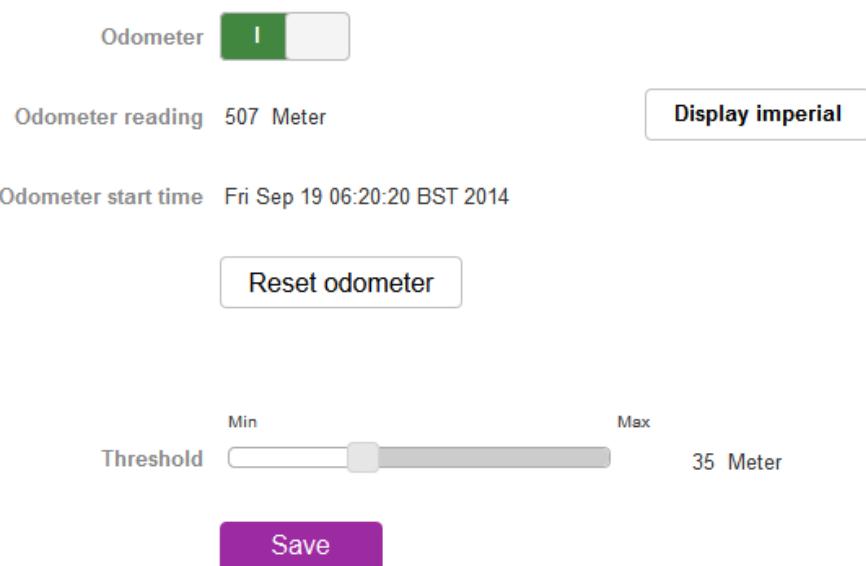
You may manually force the router to check for an update regardless of the next scheduled update time by clicking the **Update Now** button. When you have finished configuring the settings, click the **Save** button to save the changes.

Odometer

To access the Odometer screen, select the **Services** item from the top menu bar then the **GPS** item on the left. Finally, select the **Odometer** menu item.

The GPS may be used to record the distance that the router has travelled. To do this, set the **Odometer** toggle key to the **ON** position as in the screenshot below. You can toggle the unit of measurement by clicking the **Display imperial / Display metric** button. The threshold setting adjusts the router's sensitivity to movement so that movement within the specified radius from the starting point does not register as distance travelled. When you have finished configuring the Odometer settings, click the **Save** button to ensure the settings are stored on the router.

Odometer



Odometer reading 507 Meter

Odometer start time Fri Sep 19 06:20:20 BST 2014

Display imperial

Reset odometer

Min Max

Threshold 35 Meter

Save

Figure 109 – Odometer options

ITEM	DESCRIPTION
Odometer	Toggles the Odometer function on and off.
Odometer reading	The number of metres/kilometres or feet that the device has travelled since the time listed in the Odometer start time field.
Display imperial / Display metric	Toggles the Odometer reading between metric and imperial measurements.
Odometer start time	The time that recording of distance travelled began.
Reset odometer	Resets the odometer reading to 0 and the Odometer start time to the current time.
Threshold	Specifies the minimum distance that the router must travel from its current position before the Odometer reading increases.

Table 19 - Odometer configuration options

IO configuration

The Vodafone MachineLink 3G Plus router is equipped with a 6-way terminal block connector providing 3 identical multipurpose inputs and outputs as well as a dedicated ignition input. These inputs and outputs may be independently configured for various functions, including:

- NAMUR (EN 60947-5-6 / IEC 60947-5-6) compatible proximity sensor input
- Proximity sensor input for use with contact closure (open/closed) type of sensors (PIR sensors, door/window sensors for security applications) with the input tamper detection possible (four states detected: open, closed, short and break) by the use of external resistors
- Analogue 0V to 30V input
- Digital input (the I/O voltage measured by the iMX283 LRADC and the software making decision about the input state) with the threshold levels configurable in software
- Open collector output.

Use the pull up voltage options to select the desired output voltage of the I/O pins. The pull up voltage you select will be the same for each pin when pull up is enabled for that pin. Each pin is capable of outputting either 3.3V or 8.2V.

IO configuration

IO Functionality I

Pull up voltage 3.3V 8.2V

IO Manager Debug level Min Max Error (Default=Error)

Per pin configuration

Pin	Mode	Pull up	Value
1	Analogue input	<input type="checkbox"/> 0	0.07 V
2	Analogue input	<input type="checkbox"/> 0	0.08 V
3	Analogue input	<input type="checkbox"/> 0	0.08 V

Save **Cancel**

Figure 110 – IO configuration options

ITEM	DESCRIPTION
IO configuration	
IO Functionality	Enables the configuration of the input and output pins on the Six-way terminal block.
Pull up voltage	Specifies the output voltage of the I/O pins.
IO Manager Debug level	Use the slide bar to adjust the level of detail you would like to see in the log for IO messages. A higher debug level displays more detailed messages in the log file.
Per pin configuration	
Pin	The I/O pin number corresponding to the pin on the terminal block.
Mode	The mode of operation for the corresponding pin. Available options are Digital input, Digital output, Analogue input, Namur input, Contact closure input.
Pull up	Use the pull up toggle keys to turn the pull up on or off for the corresponding pin. When turned on, the pull up voltage output is the value specified in the "Pull up voltage" option.
Value	The value column displays whether the voltage detected on the line is low or high or allows you to configure the output value in the case that the pin is set to digital output. This can be useful for applications where monitoring of the transition between low and high is used to trigger an action.

Table 20 - IO configuration options

The table below describes the different modes available on the physical I/O pins of the router.

MODE	DESCRIPTION
Digital input	The corresponding pin accepts digital input. Pull up may be on or off and both 3.3V and 8.2V are available as pull up voltages. The value column displays whether the signal received on the pin is High or Low.
Digital output	The corresponding pin outputs a digital signal. Pull up may be on or off and both 3.3V and 8.2V are available as pull up voltages. The value column contains a toggle key allowing you to set whether the output signal is High or Low.
Analogue input	The corresponding pin accepts an analogue signal. Pull up may be on or off and both 3.3V and 8.2V are available as pull up voltages. The value column displays the current voltage detected on the pin.
Namur input	NAMUR is a sensor standard using low-level current signals. It can supply two different signal levels depending on the state of the switch and is commonly used in hazardous or explosive locations where compact sensors are required. When a pin is set to NAMUR mode, Pull up is turned on and the global Pull up voltage is set to 8.2V. These settings may not be changed for as long as a pin is set to NAMUR mode as they are required settings according to the NAMUR IEC 60947-5-6 standard. The value column displays whether the signal received on the pin is High or Low.
Contact closure input	A common type of digital input where a sensor or switch opens or closes a set of contacts as a result of a process change. An electrical signal is then used to determine whether the circuit is open or closed. When a pin is set to Contact closure input, Pull up is enabled for that pin and may not be turned off as long as the pin remains configured as a Contact closure input. Global pull up voltage may be either 3.3V or 8.2V.

Table 21 - IO modes



Note: Please refer to the SDK Developer Guide for hardware information about the Input/Output pins, wiring examples and configuration of the pins via the command line interface. There are also wiring examples in Appendix J of this User Guide.

Low power mode

The Vodafone MachineLink 3G Plus router can be configured to enter or return from a low power ‘sleep’ mode. You can configure this to occur automatically after a timer has expired, by the status of the ignition pin, a combination of timer and ignition pin status or by manually triggering sleep mode.

During the sleep state, the Vodafone MachineLink 3G Plus router is effectively powered off. That is, it has no ability to communicate wirelessly or process any information. When in sleep mode, it draws approximately 5mA current at 12V. When sleep state is triggered, the Vodafone MachineLink 3G Plus router takes approximately 30 seconds to enter low power mode. When the wake up sequence is initiated, the router takes approximately 2 minutes to return from the sleep state. This is because returning from sleep state involves a full boot up sequence.

Ignition pin

The third pin on the 6-way terminal connector is a dedicated input called “Ignition”. This input is intended for connection to an ignition switch in vehicular applications or where an input to switch the device to a sleep/wake mode is required.

The Ignition input threshold voltage is around 3V. The input responds to a high input state (above 3V). A signal below this level is considered as a low state. If the software is configured to activate in the low state, for example 0V, it must still have the high state above 3V to turn it off.

 Note: There is a period of about 10 seconds after sleep state has been triggered where the ignition line cannot be monitored. Please take this into account when designing your ignition power on system.

Low power mode

This device can be configured to enter or return from a low power ‘sleep’ mode. This may occur automatically after a timer has expired and optionally by being sent a signal on the device’s dedicated input line, called the ‘ignition’ input.

During the sleep state, the device is effectively powered off. That is, it has no ability to communicate wirelessly or process any information. It will draw approximately 5mA current at 12V during the sleep state.

After being triggered, it takes approximately 30 seconds to enter the sleep state, and it takes approximately 2 minutes to return from the sleep state (which involves a full device boot up sequence).

Please note there is a period of around 10 seconds after the device is triggered to enter the sleep state where the ignition line cannot be monitored. Please take this into account when designing your ignition power on system.

<p>Low power mode functionality <input checked="" type="checkbox"/></p> <p>Sleep settings</p> <p>Sleep mode <input type="button" value="Sleep by manual trigger only"/></p> <p><input type="button" value="Trigger sleep mode now"/></p> <p>Wake settings</p> <p>Wake mode <input type="button" value="Only wake after specified duration and ignore ignition pin"/></p> <p>Always wake up after <input type="text" value="0"/> (0 - 4294967) seconds</p> <p><input type="button" value="Save"/></p>
--

Figure 111 - Low power mode settings

To begin using Low power mode, set the **Low power mode functionality** toggle key to the **ON** position. Extra settings are displayed. These settings, including the enabling or disabling of Low power mode functionality, only take effect when you click the **Save** button.

Sleep settings

Use the **Sleep mode** drop down list to select a condition under which the router should enter the sleep state.

Sleep by manual trigger only

When this mode is selected, the router will only enter the sleep state when the **Trigger sleep mode now** button is pressed. The **Trigger sleep mode now** button is not available unless Low power functionality has been selected and the setting saved.

Sleep settings

Sleep mode	Sleep by manual trigger only
Trigger sleep mode now	

Figure 112 - Sleep by manual trigger only

Sleep after specified duration and ignore ignition pin

When this mode is selected, the router goes to sleep after the specified time period regardless of the state of the ignition pin.

Sleep settings

Sleep mode	Sleep after specified duration and ignore ignition pin
Always go to sleep this many seconds after booting	3600 (300 - 4294967) seconds

Figure 113 - Sleep after specified duration and ignore ignition pin

Enter the time in seconds to wait before entering sleep state in the **Always go to sleep this many seconds after booting** field.

Sleep triggered by ignition pin status

This mode sets the router to enter sleep state when the signal on the ignition pin reaches the specified value.

Sleep settings

Sleep mode	Sleep triggered by ignition pin status
Sleep when ignition pin goes	<input checked="" type="radio"/> Low <input type="radio"/> High

Figure 114 - Sleep triggered by ignition pin status

Use the **Sleep when ignition pin goes** setting to select **Low** or **High**. By default, this is set to **Low**.

Sleep after specified duration or triggered by ignition pin

This option sets the router to go to the sleep state on one of two conditions, depending on which condition is reached first. These conditions are based on the state of the ignition pin and a timer. For example, based on the configuration in the screenshot below, the router will go to sleep state when the ignition pin goes low or after 3600 seconds (1 hour), depending on which condition occurs first.

Sleep settings

Sleep mode	Sleep after specified duration or triggered by ignition pin
Sleep when ignition pin goes	<input checked="" type="radio"/> Low <input type="radio"/> High
Always go to sleep this many seconds after booting	3600 (300 - 4294967) seconds

Figure 115 - Sleep after specified duration or triggered by ignition pin

Wake settings

Use the **Wake mode** drop down list to select a condition under which the router should return from the sleep state.

Only wake after specified duration and ignore ignition pin

When this mode is selected, the router wakes up after the specified time period regardless of the state of the ignition pin.

Wake settings

Wake mode	Only wake after specified duration and ignore ignition pin
Always wake up after	0 (0 - 4294967) seconds

Figure 116 - Only wake after specified duration and ignore ignition pin

Enter the time in seconds to wait before returning from sleep state in the **Always wake up after** field. A setting of 0 means that the router will automatically wake from sleep state immediately.

Wake triggered by ignition pin status

This mode sets the router to wake up when the signal on the ignition pin reaches the specified value.

Wake settings

Wake mode	Wake triggered by ignition pin status
Wake when ignition pin goes	<input type="radio"/> Low <input checked="" type="radio"/> High
Always wake up after	0 (0 - 4294967) seconds

Figure 117 - Wake when triggered by ignition pin status

Use the **Wake when ignition pin goes** setting to select **Low** or **High**. By default, this is set to **High**. The **Always wake up after** field is used to specify a time after which the router should wake up even if the ignition pin did not trigger the router to wake. This can be used as a fail-safe in the event that the ignition pin status did not change.

Advanced wake settings

The advanced wake settings screen gives you finer control over the events causing the router to wake up. In advanced wake mode, you can configure the router to monitor for up to 2 changes in the status of the ignition pin along with how long those status changes should last for to trigger a single wake up event. When selected, Event 1 and Event 2 must happen consecutively in that order to satisfy each condition.



Note: If you do not wish to specify 2 events you should select to skip Event 1, in which case the router will only monitor Event 2 to trigger a wake up.

There is also a provision to reboot the router after a specified period of time, regardless of whether the conditions of Events 1 and/or 2 are met. This can be viewed as a fall back option in the case that those Events are missed.

Wake settings

Wake mode **Advanced (configure below)**

Advanced wake settings
 In order to wake from sleep, you may choose to create up to 2 ignition pin events which must occur in a row in order to wake. Please choose the two required events below. If you wish to only require a single ignition pin event to occur, then please select Skip for Event 1, and configure Event 2 as desired.

For 'Stable time' fields, choose how long the ignition value must be stable for this Event (in 10ms increments). Note: 0 is a valid value, meaning instantaneous, 1 means 10ms etc.

Event 1

Required ignition line value for
 Low High **Skip**

Event 1
 Stable time (0 - 65535) x10ms

Event 2

Required ignition line value for
 Low High **Skip**

Event 2
 Stable time (0 - 65535) x10ms

Always wake up after (0 - 4294967) seconds

Figure 118 - Advanced wake up configuration

To configure advanced wake settings:

1. Set **Wake mode** to Advanced (configure below).
2. Under **Event 1**, select whether you want the ignition pin value to be Low or High. If you want to skip this event, select the Skip option.
3. In the Event 1 **Stable time** field, enter the length of time expressed in milliseconds that the value of the ignition line should remain low or high. For example, to specify 10 seconds, enter a value of 1000.
4. Under **Event 2**, select whether you want the ignition pin value to be Low or High. If you want to skip this event, select the Skip option.
5. In the Event 2 **Stable time** field, enter the length of time expressed in milliseconds that the value of the ignition line should remain low or high.
6. In the **Always wake up after** field, enter the time in seconds after which the router should wake up, regardless of whether Event 1 or 2 has occurred.

When in low power mode and Advanced wake mode is configured, the router waits for Event 1 to occur, then it monitors for Event 2. If Event 2 occurs before Event 1, it will not trigger the condition for either event to have occurred. If Event 1 occurs and then Events 2 occurs, the router wakes up. Alternatively, if neither or only one of the events occurs, the router waits for the time specified in the **Always wake up after** field and then wakes up when that time has been reached.

Event notification

The event notification feature is an advanced remote monitoring tool providing you with the ability to send alerts via SMS, e-mail, TCP or UDP when pre-defined system events occur.

Notification configuration

The Notification configuration page is used to select the event types, methods of notification and the destinations for the notifications. Up to four types of alerts for a particular event may be sent to a single destination profile containing the contact details.

Event notification configuration

Enable event notification	<input checked="" type="checkbox"/>					
Maximum event buffer size	100 (100-10000)					
Maximum retry count	5 (1-20)					
Event notification log file	/var/log/event.log					
Unit ID	CE8204					
Event number	Event description	Email	TCP	UDP	SMS	Destination profile
1	Unit powered up	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="button" value="Default"/>
2	Unit rebooted	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="button" value="Default"/>
3	Link status change	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="button" value="Default"/>
4	WWAN IP address change	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="button" value="Default"/>
5	WWAN Registration change	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="button" value="Default"/>
6	WWAN Cell ID change	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="button" value="Default"/>
7	WWAN technology change	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="button" value="Default"/>
8	Number of connected Ethernet interfaces change	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="button" value="Default"/>
9	Power source change	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="button" value="Default"/>
10	Web UI login failure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="button" value="Default"/>

Figure 119 - Event notification configuration

ITEM	DESCRIPTION
Enable event notification	Toggles the event notification feature on and off.
Maximum event buffer size	Specifies the buffer size for event notifications which failed to be delivered or are yet to be sent. The minimum size is 100 and the maximum is 10000.
Maximum retry count	Specifies the maximum number of attempts that the router will make to deliver an event notification. The range is between 1 and 20.
Event notification log file	Specifies to the location and name of the file used to log the event notification activity.
Unit ID	The Unit ID field is used to specify an identifier for the router which is sent in the event notifications so that you know which router has an event. By default, the Unit ID field is configured with the last 6 characters of the MAC address of the router.

Table 22 - Event notification configuration options

Event types

There are ten events for which you can configure alerts. Hovering the mouse over the event description provides more details of event notification type.

NUMBER	EVENT	DESCRIPTION
1	Unit powered up	Notification is sent when the unit is powered up through connection of a power source or after a soft-reset.
2	Unit rebooted	Notification is sent when the unit is rebooted via Web UI, SMS diagnostics or via command line/telnet session.
3	Link status changed	Notification is sent if the status of the data connection profile or any IPSec/OpenVPN/PPTP/GRE tunnel endpoint changes i.e. the link goes up or down.
4	WWAN IP address change	Notification is sent if an active data connection profile's WWAN IP address changes.
5	WWAN Registration change	Notification is sent if the network registration status changed between "registered", "unregistered" or "roaming".
6	WWAN Cell ID change	Notification is sent if the router connects to a different cell, marked by a changed in the Cell ID.
7	WWAN technology change	Notification is sent if the router connects to a different network technology, e.g. 3G/2G.
8	Number of connected Ethernet interfaces change	Notification is sent if there is a change to the number of directly connected Ethernet interfaces.
9	Power source change	Notification is sent if the router's power source changes between DC and PoE (if supported).
10	Web UI login failure	Notification is sent if there was a failure to log in to the router via the Web UI.

Table 23 - Event notification – event types

Destinations

A "destination" is a profile on the router containing the contact details of a recipient of event notification alerts i.e. the e-mail address, SMS number, TCP or UDP server addresses of the recipient. The destination profile must contain the details of at least one destination type in order to be used.

Configuring Event notification

To configure the event notification feature:

1. Click the **Services** menu item at the top of the screen. From the **Event notification** menu on the left of the screen, select the **Destination configuration** menu item.
2. Click the **+Add** button at the top right corner of the window. The Event destination profile edit screen is displayed.
3. In the **Destination name** field enter a name for the destination profile then enter the contact details for the each type of destination i.e. Email address, TCP address and port, UDP address and port and/or SMS number.



Note: If you have selected the Email notification type for any of the events, you must also configure Email server settings to allow the router to send e-mail messages.

4. Click the **Save** button when you have entered the required details.
5. From the **Event notification** menu on the left of the screen, select the **Notification configuration** menu item.
6. Select the **Enable event notification** toggle key to turn it to the **ON** position.
7. If desired, set the **Maximum event buffer size**, **Maximum retry count**, **Event notification log file** and **Unit ID** fields. See [table 22](#) for descriptions of these options.
8. From the **Destination profile** column, use the drop down menus to select the desired destination profiles to use for the corresponding events, then select the checkboxes for the types of notifications to send to the chosen destination profile. If the Destination profile does not contain the required contact details, you are notified when you click the Save button.
9. Click the **Save** button.

Destination configuration

The Destination configuration screen displays a list of the destination “profiles” that have been configured on the device as well as providing the option to add new profiles.

Event destination profile list

Destination name	Email address	TCP address	UDP address	SMS number
Default				

+ Add
 Edit
 i

Save
 Cancel

Figure 120 - Event destination profile list

To add a new destination profile:

1. Click the **+Add** button at the top right corner of the window. The Event destination profile edit screen is displayed.
2. In the **Destination name** field enter a name for the destination profile then enter the contact details for the each type of destination i.e. Email address, TCP address and port, UDP address and port and/or SMS number.
3. Click the **Save** button when you have entered the required details.

To edit a destination profile:

1. From the Event destination profile list, click the edit button for the corresponding destination profile. The Event destination profile edit page is displayed. Make the required changes.
2. Click the **Save** button.

To delete a destination profile:

1. From the Event destination profile list, select the delete button for the corresponding destination profile that you would like to delete. If the destination profile is linked to an event notification type, the **i** button is displayed instead of the delete button. In this case, you must go to the **Notification configuration** screen and remove the check marks from all the notification types for each event for which the destination profile is configured. When you have done that, return to the Event destination profile list and select the delete button.
2. Click the **Save** button.

Clicking the **i** button next to any destination profile displays a list of event notifications which are linked to that profile.

Email server

The Email server screen allows the configuration of the email account that is used to send emails in features such as Event notification.

Email server settings

Email server address (SMTP)	<input type="text"/>
Email server port	<input type="text"/> (TLS:587, SSL:465, Default:25)
Username	<input type="text"/>
Password	<input type="text"/>
Confirm password	<input type="text"/>
Email test recipient	<input type="text"/> <input type="button" value="Send test email"/>
<input type="button" value="Save"/> <input type="button" value="Refresh"/>	

Figure 121 - Email server settings

ITEM	DESCRIPTION
Email server address (SMTP)	Enter the SMTP server address of the email server. This may be an IP address or a hostname.
Email server port	Enter the Email server's SMTP port.
Username	Enter the username of the account to be used for sending emails.
Password	Enter the password of the account to be used for sending emails.
Confirm password	Enter the password of the account to be used for sending emails once more for confirmation.
Email test recipient	Enter an email address to send a test message to, then click the Send test email button. You do not need to Save the settings before clicking the Send test email button as the router uses the currently entered settings to send the test message. The email test only tests that the email was correctly sent, not that it was received, for example, the test may pass if the recipient is wrong or the inbox is full but the email is correctly delivered to the SMTP server.

Table 24 - Email server settings

SMS messaging

The Vodafone MachineLink 3G Plus router offers an advanced SMS feature set, including sending messages, receiving messages, redirecting incoming messages to another destination, as well as supporting remote commands and diagnostics messages.

Some of the functions supported include:

- Ability to send a text message via a 2G/3G network and store it in permanent storage
- Ability to receive a text message via a 2G/3G network and store it in permanent storage
- Ability to forward incoming text messages via a 2G/3G network to another remote destination which may be a TCP/UDP server or other mobile devices
- Ability to receive run-time variables from the device (e.g. uptime) on request via SMS
- Ability to change live configuration on the device (e.g. network username) via SMS
- Ability to execute supported commands (e.g. reboot) via SMS
- Ability to trigger the Vodafone MachineLink 3G Plus router to download and install a firmware upgrade
- Ability to trigger the Vodafone MachineLink 3G Plus router to download and apply a configuration file

To access the SMS messaging functions of the Vodafone MachineLink 3G Plus router, click on the **Services** menu item from the top menu bar, and then select one of the options under the **SMS messaging** section on the left hand menu.

Setup

The Setup page provides the options to enable or disable the SMS messaging functionality and SMS forwarding functionalities of the router. SMS messaging is enabled by default.

General SMS configuration

SMS messaging

Messages per page (10-50)	<input type="text" value="20"/>
Encoding scheme	<input checked="" type="radio"/> GSM 7-bit <input type="radio"/> UCS-2
SMSC address	<input type="text" value="+61412345678"/>
Routing option	<input type="radio"/> Packet-switched <input type="radio"/> Circuit-switched <input type="radio"/> Packet-switched preferred <input checked="" type="radio"/> Circuit-switched preferred

SMS forwarding configuration

Forwarding

Redirect to mobile	<input type="text"/>
TCP server address	<input type="text"/>
TCP port	<input type="text"/> (1-65535)
UDP server address	<input type="text"/>
UDP port	<input type="text"/> (1-65535)

Figure 122 - General SMS Configuration

OPTION	DEFINITION
General SMS configuration	
SMS messaging	Toggles the SMS functionality of the router on and off.
Messages per page (10-50)	The number of SMS messages to display per page. Must be a value between 10 and 50.
Encoding scheme	The encoding method used for outbound SMS messages. GSM 7-bit mode permits up to 160 characters per message but drops to 50 characters if the message includes special characters. UCS-2 mode allows the sending of Unicode characters and permits a message to be up to 50 characters in length.
SMS forwarding configuration	
Forwarding	Toggles the SMS forwarding function of the router on and off.
Redirect to mobile	Enter a mobile number as the destination for forwarded SMS messages.
TCP server address	Enter an IP address or domain name as the destination for forwarded SMS messages using TCP.
TCP port	The TCP port on which to connect to the remote destination.
UDP server address	Enter an IP address or domain name as the destination for forwarded SMS messages using UDP.
UDP port	The UDP port on which to connect to the remote destination.

Table 25 - SMS Setup Settings

SMS forwarding configuration

Incoming text messages can be redirected to another mobile device and/or a TCP/UDP message server.

Redirect to mobile

You can forward incoming text messages to a different destination number. This destination number can be another mobile phone or a 3G router phone number.

For Example:

If someone sends a text message and **Redirect to mobile** is set to “+61412345678”, the text message is stored on the router and forwarded to “+61412345678” at the same time.

To disable redirection to a mobile, clear the **Redirect to mobile** field and click the **Save** button.

Redirect to TCP / UDP server address

You can also forward incoming text messages to a TCP/UDP based destination. The TCP or UDP server can be any kind of public or private server if the server accepts incoming text-based messages.

The TCP/UDP address can be an IP address or domain name. The port number range is from 1 to 65535. Please refer to your TCP/UDP based SMS server configuration for which port to use.

For Example:

If someone sends a text message and **TCP server address** is set to “123.209.5.10” and **TCP port** is set to “2002”, this text message is stored in the router and forwarded to “123.209.5.10” on port “2002” at the same time.

To disable redirection to a TCP or UDP address, clear the **TCP server address** and **UDP server address** fields and click the **Save** button.

New message

The New message page can be used to send SMS text messages to a single or multiple recipients.

A new SMS message can be sent to a maximum of 9 recipients at the same time. After sending the message, the result is displayed next to the destination number as “Success” or “Failure” if the message failed to send. By default, only one destination number field is displayed. Additional destination numbers may be added one at a time after entering a valid number for the current destination number field. To add a destination number, click the  button and to remove the last destination in the list, click the  button.

New message

Destination number 01  

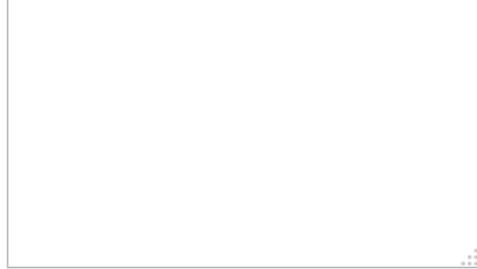
New message 

Figure 123 - SMS - New Message

Destination numbers should begin with the “+” symbol followed by the country calling code. To send a message to a destination number, enter the “+” symbol followed by the country calling code and then the destination number.

For example:

To send a message to the mobile destination number 0412345678 in Australia (country calling code 61), enter “+61412345678”.

After entering the required recipient numbers, type your SMS message in the **New message** field. As you type your message, a counter shows how many characters you have entered out of the total number available for your chosen encoding scheme. When you have finished typing your message and you are ready to send it, click the **Send** button.

Inbox / Sent Items

The Inbox displays all received messages that are stored on the router while Sent Items displays all sent messages.

Received messages (1)



+61412345678 2014/08
/18, 12:03:10

Test message



Figure 124 - Inbox

Sent messages (1)



+61412345678 Tue Sep 23
01:51:17 2014

Test message.



Figure 125 - Sent items

ICON	DESCRIPTION
	Forward button. Click this button to open a new message window where you can forward the corresponding message to another recipient.
	Reply button. Click this button to open a new message window where you can reply to the sender.
	Add to White list. Click this button to add the sender's mobile number to the white list on the router.
	Delete button. Click this button to delete the corresponding message.
	Refresh button. Click this button to refresh the inbox or outbox to see new messages.

Table 26 - Inbox/Sent items icons

Diagnostics

The Diagnostics page is used to configure the SMS diagnostics and command execution configuration. This allows you to change the configuration, perform functions remotely and check on the status of the router via SMS commands.

To access the Diagnostics page, click on the **Services** menu item then select the **SMS** menu on the left and finally select **Diagnostics** beneath it.

SMS diagnostics and command execution configuration

Enable remote diagnostics and command execution	<input checked="" type="checkbox"/>
Only accept authenticated SMS messages	<input checked="" type="checkbox"/>
Send Set command acknowledgement replies	<input type="checkbox"/> 0
Access advanced RDB variables	<input checked="" type="checkbox"/>
Allow execution of advanced commands	<input checked="" type="checkbox"/>
Send acknowledgement replies to	
<input type="radio"/> a fixed number <input checked="" type="radio"/> the sender's number	
Send command error replies	
<input checked="" type="checkbox"/>	
Send error replies to	
<input type="radio"/> a fixed number <input checked="" type="radio"/> the sender's number	
Send a maximum number of	<input type="text" value="100"/> replies per <input type="button" value="day"/>
0 / 100 messages sent	

Limit the number of diagnostic text messages that can be sent in a designated time period. Currently, the 'messages sent' count automatically resets at the end of the designated time period. For example, it will reset to zero at 01:00, 02:00, 03:00 etc for 'hour', 00:00 for 'day', 00:00 on Monday for 'week' and the first day of the month for 'month', or at anytime the unit reboots.

White list for diagnostic or execution SMS

All incoming diagnostic or execution text messages are checked against this white list. If the message sender and password don't match any destination numbers and passwords in this white list, the message is ignored and an error message reply is sent to the sender or to a predefined destination. You can add up to 20 destination numbers via the SMS inbox/sent items pages by clicking on 'Add white list'. Alternatively, click on 'Add' below to add a number now.

			+ Add
#	Destination number	Password	
01	<input type="text" value="310000214"/>	<input type="text"/>	<input type="button" value="x"/>
02	<input type="text" value="310000202"/>	<input type="text"/>	<input type="button" value="x"/>
03	<input type="text" value="8823993560000"/>	<input type="text"/>	<input type="button" value="x"/>
04	<input type="text" value="8823903560000"/>	<input type="text"/>	<input type="button" value="x"/>

Save

Refresh

Figure 126 - SMS diagnostics and command execution configuration

SMS diagnostics and command execution configuration

Enable remote diagnostics and command execution

Enables or disables the remote diagnostics feature. If this setting is enabled all incoming text messages are parsed and tested for remote diagnostics commands.

If remote diagnostics commands are found, the router executes those commands. This feature is enabled by default. All remote diagnostic commands that are received are stored in the Inbox.



Note: It is possible to adjust settings and prevent your router from functioning correctly using remote diagnostics. If this occurs, you will need to perform a factory reset in order to restore normal operation.



We highly recommend that you use the white list and a password when utilising this feature to prevent unauthorised access. See the [White list](#) description for more information.

Only accept authenticated SMS messages

Enables or disables checking the sender's phone number against the allowed sender white list for incoming diagnostics and command execution SMS messages.

If authentication is enabled, the router will check if the sender's number exists in the white list. If it exists, the router then checks the password (if configured) in the incoming message against the password in the white list for the corresponding sending number. If they match, the diagnostic or command is executed.

If the number does not exist in the white list or the password does not match, the router does not execute the incoming diagnostic or command in the SMS message.

This is enabled by default and it is strongly advised that you leave this feature enabled to maintain security.

Send Set command acknowledgement replies

The Vodafone MachineLink 3G Plus router will automatically reply to certain types of commands received, such as *get* commands, or *execute* commands. However acknowledgement replies from the Vodafone MachineLink 3G Plus router are optional with *set* commands and the *Wakeup* command. This option Enables or disables sending an acknowledgment message after execution of a *set* command or SMS Wakeup command. If disabled, the router does not send any acknowledgement after execution of a *set* command or SMS Wakeup command. All acknowledgment replies are stored in the Sent items after they have been sent. This can be useful to determine if a command was received and executed by the router. This option is disabled by default.

Access advanced RDB variables

By default, this option is turned on and allows access to all RDB variables via SMS. When this option is disabled you only have access to the [basic RDB variables](#) listed later in this guide.

Allow execution of advanced commands

By default, this option is turned on and allows execution of advanced commands such as those which are common to the Linux command line. For example: "execute ls /usr/bin/sms*" to list the contents of the /usr/bin/ folder on the router. When this option is disabled you may only execute the [basic commands](#) listed later in this guide

Send acknowledgement replies to

This option allows you to specify where to send acknowledgment messages after the execution of a *set*, *get*, or *exec* command.

If a **fixed number** is selected, the acknowledgement message will be sent to the number defined in the **Fixed number to send replies to** field. If the **sender's number** is selected, the acknowledgement message will be sent to the number that the SMS diagnostic or command message originated from. The default setting is to use **the sender's number**.

Fixed number to send replies to

This field defines the destination number to which acknowledgement messages are sent after the execution of a *get*, *set*, or *exec* command.

Send command error replies

Enables or disables the sending of an error message resulting from the execution of a *get*, *set*, or *exec* command. All error replies are stored in the Sent items after they have been sent.

Send error replies to

When **Send command error replies** is set to **ON**, this option is used to specify where the error SMS is sent. Use the radio buttons to select either a **fixed number** or the **sender's number**. When set to **the sender's number** the router will reply to the originating number of the SMS diagnostic or command. When set to **a fixed number** the router will send the error messages to the number specified in the following field.

Fixed number to send error replies to

This field defines the destination number to which error messages are sent after the execution of a get, set, or exec command.

Send a maximum number of

You can set the maximum number of acknowledgement and error messages sent when an SMS diagnostic or command is executed. The maximum limit can be set per hour, day, week or month. The router will send a maximum of 100 replies per day by default.

The number of messages sent is shown below the options. The total transmitted message count resets after a reboot or at the beginning of the time frame specified.

White List for diagnostic or execution SMS

The white list is a list of mobile numbers that you can create which are considered “friendly” to the router. If **Only accept authenticated SMS messages** is enabled in the diagnostics section, the router will compare the mobile number of all incoming diagnostic and command messages against this white list to determine whether the diagnostic or command should be executed. You may optionally configure a password for each number to give an additional level of security. When a password is specified for a number, the SMS diagnostic or command message is parsed for the password and will only be executed if the number and password match.

White list for diagnostic or execution SMS

All incoming diagnostic or execution text messages are checked against this white list. If the message sender and password don't match any destination numbers and passwords in this white list, the message is ignored and an error message reply is sent to the sender or to a predefined destination. You can add up to 20 destination numbers via the SMS inbox/sent items pages by clicking on 'Add white list'. Alternatively, click on 'Add' below to add a number now.

#	Destination number	Password	
01	310000214		<input type="button" value="x"/>
02	310000202		<input type="button" value="x"/>
03	8823993560000		<input type="button" value="x"/>
04	8823903560000		<input type="button" value="x"/>

Figure 127 - White list for diagnostic or execution SMS

Up to 20 numbers may be stored in the white list, however, when using a Vodafone GDSP SIM, 4 entries are reserved for system numbers and may not be removed. To add a number to the white list, click the “**+Add**” button.

#	Destination number	Password	
01	+61412345678	password123	<input type="button" value="x"/>

Figure 128 – Adding a number to the SMS white list

The White List numbers and passwords can be cleared by pressing the  button to the right of each entry. To add a number to the white list, enter it in the **Destination number** field and optionally define a password in the **Password** field. When you have finished adding numbers click the **Save** button to save the entries.

Sending an SMS Diagnostic Command

Follow the steps below to configure the router to optionally accept SMS diagnostic commands only from authenticated senders and learn how to send SMS diagnostic commands to the router.

1. Navigate to the Services > SMS messaging > Diagnostics page
2. Confirm that the **Enable remote diagnostics and command execution** toggle key is set to the **ON** position. If it is set to **OFF** click the toggle key to switch it to the **ON** position.
3. If you wish to have the router only accept commands from authenticated senders, ensure that **Only accept authenticated SMS messages** is set to the **ON** position. In the **White list for diagnostic or execution SMS** section, click the **+Add** button and enter the sender's number in international format into the **Destination number** field that appears. If you wish to also configure a password, enter the password in the **Password** field corresponding to the destination number.
4. If you would prefer to accept SMS diagnostic commands from any sender, set the **Only accept authenticated SMS messages** toggle key to the **OFF** position.

 Note: An alternative method of adding a number to the white list is to navigate to **Services > SMS messaging > Inbox** and then click the  button next to the message which corresponds to the sender's number.

5. Click the **Save** button.

Types of SMS diagnostic commands

There are three types of commands that can be sent; **execute**, **get** and **set**. The basic syntax is as follows:

- execute COMMAND
- get VARIABLE
- set VARIABLE=VALUE

If authentication is enabled, each command must be preceded by the password:

- PASSWORD execute COMMAND
- PASSWORD get VARIABLE
- PASSWORD set VARIABLE=VALUE

The following are some examples of SMS diagnostic commands:

- password6657 execute reboot
- get rssi
- set apn1=testAPNvalue

SMS acknowledgment replies

The router automatically replies to **get** commands with a value and **execute** commands with either a success or error response. **Set** commands will only be responded to if the **Send Set command acknowledgement replies** toggle key is set to **ON**. If the **Send command error replies** toggle key is set to **ON**, the router will send a reply if the command is correct but a variable or value is incorrect, for example, due to misspelling.

SMS command format

Generic Format for reading variables:

get VARIABLE

PASSWORD get VARIABLE

Generic Format for writing to variables:

set VARIABLE=VALUE

PASSWORD set VARIABLE=VALUE

Generic Format for executing a command:

execute COMMAND

PASSWORD execute COMMAND

Replies

Upon receipt of a successfully formatted, authenticated (if required) command, the gateway will reply to the SMS in the following format:

TYPE	SMS CONTENTS	NOTES
get command	"VARIABLE=VALUE"	
set command	"Successfully set VARIABLE to VALUE"	Only sent if the acknowledgment message function is enabled
execute command	"Successfully executed command COMMAND"	

Table 27 - SMS Diagnostic Command Syntax

Where "VARIABLE" is the name of the value to be read

Where "VARIABLE (x)" is the name of another value to be read

Where "VALUE" is the content of, or to be written to the "VARIABLE"

Where "COMMAND" is a supported command to be executed by the device (e.g. reboot)

Where "PASSWORD" is the password (if configured) for the corresponding sender number specified in the White List

Multiple commands can be sent in the same message, if separated by a semicolon.

For Example:

get VARIABLE1; get VARIABLE2; get VARIABLE3

PASSWORD get VARIABLE1; get VARIABLE2

set VARIABLE=VALUE1 ; set VARIABLE2=VALUE2

PASSWORD set VARIABLE1=VALUE1; set VARIABLE2=VALUE2; set VARIABLE3=VALUE3

If required, values can also be bound by an apostrophe, double apostrophe or back tick.

For Example:

"set VARIABLE='VALUE'"

"set VARIABLE="VALUE""

"set VARIABLE=`VALUE`"

"get VARIABLE"

A password (if required), only needs to be specified once per SMS, but can be prefixed to each command if desired.

“PASSWORD get Variable1”; “get VARIABLE2”
 “PASSWORD set VARIABLE1=VALUE1”; “set VARIABLE2=VALUE2”

If the command sent includes the “reboot” command and has already passed the white list password check, the device keeps this password and executes the remaining command line after the reboot with this same password.

For Example:

“PASSWORD execute reboot; getVariable1”; “get VARABLE2”
 “PASSWORD execute reboot; PASSWORD get Variable1”; “get VARABLE2”



Note: COMMANDs, VARIABLEs and VALUEs are case sensitive.

List of basic commands

A list of basic commands which can be used in conjunction with the execute command are listed below:

“pdpcycle”, “pdtdown” and “pdpu” commands can have a profile number suffix ‘x’ added. Without the suffix specified, the command operates against the default profile configured on the profile list page of the Web-UI.

#	COMMAND NAME	DESCRIPTION
1	reboot	Immediately performs a soft reboot.
2	pdpcycle	Disconnects (if connected) and reconnects the data connection. If a profile number is selected in the command, try to disconnect/reconnect the specified profile in case the profile is active. If no profile number is selected, try to disconnect/reconnect the current active profile. Reports an error if no profile number is selected and there is no currently activated profile.
3	pdtdown	Disconnects the PDP. If a profile number is selected in the command, the router tries to disconnect the specified profile in case the profile is active. If no profile number is selected, try to disconnect the current active profile. Reports an error if no profile number is selected and there is no currently activated profile.
4	pdpu	Reconnects the PDP. If a profile number is selected in the command, the router tries to connect with the specified profile. If no profile number is selected, the router tries to connect to the last active profile. The gateway will check the currently activated profile and disconnect this profile before executing the command. The router reports an error if no profile number is selected and there is no stored last active profile number.
5	factorydefaults	Performs a factory reset on the router. Be aware that this command also clears the SMS white list on the router.
6	download	Performs a download and install of a Firmware Upgrade (.cdi), Config File (.tar.gz) or a help document (.pdf) file. If the file is a firmware image as in the case of a .cdi file, the router will apply the recovery image first and then the main firmware image. When the router has finished installing both recovery and main images, it automatically reboots. The download location is specified immediately after the command and may be from an HTTP or FTP source URL. If the file is a .tar.gz file, the router will apply the file as a configuration file update for the device and then prompt the user to reboot the router so that the new configuration can take effect. If the file is a .pdf, the router will assume this is a user guide document and save it to the router and make the file available for viewing via the help menu on the Web-UI. Note: If your download URL includes any space characters, please encode these prior to transmission according to RFC1738, for example: ftp://username:password@serveraddress/directory%20with%20spaces/filename.cdi Note: Authenticated FTP addresses may be used following the format as defined in RFC1738, for example: ftp://username:password@serveraddress/directory/filename.cdi Note: After issuing the download command to install a firmware image, avoid sending another diagnostic SMS to the router for 5 minutes to allow the router time to perform the firmware upgrade.
7	codconnect	Causes the router to activate the PDP context when the Connect on demand feature is enabled.
8	coddisconnect	Causes the router to de-activate the PDP context when the Connect on demand feature is enabled.
9	ssh.genkeys	Instructs the router to generate new public SSH keys.
10	ssh.clearkeys	Instructs the router to clear the client public SSH key files.

Table 28 - List of basic SMS diagnostic commands

List of get/set commands

The following table is a partial list of get and set commands which may be performed via SMS.

COMMAND NAME	EXAMPLE	DESCRIPTION
Status		
get status	get status	Returns the Module firmware version, LAN IP Address, Network State, Network operator and RSSI.
get sessionhistory	get sessionhistory	Returns the time and date of recent sessions along with the total amount of data sent and received for each session.
Log file		
set syslogserver	set syslogserver=123.45.67.89:514	Sets a remote syslog server IP or hostname and port.
Connect on demand		
set cod	set cod=1	Enables or disables Connect on demand.
get cod	get cod	Returns the enable/disable status of the Connect on demand feature.
get codstatus	get codstatus	Returns the connection status of the Connect on demand feature.
set coddialport	set coddialport=on,53	Sets the Connect on demand feature to connect only when traffic is received on the specified port.
get coddialport	get coddialport	Returns the Connect on demand port filter status and list of filtered ports.
set codonline	set codonline=20	Sets the router to stay online for at least X minutes when data activity is detected.
get codonline	get codonline	Returns the number of minutes the router is configured to stay online when data activity is detected.
set codminonline	set codminonline=10	Sets the router to stay online for a minimum of X minutes after connecting.
get codminonline	get codminonline	Returns the minimum number of minutes the router should stay online after connecting.
set codredial	set codredial=5	Sets the number of minutes that the router should not attempt to redial after hanging up.
get codredial	get codredial	Returns the number of minutes that the router is configured to not attempt to redial after hanging up.
set coddisconnect	set coddisconnect=0	Sets the number of minutes after which the router should disconnect regardless of traffic.
get coddisconnect	get coddisconnect	Returns the number of minutes the router is configured to disconnect regardless of traffic.
set codconnectreg	set codconnectreg=30	Sets the number of minutes that the router should regularly attempt to connect.
get codconnectreg	get codconnectreg	Returns the number of minutes that the router is configured to regularly attempt to connect.
set codrandomtime	set codrandomtime=3	Sets the number of minutes that the router should randomise the dial time by.
get codrandomtime	get codrandomtime	Returns the number of minutes that the router is configured to randomise the dial time by.
set codverbose	set codverbose=1	Sets verbose logging on or off.
get codverbose	get codverbose	Returns the status of verbose logging.
set codignore.icmp	set codignore.icmp=1	Sets the router to ignore ICMP packets triggering data activity detection.
get codignore.icmp	get codignore.icmp	Returns the status of the Ignore ICMP option.
set codignore.tcp	set codignore.tcp=1	Sets the router to ignore TCP packets triggering data activity detection.
get codignore.tcp	get codignore.tcp	Returns the status of the Ignore TCP option.
set codignore.udp	set codignore.udp=1	Sets the router to ignore UDP packets triggering data activity detection.
get codignore.udp	get codignore.udp	Returns the status of the Ignore UDP option.
set codignore.dns	set codignore.dns=1	Sets the router to ignore DNS traffic triggering data activity detection.
get codignore.dns	get codignore.dns	Returns the status of the Ignore DNS option.
set codignore.ntp	set codignore.ntp=1	Sets the router to ignore NTP traffic triggering data activity detection.
get codignore.ntp	get codignore.ntp	Returns the status of the Ignore NTP option.
set codignore.ncsi	set codignore.ncsi=1	Sets the router to ignore NCSI traffic triggering data activity detection.
get codignore.ncsi	get codignore.ncsi	Returns the status of the Ignore NCSI option.
Operator settings		
get plmnscan	get plmnscan	Instructs the router to perform a network scan and returns the results by SMS.
set forceplmn	set forceplmn=505,03	Sets the operator to a manual selection made by the user where "505" is the Mobile Country Code for Australia and "03" is the Mobile Network Code for Vodafone. As no network type (i.e. 3G or 2G) is specified, it is selected automatically.
get forceplmn	get forceplmn	Returns the operator and network type selection mode (Automatic/Manual), in addition to the MCC and MNC values
Data connection (PPPoE mode)		
get pppoe	get pppoe	Returns the PPPoE status, currently configured dial string and service name

set pppoe	set pppoe=1, telstra.internet, test	Sets the PPPoE status on, APN to telstra.internet, and service name to test.
LED operation mode		
get ledmode	get ledmode	Returns the status of the LED operation mode.
set ledmode	set ledmode=10	Sets the LED operation mode to be always on or to turn off after the specified number of minutes.
SSH key management		
get ssh.proto	get ssh.proto	Returns the SSH protocol in use.
set ssh.proto	set ssh.proto=1,2	Sets the SSH Protocol to protocol 1, 2 or both (1,2).
get ssh.passauth	get ssh.passauth	Returns the status of the SSH Enable password authentication option.
set ssh.passauth	set ssh.passauth=1	Sets the SSH Enable password authentication option on or off.
get.ssh.keyauth	get.ssh.keyauth	Returns the status of the SSH Enable key authentication option.
set.ssh.keyauth	set.ssh.keyauth=1	Sets the SSH Enable key authentication option on or off.

Table 29 - List of get/set commands



Note: get/set commands may also be performed on many RDB variables. To obtain a full list of RDB variables, refer to [Appendix H](#).

List of basic RDB variables

The following table lists valid variables where "x" is a profile number (1-6). If no profile is specified, variables are read from or written to for the current active profile. If a profile is specified, variables are read from or written to for the specified profile number ('x').

#	RDB VARIABLE NAME	SMS VARIABLE NAME	READ/WRITE	DESCRIPTION	EXAMPLE VALUE
0	link.profile.1.enable link.profile.1.apn link.profile.1.user link.profile.1.pass link.profile.1.auth_type link.profile.1.iplocal link.profile.1.status	profile	RW	Profile	Read: (profile no,apn,user,password,auth,iplocal,status) 1,apn,username,password, chap,202.44.185.111,up Write: (apn, user, pass,auth) apn,username,password
2	link.profile.1.user	username	RW	3G username	Guest, could also return "null"
3	link.profile.1.pass	password	RW	3G password	Guest, could also return "null"
4	link.profile.1.auth_type	authtype	RW	3G Authentication type	"pap" or "chap"
5	link.profile.1.iplocal	wanip	R	WAN IP address	202.44.185.111
6	wwan.0.radio.information.signal_strength	rssi	R	3G signal strength	-65 dBm
7	wwan.0.imei	imei	R	IMEI number	357347050000177
8	statistics.usage_current	usage	R	3G data usage of current session	"Rx 500 bytes, Tx 1024 bytes, Total 1524 bytes" or "Rx 0 byte, Tx 0 byte, Total 0 byte" when wwan down
9	statistics.usage_current	wanuptime	R	Up time of current 3G session	1 days 02:30:12 or 0 days 00:00:00 when wwan down
10	/proc/uptime	deviceuptime	R	Device up time	1 days 02:30:12
11	wwan.0.system_network_status.current_band	band	R	Current band	WCDMA850

Table 30 - List of basic SMS diagnostics RDB variables

Network scan and manual network selection by SMS

Performing a network scan

The **get plmnscan** SMS command enables you to perform a scan of the cellular networks available at the time of the scan.

It returns the following semi-colon separated information for each network in range:

- MCC
- MNC
- Network Type (3G, 2G)
- Provider's Name

- Operator Status (available, forbidden, current)

The following is an example of a response from the **get plmnscan** SMS command:

```
plmnscan:505,03,7,vodafone AU,4;505,03,1,vodafone AU,1;505,02,7,YES OPTUS,1;505,02,1,YES OPTUS,1;505,01,1,Telstra
Mobile,1;505,01,7,Telstra Mobile,1
```

NETWORK TYPE	DESCRIPTION
7	Indicates a 3G network
1	Indicates a 2G network

Table 31 - Network types returned by get plmnscan SMS command

OPERATOR STATUS	DESCRIPTION
1	Indicates an available operator which may be selected.
2	Indicates a forbidden operator which may not be selected (applies only to generic SIM cards).
4	Indicates the currently selected operator.

Table 32 - Operator status codes returned by get plmnscan SMS command



Notes about the network connection status when using the **get plmnscan** command:

- If the connection status is **Up** and connection mode is **Always on**, the **get plmnscan** SMS will cause the connection to disconnect, perform the scan, send the result through SMS and then bring the connection back up again. If the connection status is **Down**, the router will perform the PLMN scan, send the result and keep the connection status down.
- If the connection status is **Waiting** and connection mode is **Connect on demand**, the **get plmnscan** SMS will change the connection status to **Down**, perform the scan, send the result through SMS and then restore the connection status to the **Waiting** state.
- If the connection status is **Up** and connection mode is **Connect on demand**, the **get plmnscan** SMS will cause the connection to disconnect, perform the scan, send the result through SMS, and then restore the connection status to the **Waiting** state unless there is a traffic which triggers a connection in which case the connection status will be set to **Up**.

Setting the router to connect to a network

The router can be instructed by SMS to connect to one of the networks returned by the **get plmnscan** command. The **set forceplmn** command forces the router to connect to a specified operator network (if available) while the **get forceplmn** command retrieves the currently configured network on the router.

Command format:

```
set forceplmn=0|MCC,MNC| MCC,MNC,Network Type
```

For example:

```
set forceplmn=0
```

Sets the selection of operator and network type to automatic mode.

```
set forceplmn=505,03
```

Sets the operator to a manual selection made by the user where "505" is the Mobile Country Code for Australia and "03" is the Mobile Network Code for Vodafone. As no network type (i.e. 3G or 2G) is specified, it is selected automatically.

```
set forceplmn=505,03,07
```

Sets the operator and network type to a manual selection made by the user where "505" is the Mobile Country Code for Australia, "03" is the Mobile Network Code for Vodafone and "07" is the 3G network type.



Notes about the **set forceplmn** command:

1. If the manual selection fails, the device will fall back to the previous 'good' network.
2. When enabled, the SMS acknowledgement reply reflects the success or failure of the manual selection with respect to the *set* command and includes the final MNC/MCC that was configured.

Confirming the currently configured operator and network type

You can retrieve the currently configured operator and network type using the **get forceplmn** command.

The **get forceplmn** command returns the operator and network type selection mode (Automatic/Manual), in addition to the MCC and MNC values, for example:

Automatic,505,03

This response indicates that the operator/network selection mode is Automatic, and the network used is Vodafone AU.

SMS diagnostics examples

The examples below demonstrate various combinations of supported commands. This is not an exhaustive list and serves as an example of possibilities only.

DESCRIPTION	AUTHENTICATION	INPUT EXAMPLE
Send SMS to change the data connection username	Not required	set username='NetComm'
	Required	PASSWORD set username= "NetComm"
Send SMS to change the data connection password	Not required	set password= `NetComm`
	Required	PASSWORD set password= `NetComm`
Send SMS to change the data connection authentication	Not required	set authtype='pap'
	Required	PASSWORD set authtype = pap
Send SMS to reboot	Not required	execute reboot
	Required	PASSWORD execute reboot
Send SMS to check the WAN IP address	Not required	get wanip
	Required	PASSWORD get wanip
Send SMS to check the mobile signal strength	Not required	get rssi
	Required	PASSWORD get rssi
Send SMS to check the IMEI number	Not required	get imei
	Required	PASSWORD get imei
Send SMS to check the current band	Not required	get band
	Required	PASSWORD get band
Send SMS to Disconnect (if connected) and reconnect the data connection	Not required	execute pdpcycle
	Required	PASSWORD execute pdpcycle
Send SMS to disconnect the data connection	Not required	execute pdpdown
	Required	PASSWORD execute pdpdown
Send SMS to connect the data connection	Not required	execute pdpup
	Required	PASSWORD execute pdpup
Send multiple get command	Not required	get wanip;get rssi
	Required	PASSWORD get wanip; get rssi
Send multiple set command	Not required	set ssh.genkeys=1; set username=test; set auth=pap
	Required	PASSWORD set ssh.genkeys=1; set username=test; set auth=pap
Send SMS to reset to factory default settings	Not required	execute factorydefaults
	Required	PASSWORD execute factorydefaults
Send SMS to retrieve status of router	Not required	get status
	Required	PASSWORD get status
Send SMS to retrieve the history of the session, including start time, end time and total data usage	Not required	get sessionhistory
	Required	PASSWORD get sessionhistory

Send SMS to configure the router to send syslog to a remote syslog server	Not required	set syslogserver=123.209.5.68
	Required	PASSWORD set syslogserver=123.209.5.68
Send SMS to wake up the router, turn on the default gateway and trigger the 'connect on demand' profile if in waiting state.	Not required	A zero byte class 1 flash SMS
Send SMS to perform firmware upgrade when firmware is located on HTTP server	Not required	execute download http://download.com:8080/firmware_image.cdi execute download http://download.com:8080/firmware_image_r.cdi
	Required	PASSWORD execute download http://download.com:8080/firmware_image.cdi PASSWORD execute download http://download.com:8080/firmware_image_r.cdi
Send SMS to perform firmware upgrade when firmware is located on FTP server	Not required	execute download ftp://username:password@download.com/firmware_image.cdi execute download ftp://username:password@ download.com/firmware_image_r.cdi
	Required	PASSWORD execute download ftp://username:password@ download.com/firmware_image.cdi PASSWORD execute download ftp://username:password@ download.com/firmware_image_r.cdi
Send SMS to download and install IPK package located on HTTP server	Not required	execute download http://download.com:8080/package.ipk
	Required	PASSWORD execute download http://download.com:8080/package.ipk
Send SMS to download and install IPK package located on FTP server	Not required	execute download ftp://username:password@ download.com:8080/package.ipk
	Required	PASSWORD execute download ftp://username:password@ download.com:8080/package.ipk
Send SMS to turn off PPPoE	Not required	set pppoe=0
	Required	PASSWORD set pppoe=0
Send SMS to retrieve the PPPoE status, currently configured dial string and service name	Not required	get pppoe
	Required	PASSWORD get pppoe
Send SMS to set the LED mode timeout to 10 minutes	Not required	set ledmode=10
	Required	PASSWORD set ledmode=10
Send SMS to retrieve the current LED mode	Not required	get ledmode
	Required	PASSWORD get ledmode
Retrieve current SSH protocol	Not required	get ssh.proto
	Required	PASSWORD get ssh.proto
Select SSH protocol	Not required	set ssh.proto=1
	Required	PASSWORD set ssh.proto=1
Retrieve password authentication status	Not required	get ssh.passauth
	Required	PASSWORD get ssh.passauth
Enable/disable password authentication on host	Not required	set ssh.passauth=1 or set ssh.passauth=0
	Required	PASSWORD set ssh.passauth=1 or PASSWORD set ssh.passauth=0
Generate set of public/private keys on the host	Not required	execute ssh.genkeys
	Required	PASSWORD execute ssh.genkeys
Clear client public keys stored on host	Not required	execute ssh.clearkeys
	Required	PASSWORD execute ssh.clearkeys

Table 33 - SMS diagnostics example commands

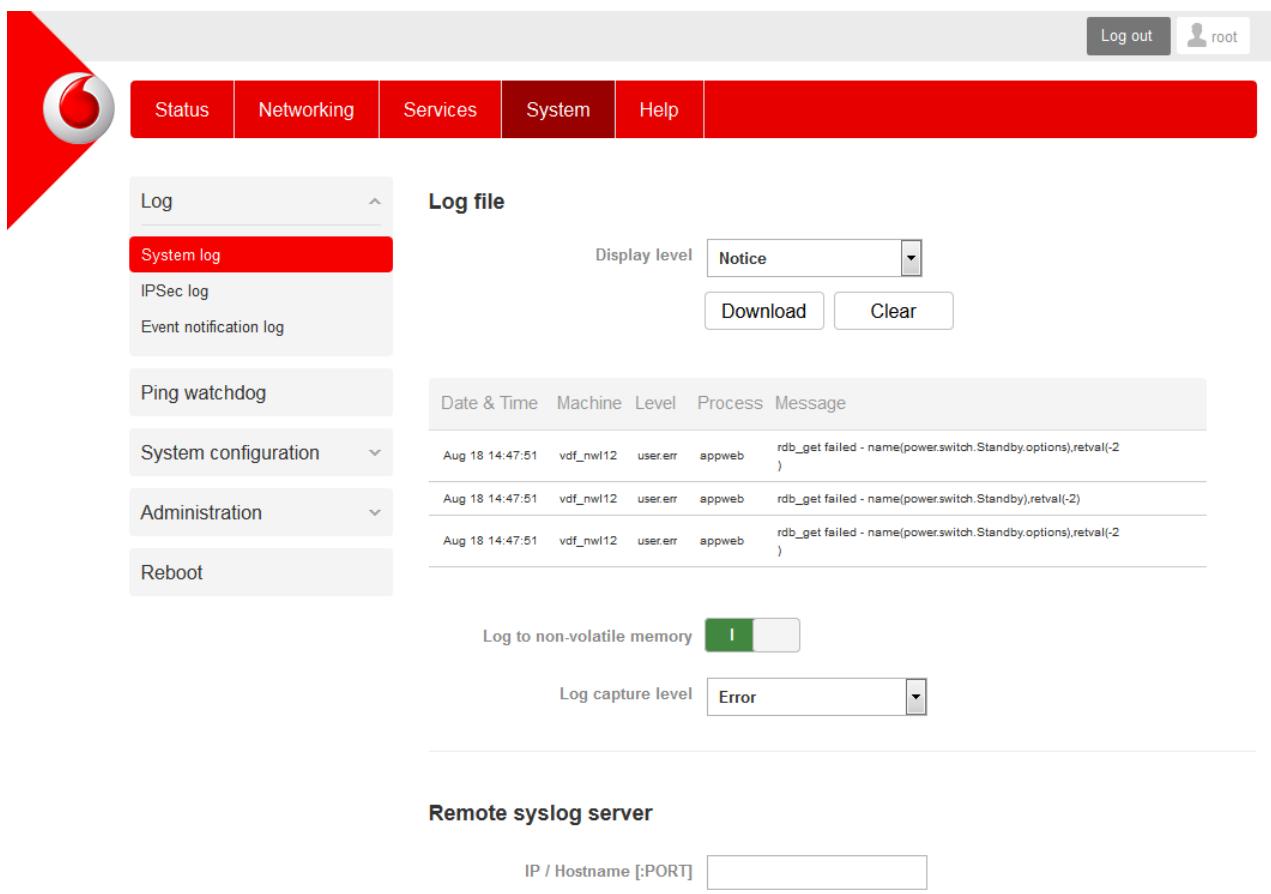
System

Log

The Log pages are used to display or download the System log, IPSec log and Event notification logs on the router.

System log

The System Log enables you to troubleshoot any issues you may be experiencing with your Vodafone MachineLink 3G Plus router. To access the System Log page, click on the **System** menu. The System Log is displayed.



Date & Time	Machine	Level	Process	Message
Aug 18 14:47:51	vdf_nwl12	user.err	appweb	rdb_get failed - name(power.switch.Standby.options),retval(-2)
Aug 18 14:47:51	vdf_nwl12	user.err	appweb	rdb_get failed - name(power.switch.Standby),retval(-2)
Aug 18 14:47:51	vdf_nwl12	user.err	appweb	rdb_get failed - name(power.switch.Standby.options),retval(-2)

Figure 129 - System log file

Log file

The **Log capture level** drop down list lets you select the level of logs that are written to the log file. Set the level that you would like to capture first, then set the **Display level** since the Display level chosen filters only the messages that are captured.

To download the System log for offline viewing, right-click the **Download** button and choose **Save as..** to save the file. To clear the System log, click the **Clear** button. The downloaded log file is in Linux text format with carriage return (CR) only at the end of a line, therefore in order to be displayed correctly with new lines shown, it is recommended to use a text file viewer which displays this format correctly (e.g. Notepad++).

Log data is stored in RAM and therefore, when the unit loses power or is rebooted, it will lose any log information stored in RAM. To ensure that log information is accessible between reboots of the router there are two options:

1. Enable the **Log to non-volatile memory** option
2. Use a remote syslog server

Enable the Log to non-volatile memory option

When the router is configured to log to non-volatile memory, the log data is stored in flash memory, making it accessible after a reboot of the router. Up to 512kb of log data will be stored before it is overwritten by new log data. Flash memory has a finite number of program-erase operations that it may perform to the blocks of memory. While this number of program-erase operations is quite large, we recommend that you do not enable this option for anything other than debugging to avoid excessive wear on the memory.

Use a remote syslog server

The router can be configured to output log data to a remote syslog server. This is an application running on a remote computer which accepts and displays the log data. Most syslog servers can also save the log data to a file on the computer on which it is running allowing you to ensure that no log data is lost between reboots.

To configure the Vodafone MachineLink 3G Plus router to output log data to a remote syslog server:

1. Click on the **System** menu from the top menu bar. The System log item is displayed.
2. Under the **Remote syslog server** section, enter the IP address or hostname of the syslog server in the **IP / Hostname [:PORT]** field. You can also specify the port number after the IP or hostname by entering a colon and then the port number e.g. 192.168.1.102:514. If you do not specify a port number, the router will use the default UDP port 514.
3. Click the **Save** button to save the configuration.

Log levels

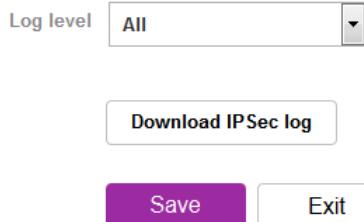
ITEM	DEFINITION
Debug	Show extended system log messages with full debugging level details.
Info	Show informational messages only.
Notice	Show normal system logging information.
Error	Show error condition messages only.

Table 34 - System log detail levels

IPSec log

The IPSec log section provides the ability for you to download the log for the IPSec VPN function. This can assist in troubleshooting any problems you may have with the IPSec VPN.

IPSec log



Log level

Figure 130 - IPSec log

Use the **Log level** drop down list to specify the type of detail you want to capture in the log and then click the **Save** button. When you change the logging level, any active IPSec VPN tunnels will be disconnected as a change in logging level requires the IPSec service to be restarted.

To download the IPSec log, click the **Download IPSec log** button and you will be prompted to save the file.

Event notification log

The Event notification log displays a history of the notifications that have been triggered. You can download the log file or manually force the log to be updated using the provided buttons. The Clear button clears the Event notification history window and also clears the number of events displayed on the Status page. The Event notification section of the Status page shows the number of events that have been triggered and provides a link to this Event notification history window.

Event notification log

Event notification history

```
[0]-[EVENT#3] 2014-09-23 05:23:46 Profile 1 WWAN status changed : down -> up
[1]-[EVENT#8] 2014-09-23 05:23:47 Ethernet device number changed : 0 -> 1
[2]-[EVENT#4] 2014-09-23 05:23:48 WWAN IP address changed : N/A -> 10.100.206.202
```

Figure 131 – Event notification log

Ping watchdog

The Ping watchdog page is used to configure the behaviour of the Periodic Ping monitor function.

When configured, the Ping watchdog feature transmits controlled ping packets to 1 or 2 user specific IP addresses. Should the watchdog not receive responses to the pings, it will reboot the device in a last resort attempt to restore connectivity.

Please be very careful when considering using this feature in situations where the device is intentionally offline for a particular reason (e.g. user configured PDP session disconnect, or the Connect on demand feature enabled). This is because the ping watchdog feature expects to be able to access the internet at all times and will always eventually reboot the router if access isn't restored by the time the various timers and retries expire.

It is due to the nature of the ping watchdog being a last resort standalone backup mechanism that it will continue to do its job and reboot the device even when the Connect on demand session is idle, or the PDP context is disabled by the user. Therefore, it is recommended to disable this feature if Connect on demand is configured, or if the PDP context will be intentionally disconnected on the occasion.

The feature operates as follows:

- A. After every "Periodic Ping timer" configured interval, the router sends 3 consecutive pings to the "First destination address".
- B. If all 3 pings fail the router sends 3 consecutive pings to the "Second address".
- C. The router then sends 3 consecutive pings to the "Destination address" and 3 consecutive pings to the "Second address" every "Periodic Ping accelerated timer" configured interval.
- D. If all accelerated pings in step C above fail then number of time configured in "Fail count", the router reboots.
- E. If any ping succeeds, the router returns to step A and does not reboot.

 Note: The "Periodic Ping timer" should not be set to a value of less than 300 seconds to allow the router time to reconnect to the cellular network following a reboot.

To disable the Ping watchdog, set **Fail count** to 0.

First destination address	<input type="text"/>
Second destination address	<input type="text"/>
Periodic Ping timer	<input type="text" value="0"/> (0=disable, 300-65535) secs
Periodic Ping accelerated timer	<input type="text" value="0"/> (0=disable, 60-65535) secs
Fail count	<input type="text" value="0"/> (0=disable, 1-65535) times

Periodic reboot

Force reboot every	<input type="text" value="0"/> (0=disable, 5-65535) mins
Randomize reboot time	<input type="text" value="1 minute"/>

Save

Figure 132 – Ping watchdog settings

Configuring Periodic Ping settings

The Periodic Ping settings configure the router to transmit controlled ping packets to 2 specified IP addresses. If the router does not receive responses to the pings, the router will reboot.

To configure the ping watchdog:

1. In the **First destination address** field, enter a website address or IP address to which the router will send the first round of ping requests.
2. In the **Second destination address** field, enter a website address or IP address to which the router will send the second round of ping requests.
3. In the **Periodic Ping timer** field, enter an integer between 300 and 65535 for the number of seconds the router should wait between ping attempts. Setting this to 0 disables the ping watchdog function.
4. In the **Periodic Ping accelerated timer** field, enter an integer between 60 and 65535 for the number of seconds the router should wait between accelerated ping attempts, i.e. pings to the second destination address. Setting this to 0 disables the ping watchdog function
5. In the **Fail count** field, enter an integer between 1 and 65535 for the number of times an accelerated ping should fail before the router reboots. Setting this to 0 disables the ping watchdog function.

Disabling the Ping watchdog function

To disable the Ping watchdog function, set **Fail Count** to 0.



Note: The traffic generated by the periodic ping feature is usually counted as chargeable data usage. Please keep this in mind when selecting how often to ping.

Configuring a Periodic reboot

The router can be configured to automatically reboot after a period of time specified in minutes. While this is not necessary, it does ensure that in the case of remote installations, the router will reboot if some anomaly occurs.

1. In the **Force reboot every** field, enter the time in minutes between forced reboots. The default value is 0 which disables the Periodic reboot function. The minimum period between reboots is 5 minutes while the maximum value is 65535 minutes.
2. If you have configured a forced reboot time, you can use the **Randomise reboot time** drop down list to select a random reboot timer. Randomising the reboot time is useful for preventing a large number of devices from rebooting simultaneously and flooding the network with connection attempts. When configured, the router waits for the configured **Force reboot every** time and then randomly selects a time that is less than or equal to the **Randomise reboot time** setting. After that randomly selected time has elapsed, the router reboots.
3. Click the **Save** button to save the settings.

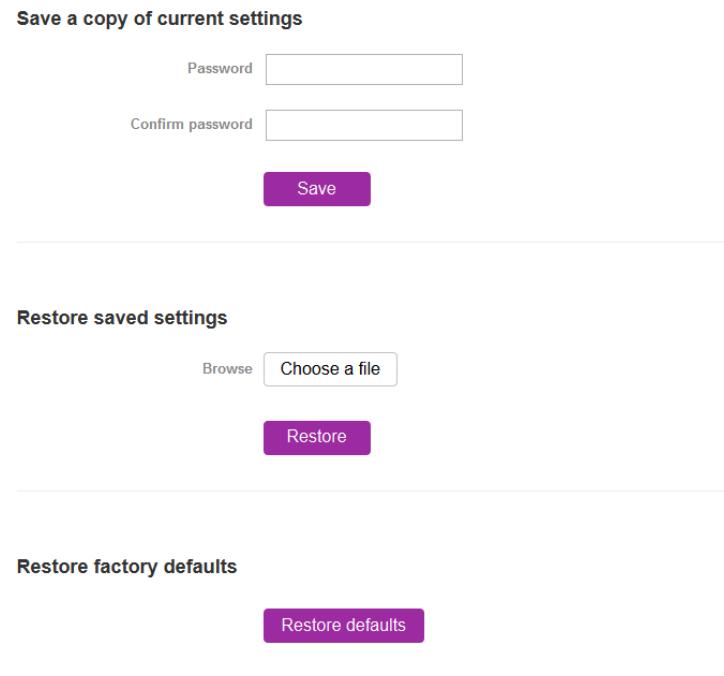


Note: The randomise reboot time is not persistent across reboots; each time the router is due to reboot, it randomly selects a time less than or equal to the **Randomise reboot time**.

System configuration

Settings backup and restore

The settings backup and restore page is used to backup or restore the router's configuration or to reset it to factory defaults. In order to view the settings page you must be logged into the web user interface as **root** using the password **admin**. The backup / restore functions can be used to easily configure a large number of Vodafone MachineLink 3G Plus routers by configuring one router with your desired settings, backing them up to a file and then restoring that file to multiple Vodafone MachineLink 3G Plus routers.



Save a copy of current settings

Password

Confirm password

Save

Restore saved settings

Browse

Restore

Restore factory defaults

Restore defaults

Figure 133 – Settings backup and restore

Back up your router's configuration

1. Log in to the web configuration interface, click on the **System** menu and select **Settings backup and restore**.
2. If you want to password protect your backup configuration files, enter your password in the fields under **Save a copy of current settings** and click on **Save**. If you don't want to password protect your files, just click on **Save**. The router will then prompt you to select a location to save the settings file.



Note: The following conditions apply:-

- It is NOT possible to edit the contents of the file downloaded; if you modify the contents of the configuration file in any way you will not be able to restore it later.
- You may change the name of the file if you wish but the filename extension must remain as ".cfg"
- Do not enter a password for the backup configuration file if you are planning to use it for remote restore

Restore your backup configuration

1. In the web configuration interface click on the **System** menu and select **Settings backup and restore**.
2. From the **Restore saved settings** section, click on **Choose a file** and select the backup configuration file on your computer.
3. Click **Restore** to copy the settings to the new Vodafone MachineLink 3G Plus router. The router will apply these settings and inform you it will reboot - click on **OK**.

Restoring the router's factory default configuration

Click the **Restore defaults** button to restore the factory default configuration. The router asks you to confirm that you wish to restore factory default settings. If you wish to continue with the restoring of factory defaults, click **OK**.



Note: All current settings on the router will be lost when performing a restore of factory default settings. The device IP address will change to 192.168.1.1 and the default username **root** and default password **admin** will be configured.

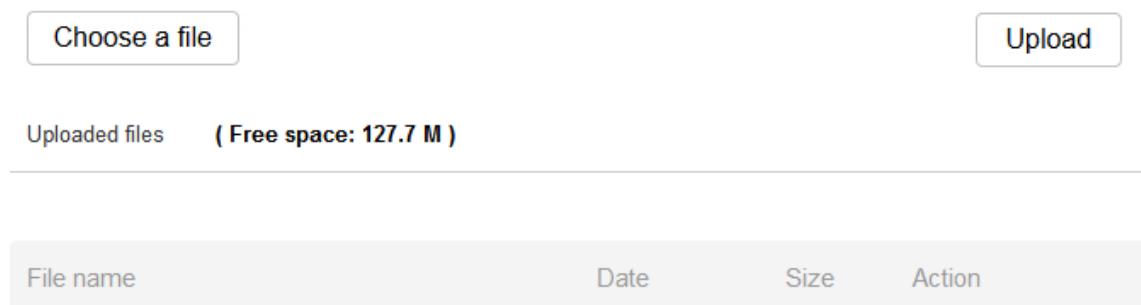
Upload

To access the Upload page, click on the **System** menu, then **System configuration** and then **Upload**.

The Upload page allows you to upload firmware files, HTTPS certificates or user created application packages to the Vodafone MachineLink 3G Plus router. When firmware files have been uploaded, they can also be installed from this page. PDF files, such as this user guide may also be uploaded for access on the router's help page.

For more information on application development, contact NetComm Wireless about our Software Development Kit.

File uploads



Choose a file Upload

Uploaded files (Free space: 127.7 M)

File name	Date	Size	Action

Figure 134 - Upload page

Updating the Firmware

The firmware update process involves first updating the recovery image firmware and then updating the main firmware image.



Note: In order to perform an update, you must be logged into the router with the root manager account (see the [Advanced configuration](#) section for more details).

To update the Vodafone MachineLink 3G Plus router's firmware:

1. Power on the router as described in the [Installing the router](#) section.
2. Log in to the router with the root user account (See the [Advanced configuration](#) section for details)
3. Select the **System** item from the top menu bar, select the **System configuration** item from the menu on the left and then select the **Upload** menu item.
4. Under the File uploads section, click the **Choose a file** button. Locate the recovery firmware image file on your computer and click **Open**. The recovery image is named vdf_nwl12_x.x.xx.x_r.cdi while the main system firmware image is named vdf_nwl12_x.x.xx.x.cdi.
5. Click the **Upload** button. The firmware image is uploaded to the storage on the router.

File uploads

Phase	Upload
Percent complete	7 %
Current position	3211 / 46388KB
Elapsed time	00:00:06
Estimated time left	00:01:18
Estimated speed	557KB

Figure 135 - File upload

1. Repeat steps 4 and 5 for the main system firmware image.
2. The uploaded firmware images are listed in the **Uploaded files** section. Click the Install link next to the recovery image to begin installing the recovery firmware image and then click **OK** on the confirmation window that appears.

Uploaded files (Free space: 94.1 M)

File name	Date	Size	Action
vdf_nwl12_2.0.18.3.cdi	Sep 23 2014	27.8M	<u>Install</u> <u>Delete</u>
vdf_nwl12_2.0.18.3_r.cdi	Sep 23 2014	13.7M	<u>Install</u> <u>Delete</u>

Figure 136 - Uploaded files

3. The recovery firmware image is flashed and when it is complete, the router displays “The firmware update was successful” and returns to the main Upload screen.

```

Erasing 128 Kibyte @ b20000 .. 92 % complete.
Erasing 128 Kibyte @ b40000 .. 93 % complete.
Erasing 128 Kibyte @ b60000 .. 94 % complete.
Erasing 128 Kibyte @ b80000 .. 95 % complete.
Erasing 128 Kibyte @ ba0000 .. 96 % complete.
Erasing 128 Kibyte @ bc0000 .. 97 % complete.
Erasing 128 Kibyte @ be0000 .. 98 % complete.
Erasing 128 Kibyte @ c00000 .. 100 % complete.
Flashing root_ubi to "rfs" (/dev/mtd2)
Writing data to block 59 at offset 0x760000
Writing data to block 60 at offset 0x780000
Writing data to block 61 at offset 0x7a0000
Writing data to block 62 at offset 0x7c0000
Writing data to block 63 at offset 0x7e0000
Writing data to block 64 at offset 0x800000
Writing data to block 65 at offset 0x820000
Done
Done
Done
The firmware update was successful

```

Close

Figure 137 - Recovery firmware flash process

4. Click the **Install** link to the right of the main firmware image you uploaded and then click **OK** to confirm that you want to continue with the installation.



Note: Do not remove the power when the router's LEDs are flashing as this is when the firmware update is in process.

5. The installation is complete when the countdown reaches zero. The router attempts to redirect you to the Status page.

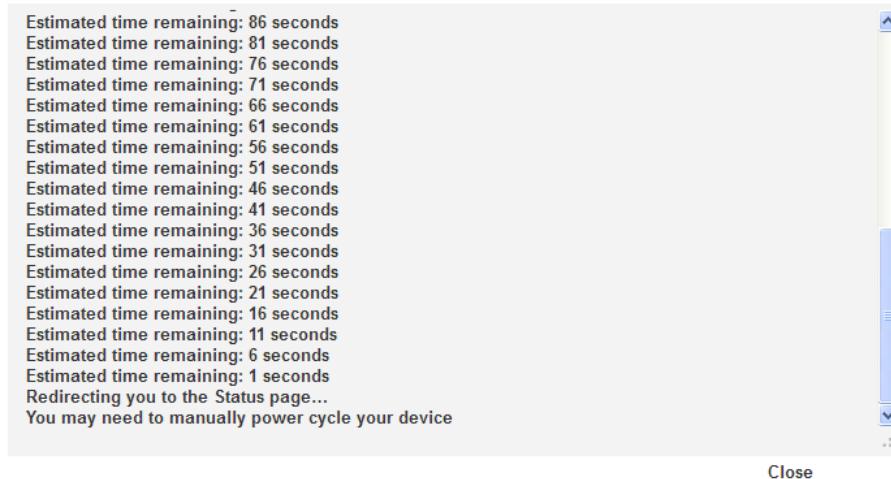


Figure 138 -- Installing main firmware image

6. Hold down the reset button on the router for 15-20 seconds to reboot and restore the factory default settings of the router. See the [Restoring factory default settings](#) section for more information.

Software applications manager

The Software application manager page is used to provide details of any user installed packages on the router and allow them to be uninstalled. For more information on application development, contact NetComm Wireless about our Software Development Kit.

Software applications manager

Application name	Version	Architecture	Time installed		
hello	1.0	arm	20/8/2014 3:39:23 pm	Package details	Uninstall

Figure 139 – Software applications manager

The Application name, Version number of the application, the architecture type and time of installation are all displayed. Clicking the **Package details** link will display a pop-up window with further details of the package.

To uninstall any software applications, click the **Uninstall** link.

Administration

Administration settings

To access the Administration settings page, click on the **System** menu then the **Administration** menu on the left and then click on **Administration settings**.

The Administration settings page is used to enable or disable protocols used for remote access and configure the passwords for the user accounts used to log in to the router.

Remote router access control

Enable HTTP	<input checked="" type="checkbox"/>
HTTP management port	8080 (Choose a port between 1 and 65534)
Enable HTTPS	<input checked="" type="checkbox"/>
Remote HTTPS access port	443 (Choose a port between 1 and 65534)
Enable telnet	<input checked="" type="checkbox"/>
Enable SSH	<input checked="" type="checkbox"/>
Remote SSH access port	22 (Choose a port between 1 and 65534)
Enable ping	<input checked="" type="checkbox"/>

Local router access control

Enable local Telnet	<input checked="" type="checkbox"/>
Enable local SSH	<input checked="" type="checkbox"/>

Web User Interface account

Username	<input type="text" value="root"/>
Password	<input type="password" value="*****"/>
Confirm password	<input type="password" value="*****"/>

Telnet/SSH account

Username	root
Password	<input type="password" value="*****"/> (1-126 characters in length)
Confirm password	<input type="password" value="*****"/> (1-126 characters in length)

Save

Figure 140 – Administration settings page

OPTION	DEFINITION
Remote router access control	
Enable HTTP	Enable or disable remote HTTP access to the router. You can also set the port you would like remote HTTP access to be available on.
HTTP management port	Enter a port number between 1 and 65534 to use when accessing the router remotely.
Enable HTTPS	Enable or disable remote HTTPS access to the router using a secure connection.
Remote HTTPS access port	Enter a port number between 1 and 65534 to use when accessing the router remotely over a secure HTTPS connection.
Enable Telnet	Enable or disable remote telnet (command line) access to the router.
Enable SSH	Enable or disable Secure Shell on the router.
Remote SSH Access Port	Enter the port number for remote SSH access. Must be a port number between 1 and 65534.
Enable Ping	Enable or disable remote ping responses on the WWAN connection.
Local router access control (Telnet/SSH)	
Enable local Telnet	Enables local telnet access to the router
Enable local SSH	Enables local SSH access to the router.
Web User Interface account	
Username	Use the drop down list to select the root or admin account to change its web user interface password.
Password	Enter the desired web user interface password.
Confirm password	Re-enter the desired web user interface password.
Telnet/SSH account	
Username	Displays the Telnet/SSH username. This may not be changed.
Password	Enter the desired Telnet/SSH password.
Confirm password	Re-enter the desired Telnet/SSH password.

Table 35 - Administration settings configuration options

To access the router's configuration pages remotely:

1. Using a remote PC/notebook, open a new browser window and type in the WAN IP address and assigned port number of the router that you want to access, for example <http://123.209.130.249:8080>



Note: You can find the router's WAN IP address by clicking on the "Status" menu. The WWAN IP field in the Packet data connection status section shows the router's WAN IP address.

2. Enter the username and password to login to the router and click **Log in**.



Note: To perform functions like Firmware upgrade, device configuration backup and restore and reset the router to factory defaults, you must be logged in with the root manager account.

HTTPS key management

What is HTTP Secure?

HTTP Secure or HTTPS is the use of the HTTP protocol over an SSL/TLS protocol. It is used primarily to protect against eavesdropping of communication between a web browser and the web site to which it is connected. This is especially important when you wish to have a secure connection over a public network such as the internet. HTTPS connections are secured through the use of certificates issued by trusted certificate authorities such as VeriSign. When a web browser makes a connection attempt to a secured web site, a digital certificate is sent to the browser so that it can verify the authenticity of the site using a built-in list of trusted certificate authorities.

There are two main differences between how HTTPS and HTTP connections work:

- HTTPS uses port 443 while HTTP uses port 80 by default.
- Over an HTTPS connection, all data sent and received is encrypted with SSL while over an HTTP connection, all data is sent unencrypted.

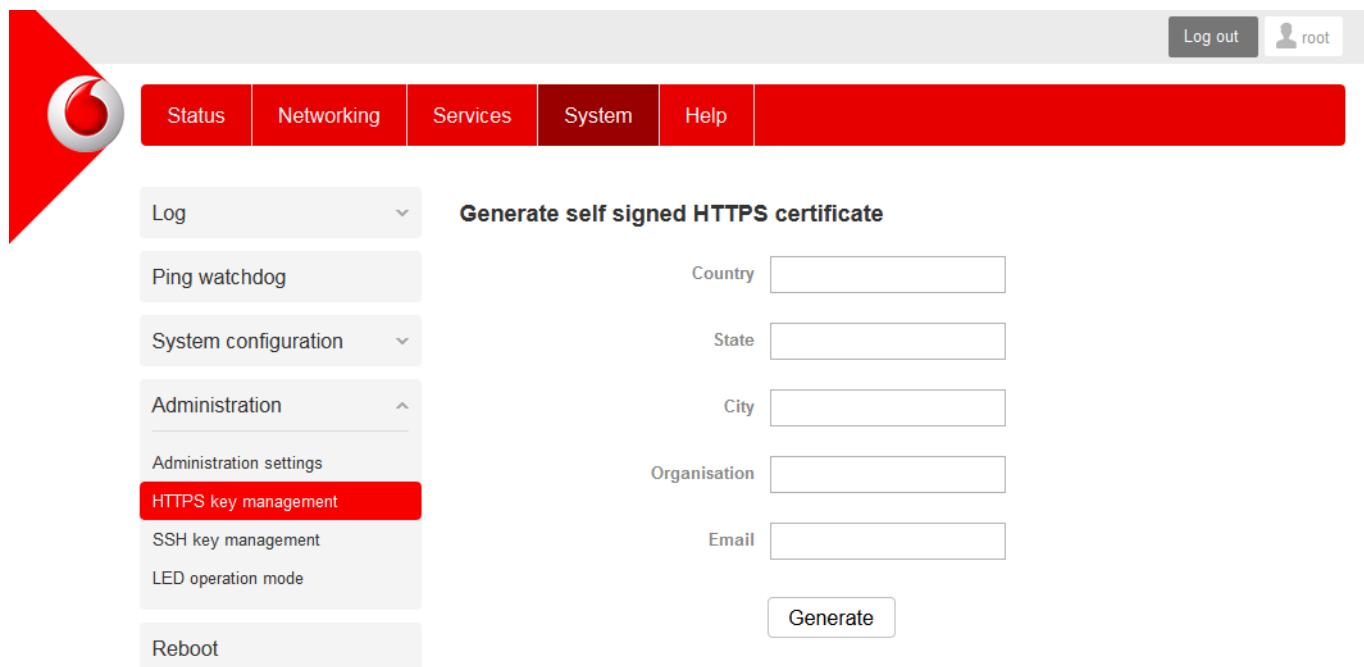
The encryption is achieved through the use of a pair of public and private keys on both sides of the connection. In cryptography, a key refers to a numerical value used by an algorithm to alter information (encrypt it), making the information secure and visible only to those who have the corresponding key to recover (decrypt) the information. The public key is used to encrypt information and can be distributed freely. The private key is used to decrypt information and must be secret by its owner.

Each Vodafone MachineLink 3G Plus router contains a self-signed digital certificate which is identical on all Vodafone MachineLink 3G Plus routers. For a greater level of security, the router also supports generating your own unique key. Additionally, you may use third party software to generate your own self-signed digital certificate or purchase a signed certificate from a trusted certificate authority and then upload those certificates to the router.

Generating your own self-signed certificate

To generate your own self-signed certificate:

1. Click the **System** item from the top menu bar, then **Administration** from the side menu bar and then **HTTPS key management**.
2. Enter the certificate details using the appropriate fields. Each field must be completed in order to generate a certificate.



The screenshot shows the Vodafone MachineLink 3G Plus web interface. At the top right are 'Log out' and 'root' buttons. The top navigation bar has tabs: Status, Networking, Services, System (which is selected and highlighted in red), and Help. On the left, there's a sidebar with a Vodafone logo and a vertical menu: Log (selected), Ping watchdog, System configuration, Administration (selected and expanded), Administration settings, HTTPS key management (selected and highlighted in red), SSH key management, LED operation mode, and Reboot. The main content area is titled 'Generate self signed HTTPS certificate'. It contains fields for Country, State, City, Organisation, and Email, each with an associated input box. A 'Generate' button is at the bottom right of these fields. The entire interface has a red header bar.

Figure 141 - Generate selfsigned HTTPS certificate



Note: The **Country** field must contain a code for the desired country from the list below.

CODE	COUNTRY	CODE	COUNTRY	CODE	COUNTRY	CODE	COUNTRY
AX	Åland Islands	ER	Eritrea	LS	Lesotho	SA	Saudi Arabia
AD	Andorra	ES	Spain	LT	Lithuania	SB	Solomon Islands
AE	United Arab Emirates	ET	Ethiopia	LU	Luxembourg	SC	Seychelles
AF	Afghanistan	FI	Finland	LV	Latvia	SE	Sweden
AG	Antigua and Barbuda	FJ	Fiji	LY	Libya	SG	Singapore
AI	Anguilla	FK	Falkland Islands (Malvinas)	MA	Morocco	SH	St. Helena
AL	Albania	FM	Micronesia	MC	Monaco	SI	Slovenia
AM	Armenia	FO	Faroe Islands	MD	Moldova	SJ	Svalbard and Jan Mayen Islands
AN	Netherlands Antilles	FR	France	ME	Montenegro	SK	Slovak Republic
AO	Angola	FX	France, Metropolitan	MG	Madagascar	SL	Sierra Leone
AQ	Antarctica	GA	Gabon	MH	Marshall Islands	SM	San Marino
AR	Argentina	GB	Great Britain (UK)	MK	Macedonia	SN	Senegal
AS	American Samoa	GD	Grenada	ML	Mali	SR	Suriname
AT	Austria	GE	Georgia	MM	Myanmar	ST	Sao Tome and Principe
AU	Australia	GF	French Guiana	MN	Mongolia	SU	USSR (former)
AW	Aruba	GG	Guernsey	MO	Macau	SV	El Salvador
AZ	Azerbaijan	GH	Ghana	MP	Northern Mariana Islands	SZ	Swaziland
BA	Bosnia and Herzegovina	GI	Gibraltar	MQ	Martinique	TC	Turks and Caicos Islands
BB	Barbados	GL	Greenland	MR	Mauritania	TD	Chad
BD	Bangladesh	GM	Gambia	MS	Montserrat	TF	French Southern Territories
BE	Belgium	GN	Guinea	MT	Malta	TG	Togo
BF	Burkina Faso	GP	Guadeloupe	MU	Mauritius	TH	Thailand
BG	Bulgaria	GQ	Equatorial Guinea	MV	Maldives	TJ	Tajikistan
BH	Bahrain	GR	Greece	MW	Malawi	TK	Tokelau
BI	Burundi	GS	S. Georgia and S. Sandwich Isls.	MX	Mexico	TM	Turkmenistan
BJ	Benin	GT	Guatemala	MY	Malaysia	TN	Tunisia
BM	Bermuda	GU	Guam	MZ	Mozambique	TO	Tonga
BN	Brunei Darussalam	GW	Guinea-Bissau	NA	Namibia	TP	East Timor
BO	Bolivia	GY	Guyana	NC	New Caledonia	TR	Turkey
BR	Brazil	HK	Hong Kong	NE	Niger	TT	Trinidad and Tobago
BS	Bahamas	HM	Heard and McDonald Islands	NF	Norfolk Island	TV	Tuvalu
BT	Bhutan	HN	Honduras	NG	Nigeria	TW	Taiwan
BV	Bouvet Island	HR	Croatia (Hrvatska)	NI	Nicaragua	TZ	Tanzania
BW	Botswana	HT	Haiti	NL	Netherlands	UA	Ukraine
BZ	Belize	HU	Hungary	NO	Norway	UG	Uganda
CA	Canada	ID	Indonesia	NP	Nepal	UM	US Minor Outlying Islands
CC	Cocos (Keeling) Islands	IE	Ireland	NR	Nauru	US	United States
CF	Central African Republic	IL	Israel	NT	Neutral Zone	UY	Uruguay
CH	Switzerland	IM	Isle of Man	NU	Niue	UZ	Uzbekistan
CI	Cote D'Ivoire (Ivory Coast)	IN	India	NZ	New Zealand (Aotearoa)	VA	Vatican City State (Holy See)
CK	Cook Islands	IO	British Indian Ocean Territory	OM	Oman	VC	Saint Vincent and the Grenadines
CL	Chile	IS	Iceland	PA	Panama	VE	Venezuela
CM	Cameroon	IT	Italy	PE	Peru	VG	Virgin Islands (British)
CN	China	JE	Jersey	PF	French Polynesia	VI	Virgin Islands (U.S.)
CO	Colombia	JM	Jamaica	PG	Papua New Guinea	VN	Viet Nam
CR	Costa Rica	JO	Jordan	PH	Philippines	VU	Vanuatu
CS	Czechoslovakia (former)	JP	Japan	PK	Pakistan	WF	Wallis and Futuna Islands
CV	Cape Verde	KE	Kenya	PL	Poland	WS	Samoa
CX	Christmas Island	KG	Kyrgyzstan	PM	St. Pierre and Miquelon	YE	Yemen
CY	Cyprus	KH	Cambodia	PN	Pitcairn	YT	Mayotte
CZ	Czech Republic	KI	Kiribati	PR	Puerto Rico	ZA	South Africa
DE	Germany	KM	Comoros	PS	Palestinian Territory	ZM	Zambia
DJ	Djibouti	KN	Saint Kitts and Nevis	PT	Portugal	COM	US Commercial
DK	Denmark	KR	Korea (South)	PW	Palau	EDU	US Educational
DM	Dominica	KW	Kuwait	PY	Paraguay	GOV	US Government
DO	Dominican Republic	KY	Cayman Islands	QA	Qatar	INT	International
DZ	Algeria	KZ	Kazakhstan	RE	Reunion	MIL	US Military
EC	Ecuador	LA	Laos	RO	Romania	NET	Network
EE	Estonia	LC	Saint Lucia	RS	Serbia	ORG	Non-Profit Organization
EG	Egypt	LI	Liechtenstein	RU	Russian Federation	ARPA	Old style Arpanet
EH	Western Sahara	LK	Sri Lanka	RW	Rwanda		

3. When you have entered all the required details, press the **Generate** button. The certificate takes several minutes to generate. When the certificate has been generated, you are informed that it has been successfully generated and installed. The web server on the router restarts and you are logged out of the router. Click **OK** to be taken back to the login screen.

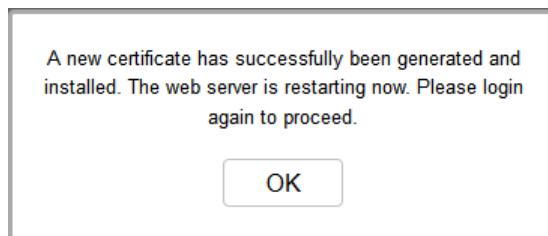


Figure 142 - New certificate successfully generated message

SSH Key Management

Secure Shell (SSH) is UNIX-based command interface and network protocol used to gain secure access to a remote computer, execute commands on a remote machine or to transfer files between machines. It was designed as a replacement for Telnet and other insecure remote shell protocols which send information, including passwords, as plain text.

SSH uses RSA public key cryptography for both connection and authentication. Two common ways of using SSH are:

- Use automatically generated public-private key pairs to encrypt the network connection and then use password authentication to log on.
- Use a manually generated public-private key pair to perform the authentication and allow users or programs to log in without using a password.

SSH server configuration

SSH protocol	Protocol 2	▼
<input checked="" type="checkbox"/> Enable password authentication		
<input type="checkbox"/> Enable key authentication		
<input style="background-color: #e64a89; color: white; border: 1px solid #e64a89; padding: 2px 10px; border-radius: 5px; font-weight: bold; font-size: 10px; margin: 0 auto;" type="button" value="Save"/>		

Host key management

Key type	Date
ssh_host_key	1970-01-01 01:01:38
ssh_host_dsa_key	1970-01-01 01:01:49
ssh_host_rsa_key	1970-01-01 01:02:34
ssh_host_ecdsa_key	1970-01-01 01:02:34

Client key management

Username	Hostname	Key type

Figure 143 - SSH server configuration

SSH server configuration

To configure the SSH server settings:

1. Use the **SSH Protocol** drop down list to select the protocol that you want to use. Protocol 2 is more recent and is considered more secure.
2. Select the types of authentication you want to use by clicking the **Enable password authentication** and **Enable key authentication** toggle keys on or off. Note that you may have both authentication methods on but you may not turn them both off.
3. Click the **Save** button to confirm your settings.

Host key management

SSH keys provide a means of identification using public key cryptography and challenge response authentication. This means that a secure connection can be established without transmitting a password, thereby greatly reducing the threat of someone eavesdropping and guessing the correct credentials.

SSH Keys always come in pairs with one being a public key and the other a private key. The public key may be shared with any server to which you want to connect. When a connection request is made, the server uses the public key to encrypt a challenge (a coded message) to which the correct response must be given. Only the private key can decrypt this challenge and produce the correct response. For this reason, the private key should not be shared with those who you do not wish to give authorization.

The Host key management section displays the current public keys on the router and their date and timestamp. These public keys are provided in different formats, including DSA, RSA and ECDSA. Each format has advantages and disadvantages in terms of signature generation speed, validation speed and encryption/decryption speed. There are also compatibility concerns to consider with older clients when using ECDSA, for example.

Host key management

Key type	Date
ssh_host_key	1970-01-01 01:01:38
ssh_host_dsa_key	1970-01-01 01:01:49
ssh_host_rsa_key	1970-01-01 01:02:34
ssh_host_ecdsa_key	1970-01-01 01:02:34

Generating new keys

The complete set of keys can be re-generated by selecting the **Generate keys** button. This key generation process takes approximately 30 seconds to complete.

Downloading keys

The **Get keys** button allows you to download the complete set of public and private keys while the **Get public keys** button will download only the set of public keys.

Uploading your own key files

Click the **Upload keys** button to upload your own public key to the router.

Client key management

The Client key management section is used for uploading the public key file of clients. To upload a client public key, click the **Upload** button, browse to the file and click **Open**. To clear the list of Client keys, click the **Clear** button.

Client key management

Username	Hostname	Key type

When the file is uploaded, it is examined for validity. If the key file is not a valid public key, it will not be uploaded. You can use the Clear button to remove the loaded client keys.

LED operation mode

The 7 front LED indicators may be turned off after a timeout period for aesthetic or power saving reasons. To access the LED operation mode page, click the **System** menu, then **Administration** on the left and finally select **LED operation mode**.

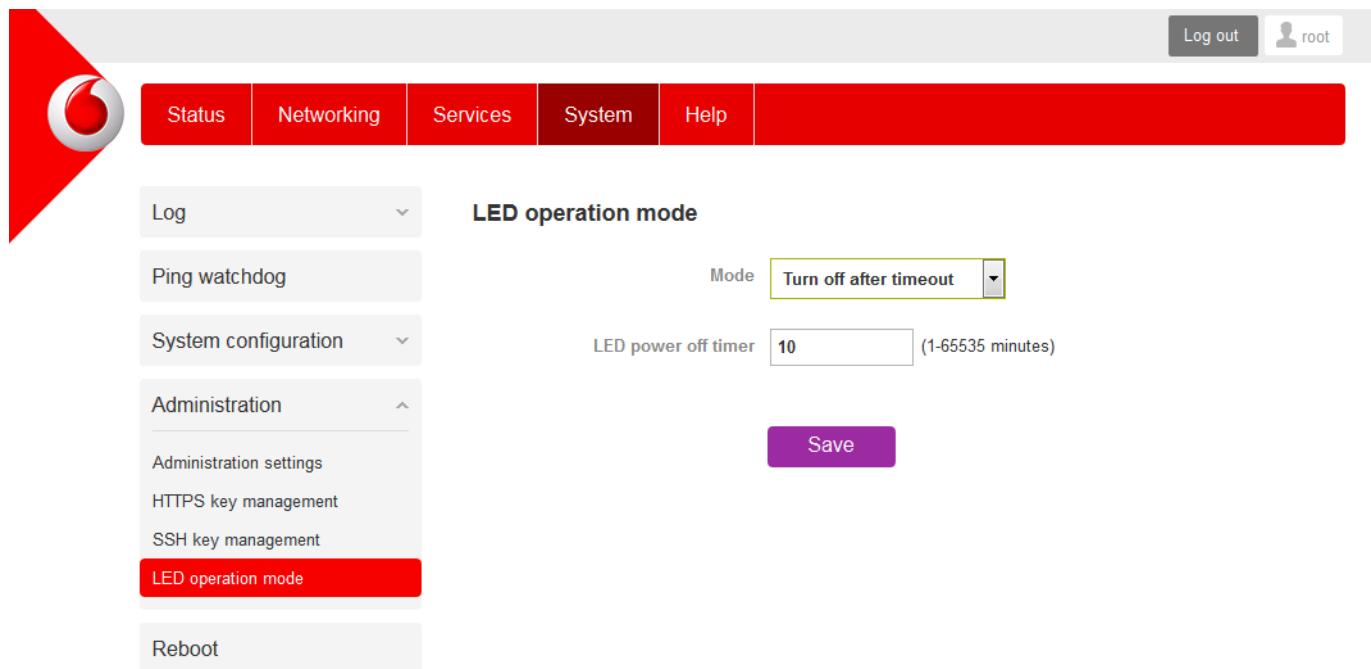


Figure 144 - LED operation mode

The **Mode** drop down list sets the operation mode of the LEDs on the front panel of the router. To set the lights to operate at all times, set this to Always on (default setting). To set the lights to turn off after a specified period, select **Turn off after timeout**. When configured to turn off after timeout, use the **LED power off timer** field to specify the time in minutes to wait before turning off the LED indicators. The LED power off timer must be an integer between 1 and 65535.

The wait period begins from the time the **Save** button is clicked. When the wait period expires, the LEDs will turn off. If the router is rebooted, the LED power off timer is reset. The router will boot up and wait for the configured time before turning off again.

Reboot

The reboot option in the System section performs a soft reboot of the router. This can be useful if you have made configuration changes you want to implement.

To reboot the router:

1. Click the **System** menu item from the top menu bar.
2. Click the **Reboot** button from the menu on the left side of the screen.

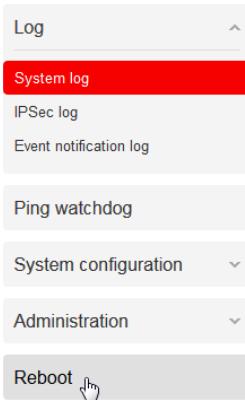


Figure 145 - Reboot menu option

3. The router displays a warning that you are about to perform a reboot. If you wish to proceed, click the **Reboot** button then click **OK** on the confirmation window which appears.

 **Attention! Clicking 'Reboot' will cause your device to power cycle.**

The reboot will take about 1-2 minutes, during which you won't be able to access your device.

Reboot

Figure 146 - Reboot confirmation



Note: It can take up to 2 minutes for the router to reboot.

Logging out

To log out of the router, click the  icon at the top right corner of the web user interface.

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Appendix B: Device Mounting Dimensions

The image below is at 100% scale and may be used as a template for mounting the device. All dimensions shown are in millimetres.

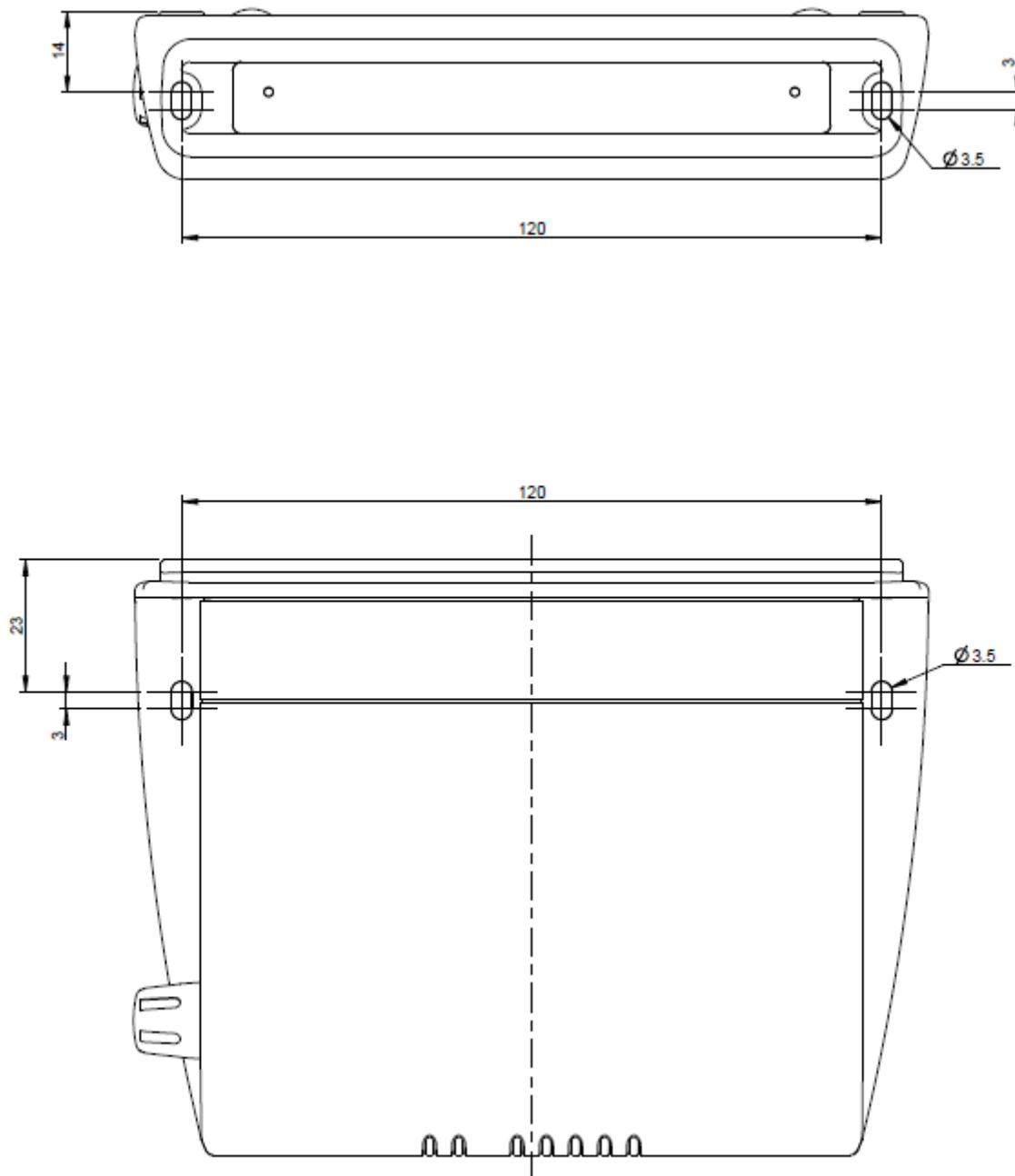


Figure 147 - Device mounting dimensions

Appendix C: Mounting Bracket

The image below is at 100% scale and may be used as a template for mounting the bracket. All dimensions shown are in millimetres.

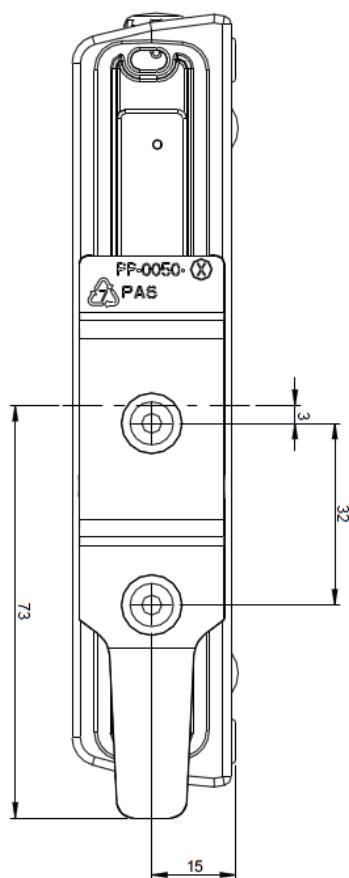


Figure 148 - Mounting bracket

Appendix D: Default Settings

The following tables list the default settings for the Vodafone MachineLink 3G Plus router.

LAN (MANAGEMENT)	
Static IP Address:	192.168.1.1
Subnet Mask:	255.255.255.0
Default Gateway:	192.168.1.1

Table 36 - LAN Management Default Settings

ADMIN MANAGER ACCOUNT		ROOT MANAGER ACCOUNT	
Username:	admin	Username:	root
Password:	admin	Password:	admin

Table 37 - Web Interface Default Settings



Note: The admin manager account allows you to manage all settings of the router except functions such as firmware upgrade, device configuration backup and restore and reset to factory default settings, which are privileged only to the root manager account.

VODAFONE MACHINELINK 3G PLUS ROUTER TELNET ACCESS	
Username:	root
Password:	admin

Table 38 - Telnet Access

Restoring factory default settings

Restoring factory defaults will reset the Vodafone MachineLink 3G Plus router to its factory default configuration. You may encounter a situation where you need to restore the factory defaults on your Vodafone MachineLink 3G Plus router such as:

- You have lost your username and password and are unable to login to the web configuration page;
- You are asked to perform a factory reset by support staff.

There are two methods you can use to restore factory default settings on your Vodafone MachineLink 3G Plus router:

- Using the web-based user interface
- Using the reset button on the interface panel of the router

Using the web-based user interface

To restore your router to its factory default settings, please follow these steps:

1. Open a browser window and navigate to the IP address of the router (default address is <http://192.168.1.1>). Login to the router using **root** as the User Name and **admin** as the password.
2. Click the **System** item from the top menu bar, then **System configuration** on the left menu and then click **Settings backup and restore**.
3. Under the **Restore factory defaults** section, click the **Restore defaults** button. The router asks you to confirm that you wish to restore factory defaults. Click **OK** to continue. The router sets all settings to default. Click **OK** again to reboot the router.
4. When the Power light returns to a steady green, the reset is complete. The default settings are now restored.

Using the reset button on the interface panel of the router

Use a pen to depress the Reset button on the device for 15-20 seconds. The router will restore the factory default settings and reboot.

When you have reset your Vodafone MachineLink 3G Plus router to its default settings you will be able to access the device's configuration web interface using <http://192.168.1.1> with username **admin** or **root** and password **admin**.

Appendix E: Recovery mode

The Vodafone MachineLink 3G Plus router features two independent operating systems, each with its own file systems. These two systems are referred to as 'Main' and 'Recovery'. It is always possible to use one in order to restore the other in the event that one system becomes damaged or corrupted (such as during a firmware upgrade failure). The recovery console provides limited functionality and is typically used to restore the main firmware image in the case of a problem.

Accessing recovery mode

Both systems have web interfaces that can be used to manipulate the other inactive system. The Vodafone MachineLink 3G Plus router starts up by default in the Main system mode, however the router may be triggered to start in recovery mode if desired.

To start the router in recovery mode:

1. Press and hold the physical reset button on the interface panel of the router for 5 to 15 seconds. When the LEDs on the front panel change to amber and countdown in a sequence, release the reset button. The router then boots into recovery mode.
2. In your browser, navigate to <http://192.168.1.1>. The router's recovery mode is hardcoded to use this address regardless of the IP address that was configured in the main system. The router's recovery console is displayed.

NetComm Cellular Router Recovery Console

Status	Log	Application Installer	Settings	Reboot
Status				
System Information				
System Up time	00:01:19			
Router Version	Hardware: 1.0 Software: XXXXXXXX			
Serial Number	164199131700017			
Trigger	button			
LAN				
IP	192.168.1.1 / 255.255.255.0			
MAC Address	00:60:64:B2:D4:22			
Ethernet Port Status				
LAN: 	Up / 100.0 Mbps / FDX			

Figure 149 - Recovery console

Status

The status page provides basic information such as the system up time, hardware and software router versions, the router's serial number, the method used to trigger the recovery mode, the IP and MAC address of the router and the status of the Ethernet port.

NetComm Cellular Router Recovery Console

Status	Log	Application Installer	Settings	Reboot
--------	-----	-----------------------	----------	--------

Status

System Information	
System Up time	00:01:19
Router Version	Hardware:1.0 Software: XXXXXXXX
Serial Number	164199131700017
Trigger	button
LAN	
IP	192.168.1.1 / 255.255.255.0
MAC Address	00:60:64:B2:D4:22
Ethernet Port Status	
LAN: 	Up / 100.0 Mbps / FDX

Figure 150 - Recovery mode - Status

Log

The log page displays the system log which is useful in troubleshooting problems which may have led to the router booting up in recovery mode. The only functionality provided here is the ability to clear the system log, filter by log level and downloading of the log file.

NetComm Cellular Router Recovery Console

Status	Log	Application Installer	Settings	Reboot
--------	-----	-----------------------	----------	--------

[Log File](#) [Display Level](#) [Debug](#)  [Page 1 of 18](#)  [Clear Log File](#)

Date & Time	Machine	Level	Process	Message
Aug 21 00:53:57	vdf_nwl12	user.notice	kernel	[288.080000] UBIFS: media format: w4/r0 (latest is w4/r0), UUID 4CB752BF-DC61-407E-AF2C-4190763A7E6B, small LPT model
Aug 21 00:53:57	vdf_nwl12	user.notice	kernel	[288.070000] UBIFS: reserved for root: 4952683 bytes (4836 kB)
Aug 21 00:53:57	vdf_nwl12	user.notice	kernel	[288.060000] UBIFS: FS size: 150974464 bytes (143 MB, 1189 LEBs), journal size 7618560 bytes (7 MiB, 60 LEBs)
Aug 21 00:53:57	vdf_nwl12	user.notice	kernel	[288.050000] UBIFS: LEB size: 128976 bytes (124 kB), min./max. I/O unit sizes: 2048 bytes/2048 bytes
Aug 21 00:53:57	vdf_nwl12	user.notice	kernel	[288.050000] UBIFS: mounted UBI device 11, volume 0, name "opt"
Aug 21 00:53:57	vdf_nwl12	user.notice	hotplug	add, /devices/virtual/bdi/ubifs_11_0
Aug 21 00:53:57	vdf_nwl12	user.notice	hotplug	add, /devices/virtual/bdi/ubifs_11_0
Aug 21 00:53:57	vdf_nwl12	user.notice	kernel	[287.830000] UBIFS: background thread "ubifs_bgt11_0" started, PID 611
Aug 21 00:53:57	vdf_nwl12	user.notice	hotplug	add, /devices/virtual/ubi/ubi11
Aug 21 00:53:56	vdf_nwl12	user.notice	hotplug	add, /devices/virtual/ubi/ubi11_0
Aug 21 00:53:56	vdf_nwl12	user.notice	kernel	[287.580000] UBI: background thread "ubi_bgt11d" started, PID 594
Aug 21 00:53:56	vdf_nwl12	user.notice	kernel	[287.550000] UBI: available PEBs: 10, total reserved PEBs: 1206, PEBs reserved for bad PEB handling: 2
Aug 21 00:53:56	vdf_nwl12	user.notice	kernel	[287.540000] UBI: max/mean erase counter: 24/16, WL threshold: 1024, image sequence number: 62701983
Aug 21 00:53:56	vdf_nwl12	user.notice	kernel	[287.530000] UBI: user volume: 1, internal volumes: 1, max. volumes count: 128
Aug 21 00:53:56	vdf_nwl12	user.notice	kernel	[287.520000] UBI: good PEBs: 1216, bad PEBs: 0, corrupted PEBs: 0
Aug 21 00:53:56	vdf_nwl12	user.notice	kernel	[287.520000] UBI: VID header offset: 2048 (aligned 2048), data offset: 4096
Aug 21 00:53:56	vdf_nwl12	user.notice	kernel	[287.510000] UBI: min./max. I/O unit sizes: 2048/2048, sub-page size 2048
Aug 21 00:53:56	vdf_nwl12	user.notice	kernel	[287.500000] UBI: PEB size: 131072 bytes (128 kB), LEB size: 128976 bytes
Aug 21 00:53:56	vdf_nwl12	user.notice	hotplug	remove, /kernel/slab/:t-0000048
Aug 21 00:53:56	vdf_nwl12	user.notice	hotplug	add, /devices/virtual/ubi/ubi11_0
Aug 21 00:53:56	vdf_nwl12	user.notice	hotplug	add, /devices/virtual/ubi/ubi11
Aug 21 00:53:56	vdf_nwl12	user.notice	hotplug	remove, /kernel/slab/:t-0000048
Aug 21 00:53:56	vdf_nwl12	user.notice	kernel	[287.500000] UBI: attached mtd0 (name "opt", size 152 MiB) to ubi11

[Download Log File](#)

Figure 151 - Recovery mode – Log

Application Installer

The Application installer is designed to upload and install main firmware images, upload recovery firmware images, custom applications and HTTPS certificates. Use the **Browse** button to select a file to be uploaded to the router. When it has been selected, press the **Upload** button. The file is sent to the router and when the transfer is complete, the file appears in the Uploaded files list. From the Uploaded files list, you are able to either **Install** or **Delete** a file.

NetComm Cellular Router Recovery Console

Status	Log	Application Installer	Settings	Reboot
--------	-----	-----------------------	----------	--------

[Recovery Console > Upload](#)

Upload:										
<input style="width: 100px; height: 20px; border: 1px solid #ccc; border-radius: 5px; padding: 2px; margin-right: 10px;" type="file"/> File	<input style="border: 1px solid #ccc; border-radius: 5px; padding: 2px 10px; margin-right: 10px;" type="button" value="Browse..."/> No file selected.	<input style="border: 1px solid #0070C0; border-radius: 5px; background-color: #0070C0; color: white; padding: 2px 10px;" type="button" value="Upload"/>								
Uploaded Files:										
Free Space: 100.8M										
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;">File Name</th> <th style="width: 15%;">Date</th> <th style="width: 15%;">Size</th> <th style="width: 10%;">Action</th> </tr> </thead> <tbody> <tr> <td style="padding: 2px;">vdf_nwl12_vX.XX.XXX.cdi</td> <td style="padding: 2px;">Aug 21 2014</td> <td style="padding: 2px;">31.7M</td> <td style="padding: 2px; text-align: center;"> Install Delete </td> </tr> </tbody> </table>		File Name	Date	Size	Action	vdf_nwl12_vX.XX.XXX.cdi	Aug 21 2014	31.7M	Install Delete	
File Name	Date	Size	Action							
vdf_nwl12_vX.XX.XXX.cdi	Aug 21 2014	31.7M	Install Delete							

Figure 152 - Recovery mode - Application Installer

Settings

The settings page provides the option of restoring the router to factory default settings. Click the **Restore** button to set the router back to the original factory settings.

Status	Log	Application Installer	Settings	Reboot
--------	-----	-----------------------	----------	--------

[Settings](#)

RESTORE FACTORY DEFAULTS:	
<input style="border: 1px solid #0070C0; border-radius: 5px; background-color: #0070C0; color: white; padding: 2px 10px;" type="button" value="Restore"/>	

Figure 153 - Recovery mode – Settings

Reboot

The reboot page allows you to reboot the router when you have finished using recovery mode. When rebooting the router from recovery mode, the router boots into the main firmware image unless there is some fault preventing it from doing so, in which case the recovery console will be loaded.

Click the **Reboot** button to reboot the router to the main firmware image.

Status	Log	Application Installer	Settings	Reboot
--------	-----	-----------------------	----------	--------

[Reboot](#)

<input style="border: 1px solid #0070C0; border-radius: 5px; background-color: #0070C0; color: white; padding: 2px 10px;" type="button" value="Reboot"/>	
To perform the reboot, click on the "Reboot" button below. You will be asked to confirm your decision.	

Figure 154 - Recovery mode - Reboot

Appendix F: HTTPS - Uploading a self-signed certificate

If you have your own self-signed certificate or one purchased elsewhere and signed by a Certificate Authority, you can upload it to the Vodafone MachineLink 3G Plus router using the [Upload](#) page.



Note: Your key and certificate files must be named **server.key** and **server.crt** respectively otherwise they will not work.

To upload your certificate:

1. Click on the **System** item from the top menu bar. From the side menu bar, select **System configuration** and then **Upload**. The file upload screen is displayed.

The screenshot shows the 'File uploads' page of the Vodafone MachineLink 3G Plus web interface. On the left, there's a sidebar with links like Log, Ping watchdog, System configuration (which is expanded), Settings backup and restore, Upload (which is highlighted in red), Software applications manager, Administration, and Reboot. The main area has a 'Choose a file' button and an 'Upload' button. Below that, there's a table for uploaded files with columns for File name, Date, Size, and Action.

Figure 155 - Upload page

2. Click the **Choose a file** button and locate your server certificate file and click **Open**.

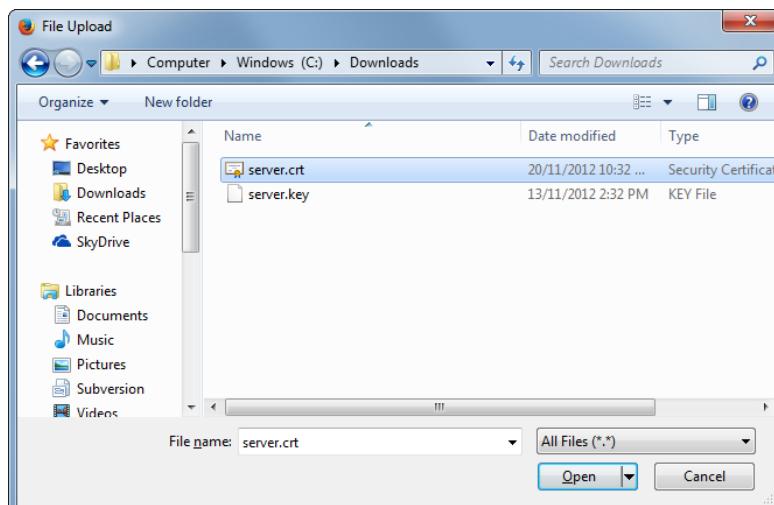
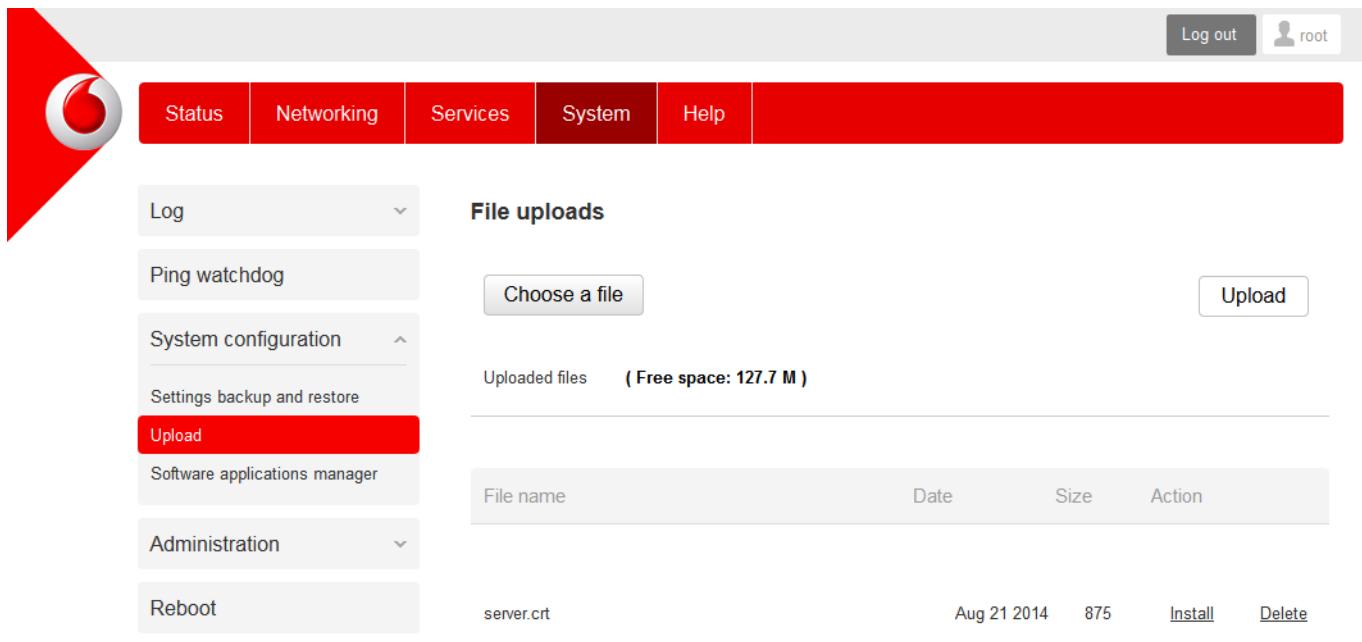


Figure 156 - Browse for server.crt

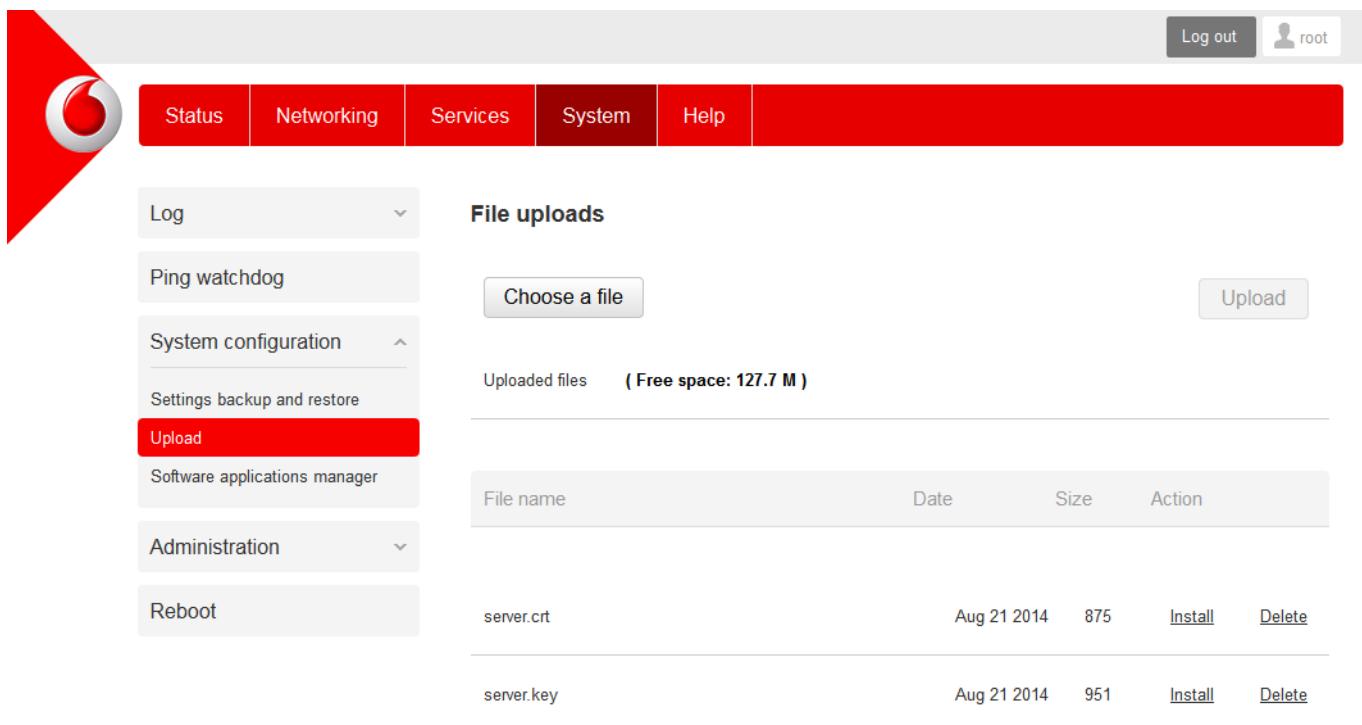
3. Click the **Upload** button to begin uploading it to the router. The file appears in the list of files stored on the router.



File name	Date	Size	Action
server.crt	Aug 21 2014	875	Install Delete

Figure 157 - Server certificate file uploaded

4. Repeat steps 2 and 3 for the server key file.
 5. Click the **Install** link next to the server.crt file then click **OK** on the prompt that is displayed. The certificate file is installed. Repeat this for the key file. When each file is installed it is removed from the list of stored files.

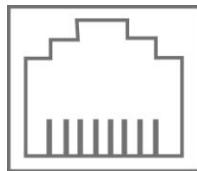


File name	Date	Size	Action
server.crt	Aug 21 2014	875	Install Delete
server.key	Aug 21 2014	951	Install Delete

Figure 158 - Installing the server.crt file

Appendix G: RJ-45 connector

The RJ-45 connector provides an interface for a data connection and for device input power using the pin layout shown below.



Pin: 8 1

Figure 159 -The RJ-45 connector

PIN	COLOUR	SIGNAL (802.3AF MODE A)	SIGNAL (802.3AF MODE B)
1	White/Orange stripe	Rx +	Rx + DC +
2	Orange Solid	Rx -	Rx - DC +
3	White/Green stripe	Tx +	Tx + DC -
4	Blue solid	DC +	unused
5	White/Blue stripe	DC +	unused
6	Green solid	Tx -	Tx - DC -
7	White/Brown stripe	DC -	unused
8	Brown solid	DC -	unused

Table 39 - RJ-45 connector pin outs

Appendix H: Serial port wiring



Figure 160 - DE9 Male connector (Pin side view)

The Vodafone MachineLink 3G Plus router has a serial interface and acts as the data communications equipment (DCE). The wiring tables below indicate the DCE and DTE devices as well as the signal direction. Shielding cable can optionally be soldered to the chassis and connected to ground.

DTE DEVICE (COMPUTER)			SIGNAL DIRECTION	DCE DEVICE (NWL-12 ROUTER)		
PIN	NAME	DESCRIPTION		DESCRIPTION	NAME	PIN
1	DCD	Data carrier detect		Data carrier detect	DCD	1
2	RXD	Receive Data		Receive Data	RXD	2
3	TXD	Transmit Data		Transmit Data	TXD	3
4	DTR	Data Terminal Ready		Data Terminal Ready	DTR	4
5	GND	Ground		Ground	GND	5
6	DSR	Data Set Ready		Data Set Ready	DSR	6
7	RTS	Request to Send		Request to Send	RTS	7
8	CTS	Clear to Send		Clear to Send	CTS	8
9	RI	Ring Indicator		Ring Indicator	RI	9
-	FGND	Shield (Soldered to D9 metal shield)		Shield (Soldered to D9 metal shield)	FGND	-

Table 40 - RS-232 Wiring

RS-485 HALF DUPLEX WIRING			
PIN	SIGNAL	NAME	DESCRIPTION
1	—	A	Differential pair A
2	+	B	Differential pair B
5		GND	Ground

Table 41 - RS-485 Half Duplex Wiring

RS-485 (RS-422) FULL DUPLEX WIRING			
PIN	SIGNAL	NAME	DESCRIPTION
1	—	RXA	Receive (Differential pair A)
2	+	RXB	Receive (Differential pair B)
3	+	TXB	Transmit (Differential pair B)
4	—	TXA	Transmit (Differential pair A)
5		GND	Ground

Table 42 - RS-485 (RS-422) Full Duplex Wiring

Appendix I: Inputs/Outputs

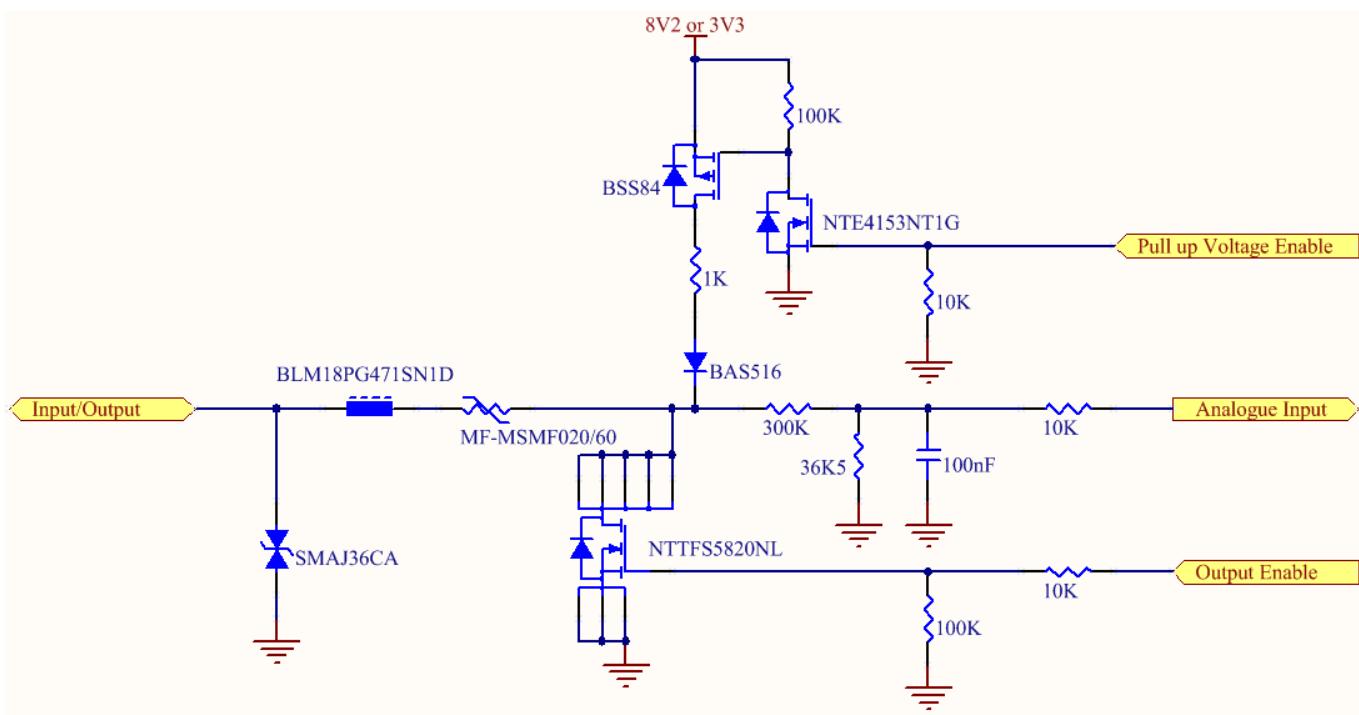
Overview

The MachineLink 3G Plus is equipped with a 6-way terminal block connector providing 3 identical multipurpose inputs and outputs as well as a dedicated ignition input. These inputs and outputs may be independently configured for various functions, including:

- NAMUR (EN 60947-5-6 / IEC 60947-5-6) compatible sensor input
- Proximity sensor input for use with contact closure (open/closed) type of sensors (PIR sensors, door/window sensors for security applications) with the input tamper detection possible (four states detected: open, closed, short and break) by the use of external resistors
- Analogue 0V to 30V input
- Digital input (the I/O voltage measured by the Analogue input and the software making a decision about the input state) with the threshold levels configurable in software
- Open collector output.

Hardware Interface

The interface of the 3 multipurpose inputs/outputs are based on the circuit diagram below



The **Input/Output** label is the physical connection to the outside world. There are protection devices and resistor dividers to condition the signal prior to it going into the processor. The three labels to the right are the interface to the processor. **Output Enable** activates the Transistor which provides an open collector (ground) output and can sink 200mA at 23°C. It is protected by a resettable fuse and transient protection diode. If used with the pull up resistor, which can be activated by the **Pull up Voltage Enable** pin, then you can have a High or Low output rather than open drain. The resistor can be pulled up to 3V3 for Cmos compatible output or 8.2V by software. The **Analogue Input** pin can read values from 0V to 30V. It is divided by a resistor network to read appropriate levels in the processor. Depending on the sensor type used, the pull up resistor can be switched on or off. If using the NAMUR sensor configuration the pull up will be activated to 8V2 by default.

Wiring Examples

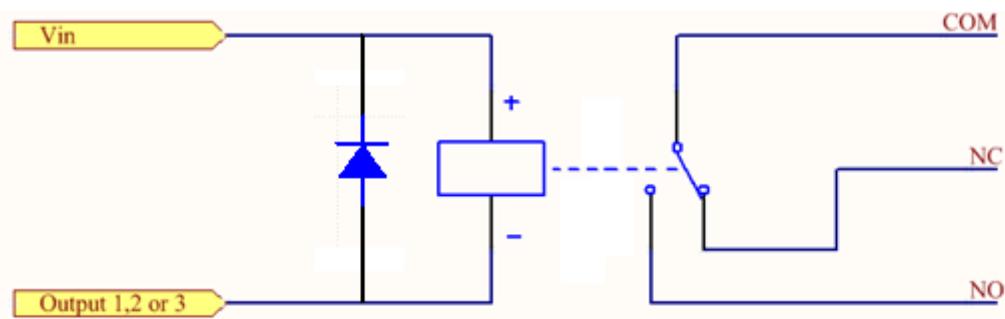
The following examples are shown as a guide as to what can be achieved by the I/O features. It is up to the system integrator to have enough knowledge about the interface to be able to achieve the required results.



Note: NetComm Wireless and Vodafone do not offer any further advice on the external wiring requirements or wiring to particular sensors, and will not be responsible for any damage to the unit or any other device used in conjunction with it. Using outputs to control high voltage equipment can be dangerous. The integrator must be a qualified electrician if dealing with mains voltages controlled by this unit.

Open Collector Output driving a relay

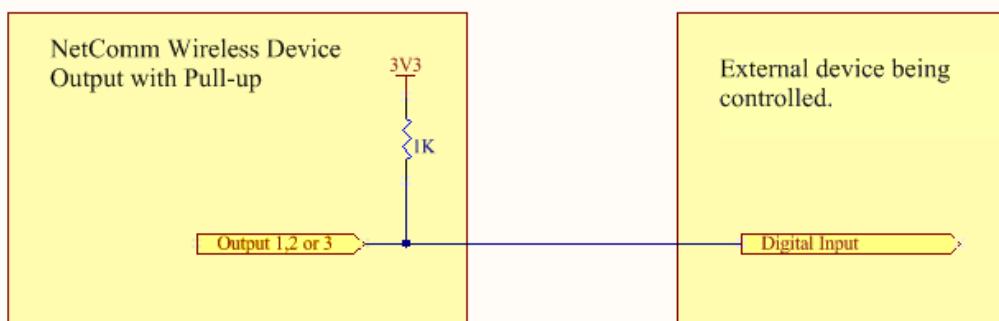
Any output can be configured to control a relay. This is an example where the transistor will supply the ground terminal of the solenoid. External voltage is supplied to the other side of the solenoid.



Relay wiring depends on the requirement of the device being controlled.

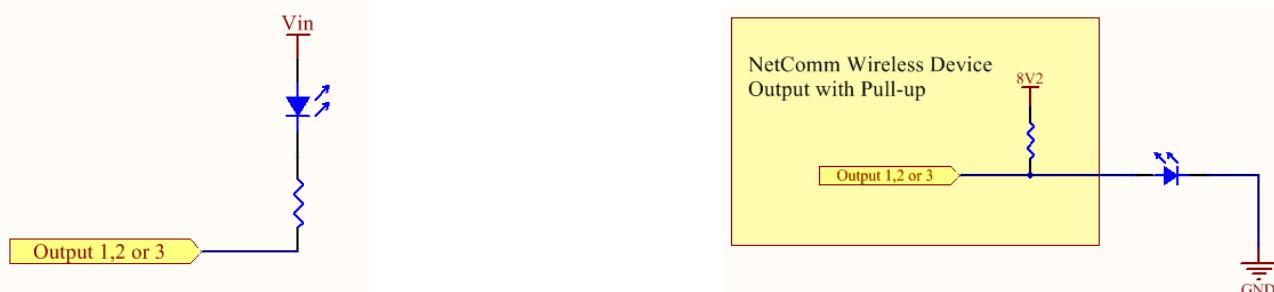
Logic level Output

An output can be used with the pull up resistor to provide a logic level output which would be suitable to control an external digital device.



LED Output

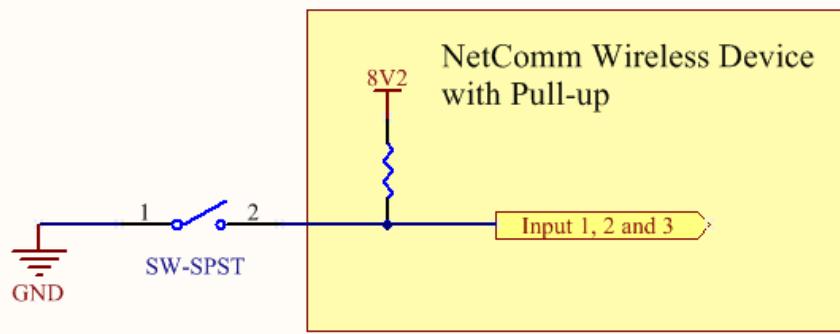
An LED can be controlled by simply providing an open collector ground to an externally powered LED Resistor value and Voltage will need to suit the LED type used. Alternatively an LED can be powered using 8V2 via 1K resistor. The suitability of the LED will need to be investigated.



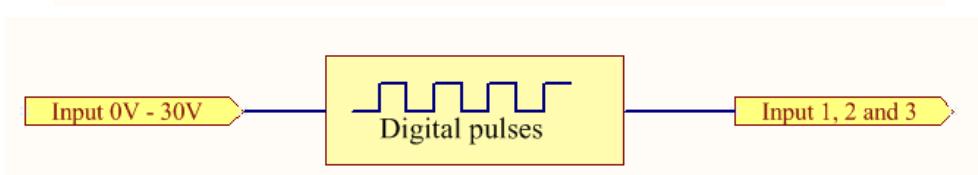
Digital inputs

There are several ways to connect a digital input. A digital input can be anything from a simple switch to a digital waveform or pulses. The unit will read the voltage in as an analogue input and the software will decode it in a certain way depending on your configuration.

Below is a contact closure type input, which is detecting an Earth. Pull up is activated for this to work.

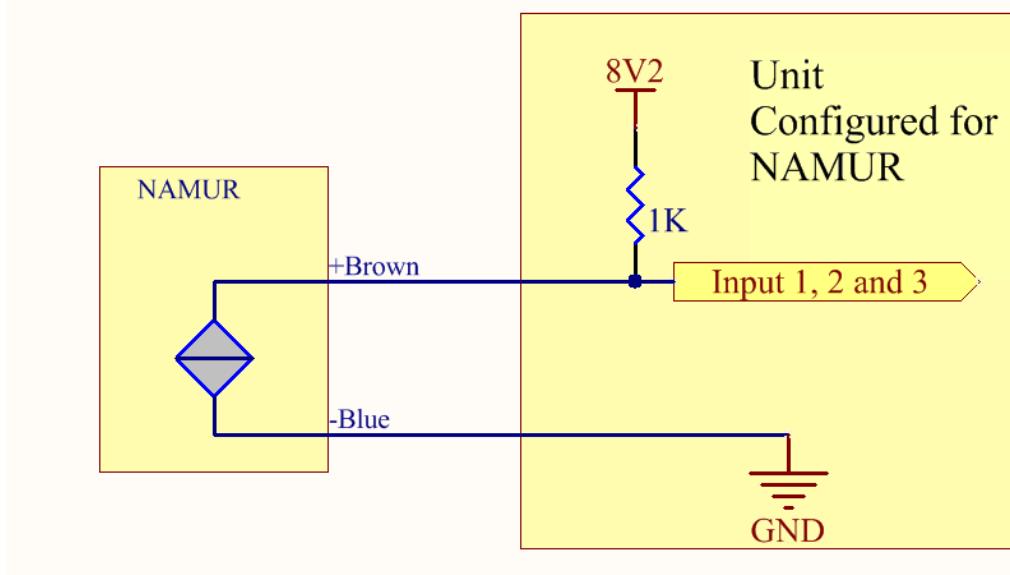


The following input detects an input going high. The turn on/off threshold can be set in the software.



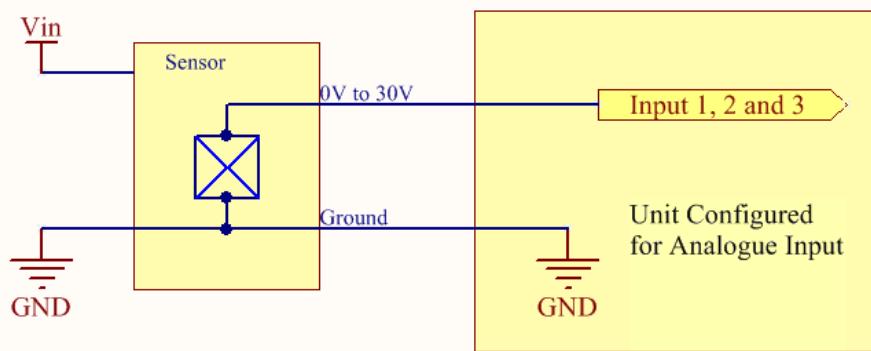
NAMUR Sensor

A NAMUR sensor is a range of sensors which conform to the EN 60947-5-6 / IEC 60947-5-6 standards. They basically have two states which are reflected by the amount of current running through a sense resistor.



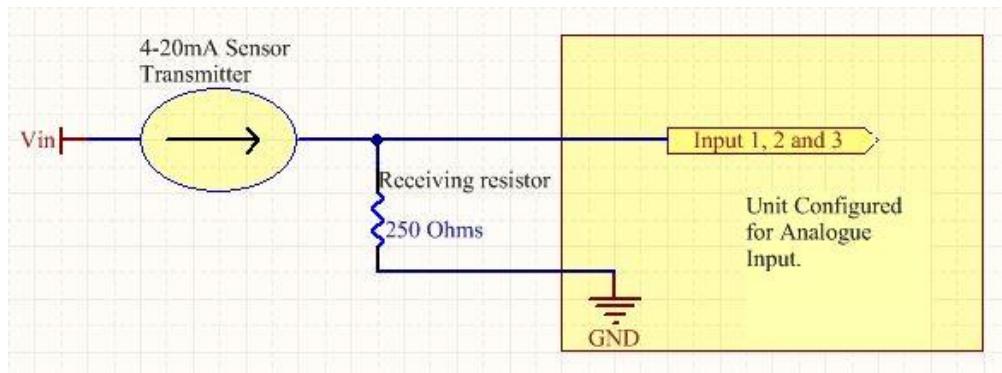
Analogue Sensor with Voltage output

There are various analogue sensors that connect directly to the unit which can provide a voltage output. These would require an external power source which may or may not be the same as the unit itself. The voltage range they provide can be between 0V and 30V. Some common sensor output ranges include 0V to 10V. These would work on the unit, The pull up resistor is not activated in this case.



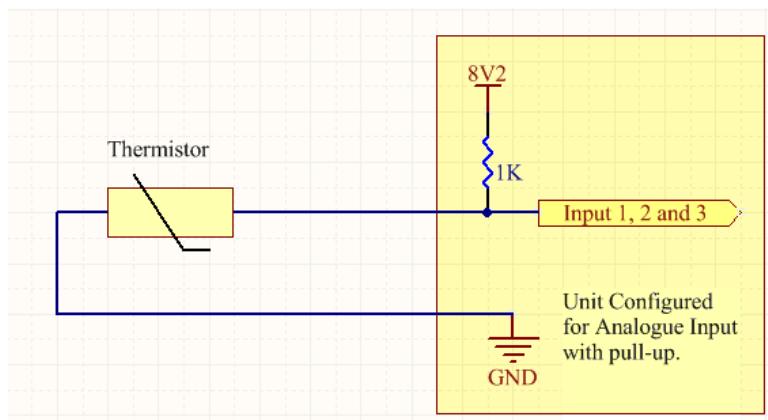
Analogue Sensor with 4 to 20mA output

Another common type of sensor type is the 4-20mA current loop sensor. It provides a known current through a fixed resistor, usually 250 ohms thus producing a voltage of 0v to 5V at the input. The sensor would require an external power source which may or may not be the same as the unit itself. It will also require an external resistor. The internal pull up resistor is not activated.



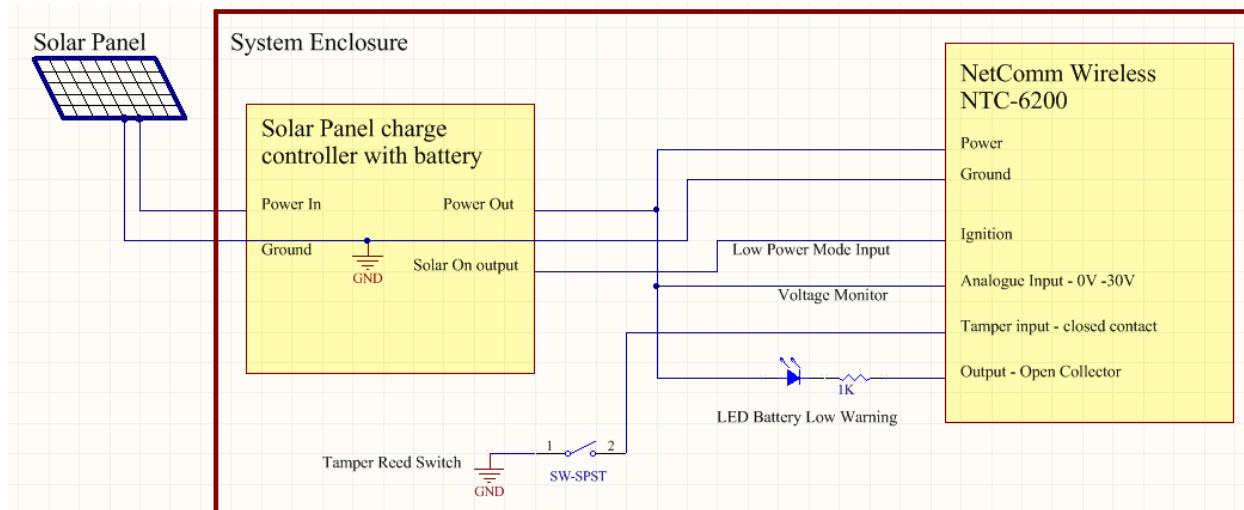
Analogue Sensor with Thermistor

Some sensors work by changing resistance due to a change, such as temperature, light etc. These may be wired up to an external or internal power source and the resistance can be read into the analogue signal. This will require some software calibration like scaling or offset to map the voltage received to the sensor resistor value. An example below shows the internal pull-up voltage and 1K resistor activated. The voltage received depends on the combination of resistors and the value of the resistance of the sensor itself.



System Example –Solar powered Router with battery backup

The previous examples of wiring can be used to come up with a system. The following test case is an example of how the I/O's can be used to enhance a simple router setup.



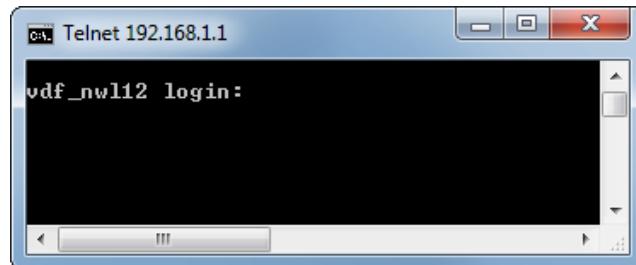
Appendix J: Obtaining a list of RDB variables

The RDB is a database of variables that contain settings on the router. You can retrieve (get) and set the values of these variables through the command-line or via SMS Diagnostics. To access a full list of the RDB variables, follow these steps:

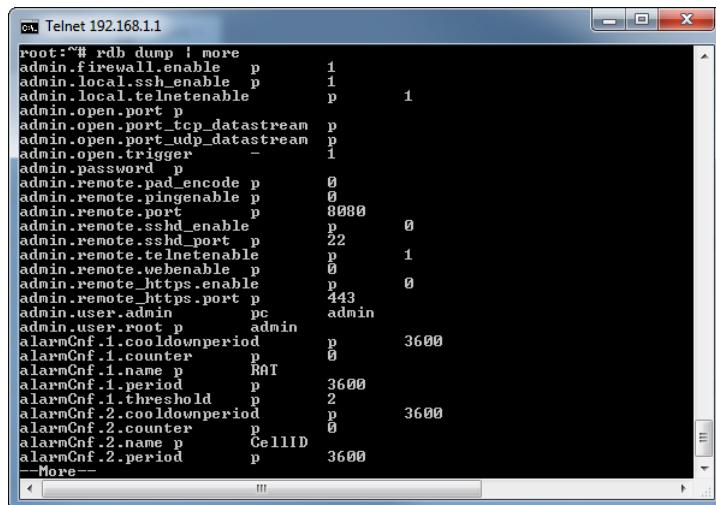
1. Log in to the web user interface as described in the [Advanced configuration](#) section of this guide.
2. Click the **System** menu at the top of the screen, then select the **Administration** menu on the left. Finally, select the **Administration settings** menu item.
3. If you are accessing the router remotely, click the **Enable telnet** toggle key so that it is in the **ON** position. If you are locally connected to the router, click the **Enable local Telnet** toggle key so that it is in the **ON** position.



4. Under the **Telnet/SSH account** section, enter a telnet password and then re-enter it in the **Confirm password** field.
5. Click the **Save** button at the bottom of the screen.
6. Open a terminal client such as PuTTY and telnet to the router using its IP address.



7. At the login prompt, type `root` and press Enter. At the password prompt, enter the password that you configured in step 4.
8. At the root prompt, enter the command `rdb dump | more`. This will display a list of every rdb variable on the router one page at a time.



```

root:# rdb dump | more
admin.firewall.enable p 1
admin.local.ssh_enable p 1
admin.local.telnetenable p 1
admin.open_port p
admin.open_port_tcp_datastream p
admin.open_port_udp_datastream p
admin.open_trigger - 1
admin.password p
admin.remote.pad_encode p 0
admin.remote.pingenable p 0
admin.remote.port p 8080
admin.remote.ssh_enable p 0
admin.remote.sshd_port p 22
admin.remote.telnetenable p 1
admin.remote.webenable p 0
admin.remote_https.enable p 0
admin.remote_https.port p 443
admin.user.admin pc admin
admin.user.root p admin
alarmCnf.1.cooldownperiod p 3600
alarmCnf.1.counter p 0
alarmCnf.1.name p RAT
alarmCnf.1.period p 3600
alarmCnf.1.threshold p 2
alarmCnf.2.cooldownperiod p 3600
alarmCnf.2.counter p 0
alarmCnf.2.name p CellID
alarmCnf.2.period p 3600
--More--

```



Note: Omitting the `| more` parameter will dump a complete list without pagination. For easier access, some terminal clients such as PuTTY have the ability to log all telnet output to a text file.

Appendix K: Using USB devices

The Vodafone MachineLink 3G Plus router features a Mini USB 2.0 OTG port capable of supplying 5V/0.5A to connected peripherals or storage devices such as USB-to-Ethernet adapters and USB-to-Serial cables.

USB Host and Device mode

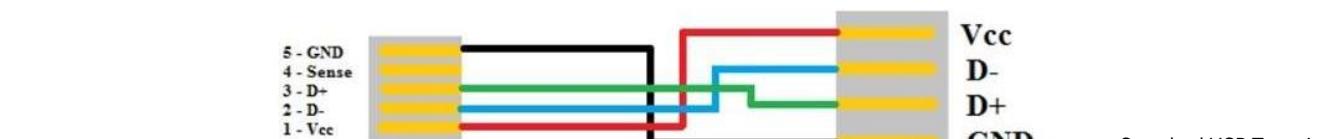
In **USB Host mode**, the router accepts

- USB to Ethernet adapters
- USB to Serial adapters
- USB storage devices (FAT16/FAT32/NTFS partitions) which are automatically mounted and accessible through the use of the Software Developer Kit.

In **USB Device mode**, the router is recognized as a multi-function device by PCs, containing the following devices:

- Ethernet over USB device (providing additional LAN port)
- Serial over USB device (may be configured as an end point in the data stream manager)
- USB storage that is a Windows device driver installation disk. The disk contains two separate drivers (i.e. Serial and Ethernet) that support Windows® XP/7/8 (manual driver installation required). Linux driver installation (e.g. using Ubuntu) is automatic for both drivers.

The diagram below illustrates the wiring of a regular USB cable compared to that of the OTG cable expected by the MachineLink 3G Plus.



USB 1.x/2.0 standard pinout			
Pin	Name	Wire color	Description
1	V _{BUS}	Red (or Orange)	+5 V
2	D-	White (or Gold)	Data-
3	D+	Green	Data+
4	GND	Black (or Blue)	Ground

USB 1.x/2.0 Mini/Micro pinout			
Pin	Name	Wire color	Description
1	V _{BUS}	Red	+5 V
2	D-	White	Data-
3	D+	Green	Data+
4	ID	N/A	Permits detection of which end of a cable is plugged in: • "A" connector (host): connected to the signal ground • "B" connector (device): not connected
5	GND	Black	Signal ground

Pin 4 of the Mini USB connector decides the USB mode of operation. When connected to ground (GND), the MachineLink 3G Plus acts as a host providing 5V/0.5A to the connected device. When pin 4 is not connected, the MachineLink 3G Plus operates in Device mode.

Safety and product care

RF Exposure

Your device contains a transmitter and a receiver. When it is on, it receives and transmits RF energy. When you communicate with your device, the system handling your connection controls the power level at which your device transmits.

This device meets the government's requirements for exposure to radio waves.

This device is designed and manufactured not to exceed the emission limits for exposure to radio frequency (RF) energy set by the Federal Communications Commission of the U.S. Government.

This equipment complies with radio frequency (RF) exposure limits adopted by the Federal Communications Commission for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator & your body.

External antenna

Any optional external antenna used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operated in conjunction with any other antenna or transmitter. Please consult the health and safety guide of the chosen antenna for specific body separation guidelines as a greater distance of separation may be required for high-gain antennas.

Any external antenna gain must meet RF exposure and maximum radiated output power limits of the applicable rule section. The maximum antenna gain for this device as reported to the FCC is: 0.2 dBi (850MHz) and 2.7 dBi (1900MHz).

CE Approval

This device has been tested to and conforms to the regulatory requirements of the European Union and attained CE Marking. The CE Mark is a conformity marking consisting of the letters "CE." The CE Mark applies to the products regulated by the central European health, safety and environmental protection legislation. The CE Mark is obligatory for products it applies to: the manufacturer affixes the marking in order to be allowed to sell their product in the European market.

The wireless device is approved to be used in the member states of the EU. NetComm Wireless declares that the wireless device is in compliance with the essential requirements and other relevant provisions of the Radio and Telecommunications Terminal Equipment Directive 1999/5/EC (R&TTE Directive). Compliance with this directive implies conformity to the following European Norms – N 60950 – Product Safety, EN 301 489 EMC, EN301511 GSM RF, EN301908 UMTS RF, EN 62311 SAR Technical requirement for radio equipment. A notified body has determined that this device has properly demonstrated that the requirements of the directive have been met and has issued a favourable certificate of expert opinion. As such the device will bear the notified body number 0682 after the CE mark.

The CE Marking is not a quality mark. Foremost, it refers to the safety rather than to the quality of the product. Secondly, CE Marking is mandatory for the product it applies to whereas most quality markings are voluntary.

Marking: The product shall bear the CE mark, the notified body number(s) as depicted to the right. **CE 0682**

This product has also passed the following certification standards –

Health (Article 3.1(a) of the R&TTE Directive)

- EN 62311: 2008 ; EN 50385 :2002

Safety (Article 3.1(a) of the R&TTE Directive)

- EN 60950-1:2006/A11:2009+A1:2010+A12:2011

Electromagnetic compatibility (Article 3.1 (b) of the R&TTE Directive)

- EN 301 489-1 V1.9.2, EN 301 489-3 V1.4.1, EN 301 489-7 V1.3.1
- EN 301 489-24 V1.5.1
- EN 55022:2010/ AC:2011 Class B, EN55024: 2010
- EN 61000-3-2:2006/A1:2009/A2:2009, EN 61000-3-3:2008

Radio frequency spectrum usage (Article 3.2 of the R&TTE Directive)

- EN 301 511 V9.0.2, EN 301 908-1 V5.2.1, EN 301 908-2 V5.2.1
- EN 300 440-1 V1.6.1, EN 300 440-2 V1.4.1

RoHS Directive (2011/65/EU)

- EN 50581: 2012

NOTE: To comply with the RF exposure requirements, this equipment must be operated with a minimum of 20 cm separation from the user. This is a regulatory requirement and applies to all 3G capable devices meeting standard regulatory compliance such as the compliance standards listed above.

FCC Statement

FCC compliance

Federal Communications Commission Notice (United States): Before a wireless device model is available for sale to the public, it must be tested and certified to the FCC that it does not exceed the limit established by the government-adopted requirement for safe exposure.

FCC regulations

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This device has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorientate or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

IC regulations

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions:

- (1) this device may not cause interference, and
- (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

- (1) l'appareil ne doit pas produire de brouillage, et
- (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement."

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

IMPORTANT NOTE:

IC radiation exposure statement:

This equipment complies with IC RSS-102 radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and users body.

Electrical safety

Accessories

Only use approved accessories.

Do not connect with incompatible products or accessories.

Connection to a car

Seek professional advice when connecting a device interface to the vehicle electrical system.

Distraction

Operating machinery

Full attention must be given to operating the machinery in order to reduce the risk of an accident.

Product handling

You alone are responsible for how you use your device and any consequences of its use.

You must always switch off your device wherever the use of a mobile phone is prohibited. Do not use the device without the clip-on covers attached, and do not remove or change the covers while using the device. Use of your device is subject to safety measures designed to protect users and their environment.

Always treat your device and its accessories with care and keep it in a clean and dust-free place.

Do not expose your device or its accessories to open flames or lit tobacco products.

Do not expose your device or its accessories to liquid, moisture or high humidity.

Do not drop, throw or try to bend your device or its accessories.

Do not use harsh chemicals, cleaning solvents, or aerosols to clean the device or its accessories.

Do not paint your device or its accessories.

Do not attempt to disassemble your device or its accessories, only authorised personnel must do so.

Do not use or install this product in extremely hot or cold areas. Ensure that the device is installed in an area where the temperature is within the supported operating temperature range (-40°C to 80°C)

Do not use your device in an enclosed environment or where heat dissipation is poor. Prolonged use in such space may cause excessive heat and raise ambient temperature, which will lead to automatic shutdown of your device or the disconnection of the mobile network connection for your safety. To use your device normally again after such shutdown, cool it in a well-ventilated place before turning it on.

Please check local regulations for disposal of electronic products.

Do not operate the device where ventilation is restricted

Installation and configuration should be performed by trained personnel only.

Do not use or install this product near water to avoid fire or shock hazard. Avoid exposing the equipment to rain or damp areas.

Arrange power and Ethernet cables in a manner such that they are not likely to be stepped on or have items placed on them.

Ensure that the voltage and rated current of the power source match the requirements of the device. Do not connect the device to an inappropriate power source.

Small children

Do not leave your device and its accessories within the reach of small children or allow them to play with it.

They could hurt themselves or others, or could accidentally damage the device.

Your device contains small parts with sharp edges that may cause an injury or which could become detached and create a choking hazard.

Emergency situations

This device, like any wireless device, operates using radio signals, which cannot guarantee connection in all conditions. Therefore, you must never rely solely on any wireless device for emergency communications.

Device heating

Your device may become warm during normal use.

Faulty and damaged products

Do not attempt to disassemble the device or its accessories.

Only qualified personnel must service or repair the device or its accessories.

If your device or its accessories have been submerged in water punctured or subjected to a severe fall, do not use until they have been checked at an authorised service centre.

Interference

Care must be taken when using the device in close proximity to personal medical devices, such as pacemakers and hearing aids.

Pacemakers

Pacemaker manufacturers recommend that a minimum separation of 15cm be maintained between a device and a pacemaker to avoid potential interference with the pacemaker.

Hearing aids

People with hearing aids or other cochlear implants may experience interfering noises when using wireless devices or when one is nearby.

The level of interference will depend on the type of hearing device and the distance from the interference source, increasing the separation between them may reduce the interference. You may also consult your hearing aid manufacturer to discuss alternatives.

Medical devices

Please consult your doctor and the device manufacturer to determine if operation of your device may interfere with the operation of your medical device.

Hospitals

Switch off your wireless device when requested to do so in hospitals, clinics or health care facilities. These requests are designed to prevent possible interference with sensitive medical equipment.

Interference in cars

Please note that because of possible interference to electronic equipment, some vehicle manufacturers forbid the use of devices in their vehicles unless an external antenna is included in the installation.

Explosive environments

Petrol stations and explosive atmospheres

In locations with potentially explosive atmospheres, obey all posted signs to turn off wireless devices such as your device or other radio equipment.

Areas with potentially explosive atmospheres include fuelling areas, below decks on boats, fuel or chemical transfer or storage facilities, areas where the air contains chemicals or particles, such as grain, dust, or metal powders.

Blasting caps and areas

Turn off your device or wireless device when in a blasting area or in areas posted turn off “two-way radios” or “electronic devices” to avoid interfering with blasting operations.