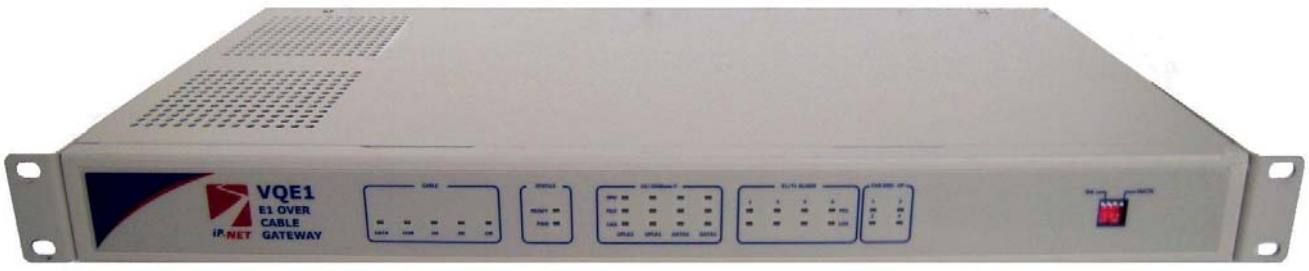
# VQE1

## E1 over RF/Ethernet Multiplexer

## V 1.3

# User's Manual




**IP-NET, LLC**

# VQE1
# E1 over RF/Ethernet Multiplexer

# User's Manual

**IP-NET, LLC.**

**2008.2**

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**Product Model:** VEQ1
**Product Name:** VQE1 Virtual Quad E-1 over RF/Ethernet Multiplexer
**Manual Version:** 1.3
**Last Update:** 2008. 2

**IP-NET, LLC.**

**Address:** 10256 N.W. 47th Street,
Sunrise, Florida 33351
U.S.A.
**Tel:** (954)-5878-5929 / (954)-578-5930
**Fax:** (954)-212-9205
**Web:** www.hfcnet.net
**E-mail:** info@hfcnet.net, sales@hfcnet.net

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# 1. 🕮 General

## 1.1 Overview

Thank you for selecting the VQE1 product designed and made by IP-NET, LLC. The product can be used to provide E1 communication channels over DOCSIS 1.0, 1.1, or 2.0 and/or directly over Ethernet/IP networks.

The VQE1 has many optional parameters, which can be modified by the user to suite different application requirements. Please read this manual carefully before installing the product.

It is well known that the E1 signal comes from PCM technology which is TDM in nature. It transmits information in a constant bit rate of E1_2048kbit/s, T1_1544 kbit/s(future). TDM technology occupies fixed transmission bandwidth, with QoS features suitable for real-time applications such as voice and video. The QoS features include short and stable transmission delay, low jitter and wander, etc.

On the other hand, Ethernet is based on statistical multiplexing, transmitting and exchanging information in packets. It does not take up a fixed transmission bandwidth, which is good for achieving higher bandwidth utilization. But Ethernet technology does not provide adequate QoS for many real time applications.

Until recently, voice and data were, and still are to a large extent, transported over two separate networks. But the requirement for both types of information to be carried over unified networks is growing rapidly. Techniques to integrate data Packets over SONET/SDH into TDM networks have been around for many years. But for voice over packet based data networks, most of the efforts are spent on creating special equipment that packetizes voice or video signals, such as VoIP techniques.

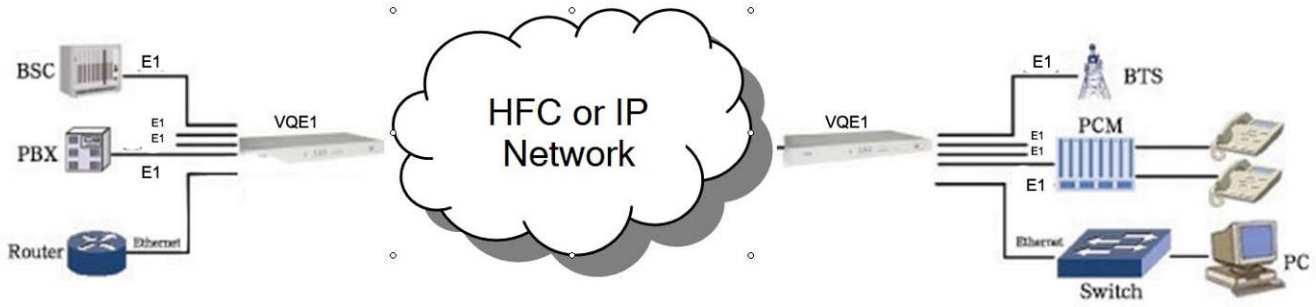
However, to take advantage of the data network, it is neither cost effective, nor necessary to hastily replace all the TDM based legacy equipment with new packet based equipment. The VQE1 can be used to emulate transparent E1 channels over a DOCSIS or Ethernet network with adequate QoS, so that most of the existing E1-based applications can be readily setup over Ethernet LANs and WANs.

## 1.2 Features

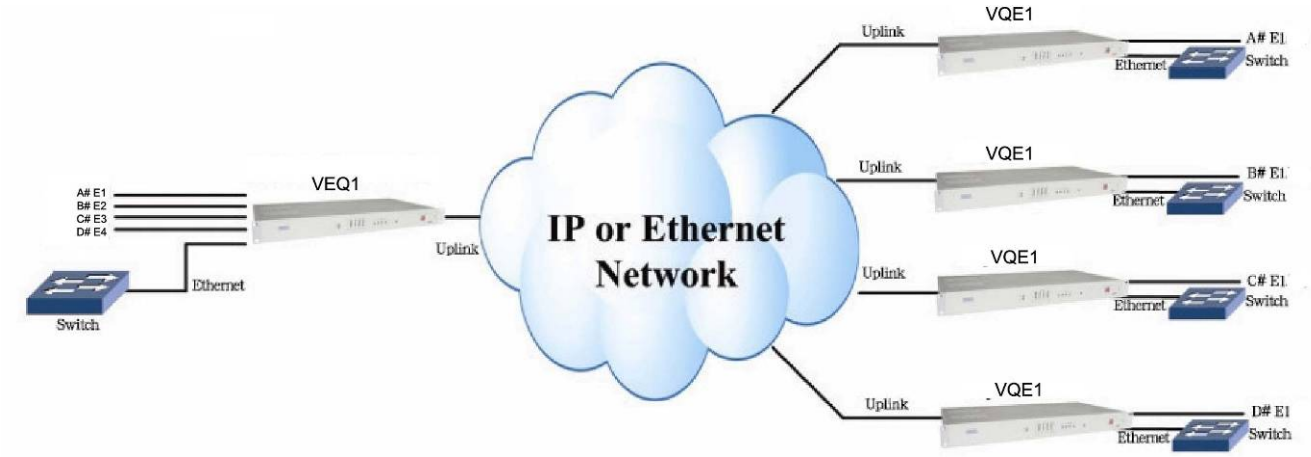
- User-friendly Web server supported for easy setup and maintenance
- Point to point and point to multipoint supported
- Uplink ports 1+1 backup supported
- Four E1 Ports supported, E1 or T1 (future) easy selected by Web Manager
- Stable E1 clock recovery, low jitter and wander
- Low processing delay for E1 channels, high bandwidth usage efficiency
- Resistant to packet loss, with PCM frame synchronization protection
- User definable encapsulation packet size for different application
- Enough jitter buffer to resist packet delay variation (PDV)
- Local Ethernet port throughput limiting, assuring E1 QoS
- Local and remote E1 LOS and AIS and packet loss indication for trouble-shooting and maintenance
- Supports cascaded concatenation or Daisy-Chaining for more than 4 E1 ports

## 1.3 Applications

VQE1 is used to setup 1~4 clear E1 channels over LAN or IP networks, as depicted in Fig. 1.3-1.




(a) Point to Point Application




(b) Point to Multipoint Application

Fig. 1.3-1 VQE1 application paradigm

In the figure, a pair of VQE1's create clear E1 channels over a DOCSIS packet network, providing connections between a PBX and a telephone exchange, or other terminal devices. At the same time, computers talk to each other through the local Ethernet ports on the VQE1's. This configuration guarantees that the E1 channels get higher priority over computer data for maximum QoS.

In addition to robust data and E1 transmissions over DOCSIS or Ethernet networks, the VQE1s can also be configured to work with wireless bridges. One common application of VQE1 is to set up point to point wireless E1 links using low cost wireless LAN bridges or IP-NET WIRELESS CAPs. VQE1 can work with most LAN bridges on the market. It may be necessary to adjust different parameters such as packet size and packet jitter absorption buffer size for best operation for different LAN bridges.

Be aware that wireless LAN bridges may have a very limited bandwidth. If Ethernet data is to be transferred at the same time, the traffic must be restricted. Otherwise it will affect the E1 packets. Since the LAN bridges usually don't have adequate QoS mechanism to guarantee the E1 priority, it is strongly recommended that the data traffic be routed through the VQE1 local data port, as depicted in Fig. 1.3-2.

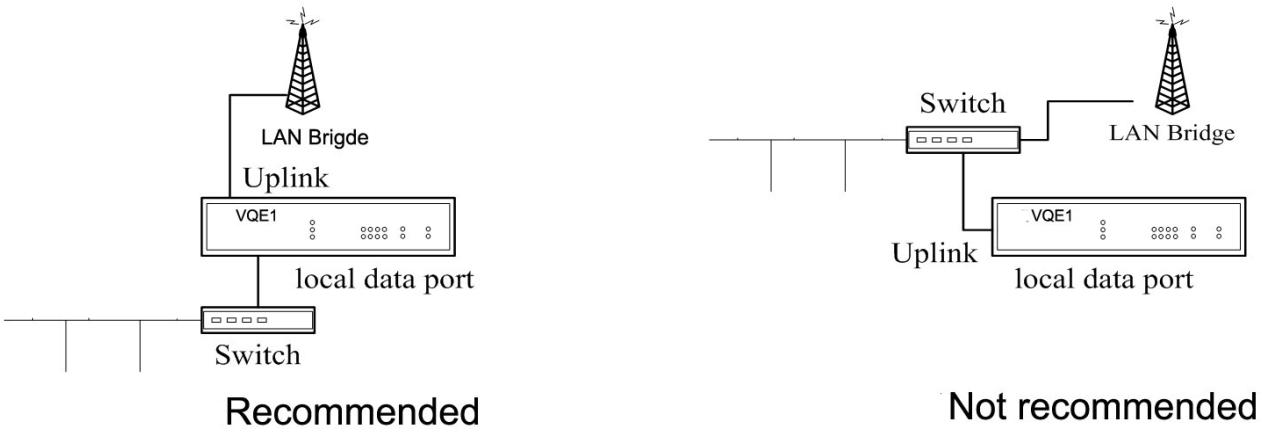



Fig. 1.3-2 Preferred connections for LAN traffic

***WARNING*: When connecting to a wireless LAN bridge, the uplink Ethernet cable often connects to the outdoor unit, posing danger to lightning strikes that can seriously damage the equipment. To protect the equipment as well as people, surge protection devices with good earth connection is strongly recommended. Poor earth connection may also hinder the operation of the Ethernet port, causing severe packet losses.**

## 1.4 Timing modes

To emulate a clear E1 channel over a packet network, the VQE1 not only conveys data stream content correctly from the source to the destination, but also passes timing. Packet networks do not provide such built-in timing transparency mechanism as TDM networks do. VQE1 uses a proprietary algorithm to reconstruct the E1 clock at the destination. The recovered clock is of very high quality, with low jitter and wander. Typical frequency offset is within ±5ppm, and jitter is below 0.1UI. It can be adapted in most applications. This timing mode of rebuilding the E1 clock at the destination is called Adaptive Timing.

For applications where separate clock distribution network exists, another timing mode, Loop back Timing, may be used for maximum clock quality.

The two timing modes of VQE1 are depicted in Fig.1.4-1.

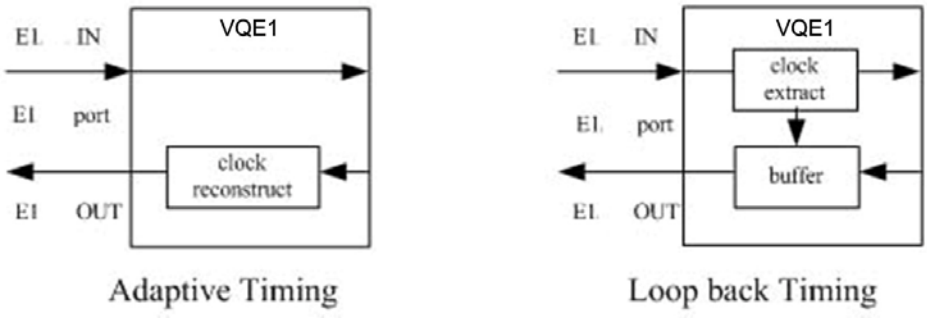



Fig.1.4-1 E1 Timing modes

Correct timing mode setting is important for smooth operations. In most cases, setting both units to adaptive timing mode is sufficient. But sometimes, setting one unit to loop timing mode may work better. For example, setting the VQE1 unit connected with the clock master (such as local exchange) to loop back mode, and the other unit connected with the clock slave (such as PBX or remote module) to adaptive mode, is probably better than setting both to adaptive modes.

One typical error in telecom applications is to connect two communication devices that are both clock slaves. Neither VQE1 will support such operation no mater how the timing modes are set.

**Note: that the E1channel emulation takes several minutes to stabilize. During that period, clock drift may exceed the limit, errors and slips may occur.**

Various timing schemes are enlisted in Table 1.4-1, for applications depicted in Fig.1.4-2.

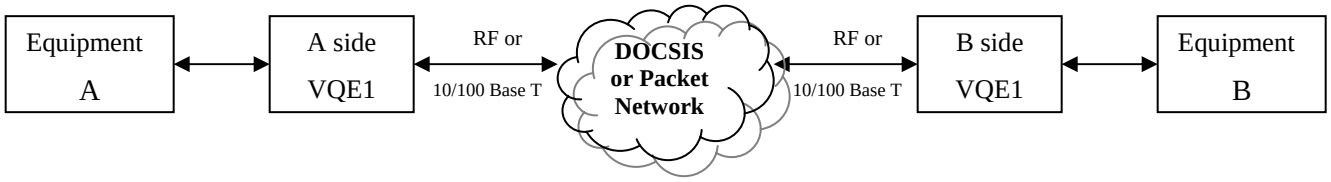



Fig.1.4-2 Timing mode scheme reference diagram

Table 1.4-1 Timing mode schemes

| Equipment A clock mode | Equipment B clock mode | A side EthMux V4 Timing mode | B side EthMux V4 Timing mode | Note |
|---|---|---|---|---|
| master | master | loop back | loop back | Equipment A & B clocks synchronous |
| | | adaptive | adaptive | |
| master | master | adaptive | adaptive | Equipment A & B clocks plesiochronous |
| master | slave | loop back | adaptive | |
| | | adaptive | adaptive | |
| slave | master | adaptive | loop back | |
| | | adaptive | adaptive | |
| slave | slave | | | Not allowed |

Note that setting both units to adaptive timing mode works well for all the conditions, although the other option may work better.

# 2. 🕮 System architecture

## 2.1 Block diagram

The internal functional structure of VQE1 is depicted below:

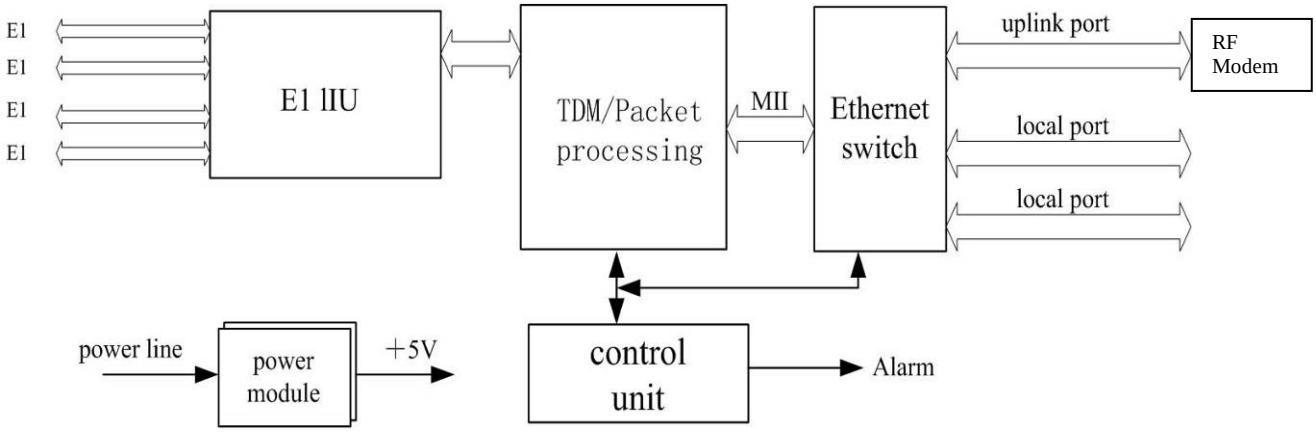



Fig. 2.1-1 Functional diagram

## 2.2 Description

The heart of VQE1 is the TDM/Packet processing unit. It truncates E1 data stream, putting the data into Ethernet packet with or without IP headers. The packets are passed to the Ethernet switch unit via MII interface, and are sent out adaptive through the uplink port to the WAN port of the RF MODEM module for transmission via a DOCSIS network, or through a Daisy-Chain up to another VQE1. Ethernet data from two local data port are also sent out through the uplink ports, but with lower priority than those packets containing E1 data.

In the reverse direction, packets from the RF MODEM or the uplink ports are sorted at the switch unit. All but E1 packets are passed to the local data ports. The packets containing E1 data are sent to the TDM/Packet processing unit for reassembly of the original data stream, and recovery of the E1 clock which is the key element of the device. A very sophisticated algorithm is used to ensure that the reconstructed clock will meet the stringent requirement of TDM applications. The most important parameters are jitter, wander, and signal delay.

The control unit interfaces with the user through a console port so that various operational parameters can be modified.

## 2.3 Front panel

### *2.3.1 Diagram*

VQE1 is shown in Fig. 2.3.1-1.

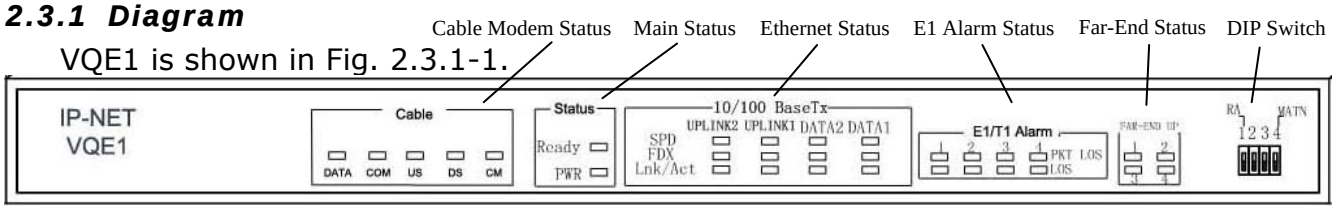



Fig. 2.3.1-1 Front panel of VQE1

### *2.3.2 LEDs*

There are 31 LEDs on the front panel, divided into 5 groups. For detailed LED description, refer to The Table 4.1-1. To verify operation, the LEDs should be interpreted in the following sequence:

In the STATUS group, the PWR and READY green LEDs indicate the operation status of the device.

In the CABLE group, there are five red, yellow and green LEDs which indicate the condition of the DOCSIS cable modem module.

In the 10/100 BASE-T group, the 12 Ethernet status green LEDs indicate the status of the 4 Ethernet ports.

In the E1/T1 ALARM group, eight red LEDs are provided for alarm indication, 4 for the local and remote E1 ports, and 4 for packet alarms.

In the FAR-END UP Group Four LEDs indicate the status of far-end E1 uplink. These LEDs are also green.

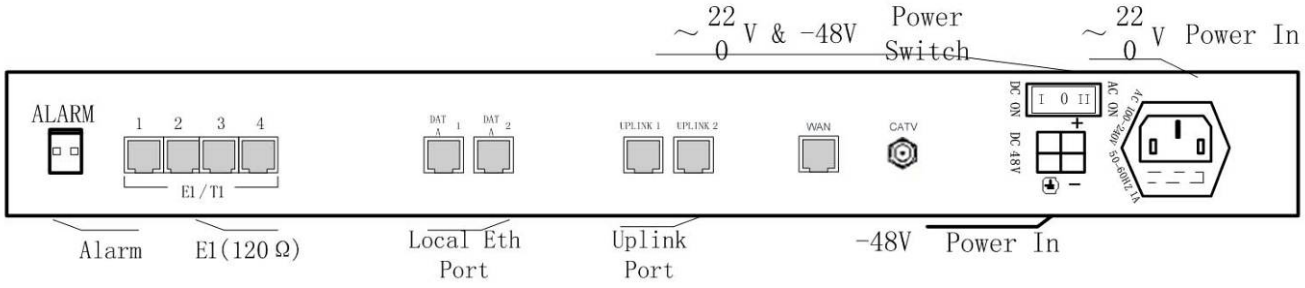
For detailed LED description, refer to The Table 4.1-1.

### *2.3.3 Dip switch*

There are two Dip Switches on the front panel; the definitions are shown on Table 4.3-1.

## 2.4 Rear panel

The VQE1 has power supply options for 110-220VAC and -48VDC. The rear panel is depicted in Fig. 2.4-1.




DC power with 2X2P socket

Fig. 2.4-1 Rear panel

### *2.4.1 Grounding screw*

This is used to connect the chassis to the protective ground.

### *2.4.2 System alarm*

The VQE1 can output system alarms for maintenance purposes. There are 2 alarm output pins, the Prompt Alarm and the Deferred Alarm, as shown in Fig. 2.4-2.

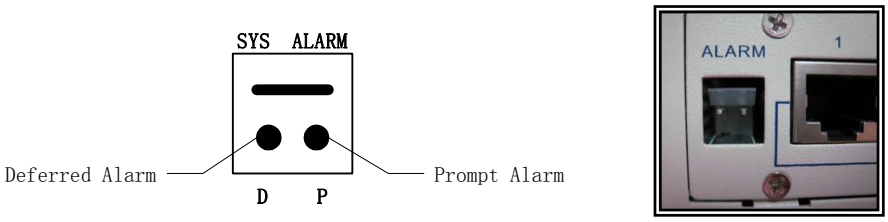



Fig. 2.4-2 System alarm port

The alarm conditions for each alarm output are set by the user. The output ports float when no alarm is present, and connect to ground when alarm activates.

### *2.4.3 E1 Port*

There are 4 E1 ports on the rear panel. The E1 ports impedance are E1-120Ω for twisted pair cables or 75Ω for coax. The E1-120Ω RJ45 sockets are internally set by default to 120Ω ports.

### *2.4.4 Ethernet ports*

There are four RJ45 Ethernet ports on the rear panel, 2 for uplink connection to the DOCSIS packet network and 2 local data ports for local computers to access the uplink.

Uplink ports support 1+1 backup.

The Web manager is supported through anyone of the two local data ports.

### *2.4.5 Power*

Three power options are available, two via 100-240VAC 50/60 Hz and another via -48VDC. The power source is selected via a rear panel three position rocker switch.

# *3. 🕮 Installation*

## 3.1 Mechanical

VQE1 can be placed on a table top or mounted in a 19” rack. If it is to be mounted in a rack, the four (4) 10mm-high stands should be removed with a screw driver.

The mechanical dimensions of VQE1 are given in Fig.3.1-1.

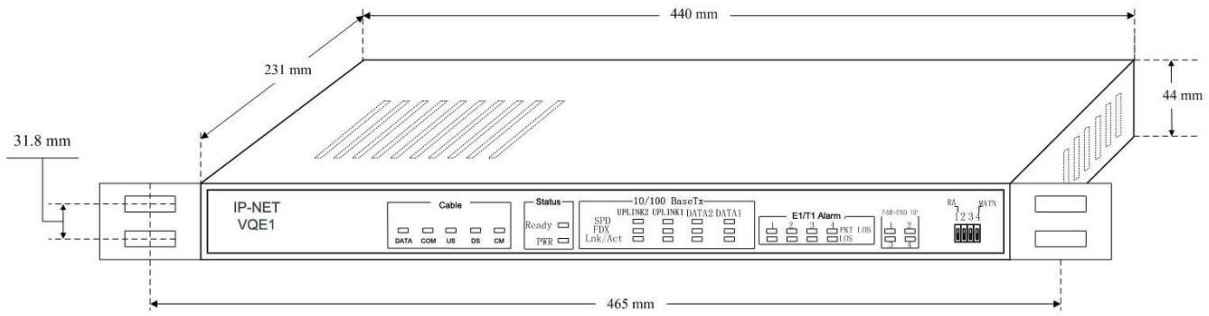



Fig.3.1-1 Mechanical dimensions

## 3.2 Electrical

### *3.2.1 Power connection*

The VQE1 consumes less than 15W of power.

The VQE1 offers the broadest powering facilities via a standard -48 VDC, 110 VAC or 220 VAC Universal Power Supply. For the -48V type, connect -48 supply to the power connector -48V port, and ground the other port. The screws on the power connector must be tightly fastened. For 110 or 220V equipment, connect the device to the 110-220V outlet with standard power cord supplied with the equipment. Please specify power cord required when ordering.

Note that there is a 1A fuse in the VAC power cord socket which may be replaced when burned. The -48V equipment uses PPTC resettable fuse, no customer replacement is required.

It is recommended to turn off the power switch before connecting or disconnecting the power.

On the left corner of the rear panel, a screw is provided for connecting the chassis to the protective ground. Be sure to make this connection using a thick wire.

***WARNING*: The system must be securely connected to a good protective ground for safety. All interconnected equipment must be grounded for maintaining signal integrity as well. Ground potential differences may also damage the interface ports.**

***WARNING*: To avoid electric shock, the 110-220V outlet must have good ground.**

### *3.2.2 E1 connections*

The E1 ports on VQE1 are used for connecting to E1 equipment such as telephone exchanges or PCM terminals.

Four E1 Ports are supported. The E1s are easily selected by Web Manager

E1 ports impedance are E1-120Ω for twisted pair cables or 75Ω for coax. **The E1-120Ω RJ45 sockets impedance is set by internal jumpers to default to 120 Ω for all ports.**

The E1-120Ω connection cable is made with RJ45 connectors and a length of 4-pair twisted cable. The cable is not provided with the equipment, and the user is responsible for making such cables in the field with length suitable for a particular installation. The signal definition is given in Table 3.2.2-1, and pin order is depicted in Fig. 3.2.2-1. Note that pin-1 and pin-2 should use the same twisted pair, so should pin-4 and pin-5.

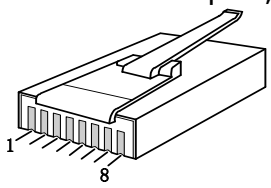



Fig. 3.2.2-1 RJ45 pin order

Table 3.2.2-1 120Ω-E1 signal definition

| Pin | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Signal | - | + | | + | - | | | |
| | E1—IN | | GND | E1—OUT | | GND | | |

**The RJ45 sockets are default for E1-120Ω/T1-110Ω, t**he 4-jumpers of CNM26, CNM25, CNM24, CNM20 in the VQE1 main board are jumpered between pins 1-2.

The cable No. **BH4.851.122** is for one RJ45 connector to two BNC (F) sockets conversion cable for 75 Ω E1 operations. The 4-jumpers of CNM26, CNM25, CNM24, and CNM20 in the main board of the VQE1 board are jumpered 2-3. This cable is optional.

### *3.2.3 DOCSIS or Ethernet connection*

Connect the Uplink 1 or 2 Ethernet port to the WAN port for connection via a DOCSIS transport network, or to external modems such as the wireless LAN bridge or Ethernet networks for other WAN transport solutions. Connect the local data port to computers or to an Ethernet switch for local data applications.

The signal definition of the two local Ethernet ports is given in Table 3.2.3-1.

Table 3.2.3-1 Ethernet signal definition

| Pin | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Signal | RxD+ | RxD- | TxD+ | | | TxD- | | |

**Note: The ports confirm to HP auto-MDIX spec. It will automatically adapt to parallel or crossed cables.**

The signal definition of the uplink Ethernet ports is given in Table 3.2.3-2.

Table 3.2.3-2 Ethernet signal definition

| Pin | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Signal | RxD+ | RxD- | TxD+ | GND | GND | TxD- | GND | GND |

**Note: The uplink port link parallel cable to LAN Bridge.**

***WARNING*: When connecting to a wireless LAN bridge, the uplink Ethernet cable often connects to the outdoor unit, posing danger to lightning strikes that can seriously damage the equipment. To protect the equipment as well as people, surge protection devices with good earth connection are strongly recommended. Poor earth connection may also hinder the operation of the Ethernet port, causing severe packet losses.**

# *4. Operation*

After successful installation, switch on power. The operation status can be monitored with LEDs on the front panel. Do not use a loop back cable to suppress unused E1 port alarms, because that shows the E1 is in operation, and will take up about 2 Mbps bandwidth. If the uplink channel does not have enough bandwidth, this will affect packets for the working E1.

Various operational parameters can be set or modified through Web manager.

It is often helpful to use an E1 tester to check the quality of the E1 channels, by measuring the round trip bit error rate of the channel. The loop back control in Web manager is useful for this purpose.

## 4.1 LED Definition

There are 31 LEDs on the front panel, the definitions of LED conditions are as follows:

Table 4.1-1 LED Definition

| LED | Color | Definition | Explanation |
|---|---|---|---|
| **CABLE** | | | |
| CM | R | Cable Modem | On: Normal<br>Off: Power Off / Failure |
| DS | G | DownStream RF | Blinking: Scanning Downstream for QAM<br>On: Downstream RF Acquired and Ready |
| US | G | UpStream RF | Blinking: Modem Module transmitting to CMTS and obtaining parameters<br>On: RF Path Ready |
| CON | Y | DOCSIS Connection Registered | Blinking: Registration In Progress<br>On: Registration Ready |
| DATA | R | WAN Data Flow | On: System Ready via Ethernet Connection to E1 module<br>Off: Failure of Ethernet Connection to E1 module<br>Blinking: Normal operation during E-1 and data TX/RX |

| STATUS | | | |
|---|---|---|---|
| PWR | G | power indicator | On: Normal<br>Off: Power Off / Failure |
| READY | G | operation status | On or off: System abnormal or system initialization.<br>Blink: Normal operation |
| **10/100Base-T** | | | |
| SPD | G | speed indicator | On: 100M<br>Off: 10M |
| LKA | G | link activity indicator | On: Link<br>Blink: Data<br>Off: Inactive |
| FDX | G | duplex indicator | On: Full duplex<br>Off: Half duplex |
| **E1/T1 ALARM** | | | |
| LOS<br>1~4 | R | LOS indicator for 4 E1 ports respectively (Local: RA is off. Remote: RA is on.) | On: LOS<br>Off: Normal or disable<br>Blink: AIS |
| PKL<br>1~4 | R | packet loss indicator | On: Ethernet packet loss<br>Off: Normal<br>Blink: E1 Packet Loss |
| **FAR-END UP** | | | |
| Far-end UP<br>n=1~4 | G | packet communication status<br>(Number of remote different MACs connected with local. Slave mode n=1, master mode n=2~4, at local end) | On: Normal, Remote MAC attained<br>Off: Remote MAC unattained while ARP is activated or disable |

## 4.2 Loop back control

The loop back of E1 ports control are supported in Web manager, shown in section 6.2.

## 4.3 Dip Switches Definition

There are Dip Switches on the front panel, the definition is as follows.

Table 4.3-1 Dip Switches Definition

| 2-Dip Switch | ON | OFF |
|---|---|---|
| **RA** | 4 red LEDs indicate **remote** E1 LOS state | 4 red LEDs indicate **local** E1 LOS state |
| **MATN** | Default IP address | User setting IP address |

# *5. 🕮 Common faults*

This paragraph describes common mistakes and faults that may occur during installation and maintenance. Please seek support from IP-NET, LLC for other problems.

## 5.1 E1 Alarms

There are two groups of LEDs, 4 LEDs E1 PKT LOS and 4 LEDs E1 LOS for E1 alarms LEDs.

When E1 LOS LED is on, loss of E1 signal fault is detected by VQE1. Possible causes include:

- The downstream equipment such as telephone exchange or PCM terminal is powered off.
- The E1 cable connection is loose or broken.

E1 LOS LED blinks when respective input E1 signal is AIS, i.e. the content of E1 data is all 1's. Such alarm indicates fault conditions on the part of the downstream equipment.

E1 LOS site is controlled by Dip Switch RA state. When RA Dip Switch ON, the 4 red LEDs indicate **remote** E1 LOS state. When RA Dip Switch OFF, the 4 red LEDs indicate **local** E1 LOS state.

The 4 LEDs, E1 PKT LOS are packet loss indicator, On for Ethernet packet loss, Blink for E1 Packet Loss, Off for Normal.

### 5.2 Lnk/Act LED off

Lnk/Act LED off means the corresponding Ethernet link is not working. Check the Ethernet cable connection, and the status of the device on the other end of the cable.

### 5.3 Ready LED does not blink

After the unit is powered on, the Ready LED should start to blink. If it does not, try switching power off and on again. If this error persists, call for support.

### 5.4 Cannot set up E1 channel

#### *5.4.1 Same LAN domain*

When two VQE1s are within the same DOCSIS / Ethernet broadcast domain, try following.

Check if the transmission network is on.

Check that the network will pass broadcast packets. For a network that suppresses broadcast packets, as some of the wireless LAN bridges do, disable ARP and manually setup local and remote MACs.

Check that there is no MAC address conflict on the LAN.

Check that the transmission network has enough bandwidth (more than 2.5Mbps duplex).

#### *5.4.2 Different LAN domain*

When two VQE1s are in different DOCSIS Ethernet broadcast domains, IP headers must be used, and packets will be routed by a gateway router, try the following.

Check if the default gateway IP is defined correctly.

Check if the local and remote IP is set correctly.

Check for any conflicts in IP or MAC addresses.

Make sure the transmission network has enough bandwidth.

### 5.5 Downstream reporting slips

Check if the downstream equipment has correct clock mode. At least one of them must be clock master. Set the VQE1 on master side to loop back timing.

If the downstream equipment on both sides is not synchronized, slips are not avoidable.

At the transition time after power on or reapplying the E1signal, slips and errors are acceptable. Such transition may take several minutes.

## *6. 🕮 Web Manager*

Web manager supported through anyone of two user data ports.

### 6.1 Show current status menu

Any local DATA interface of VQE1 supports Web Server management. The management has three sections: Status, Line Test and Configuration. User name and password are needed to enter the sections of Line Test and Configuration. Both the default user name and password are "root" .Customers can modify the user name and password in the configuration section. **Note that the modifications of Configuration will be valid after submit and reboot, while the modifications of Line Test (E1 loop-back setting) can be valid only after submit.**

After inputting the IP address, status information of VQE1 will be displayed such as hardware version, software version, IP address, subnet mask, gateway address and MAC address. The default IP address is 192.168.1.2. Details are shown in fig. 6.1-1.

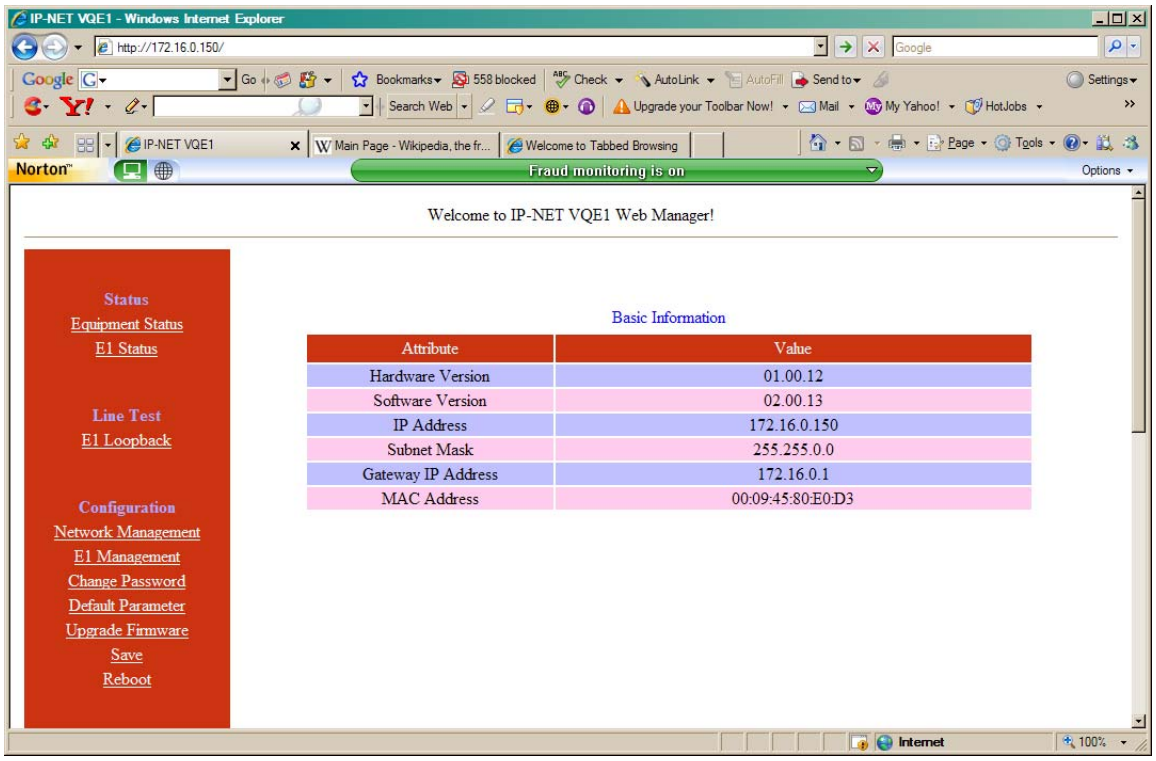



Fig.6.1-1 Status Menu

Click on the E1 Status option will bring the E1 Status Information window showing LOS, AIS and loop-back status.Fig.5.1-2.

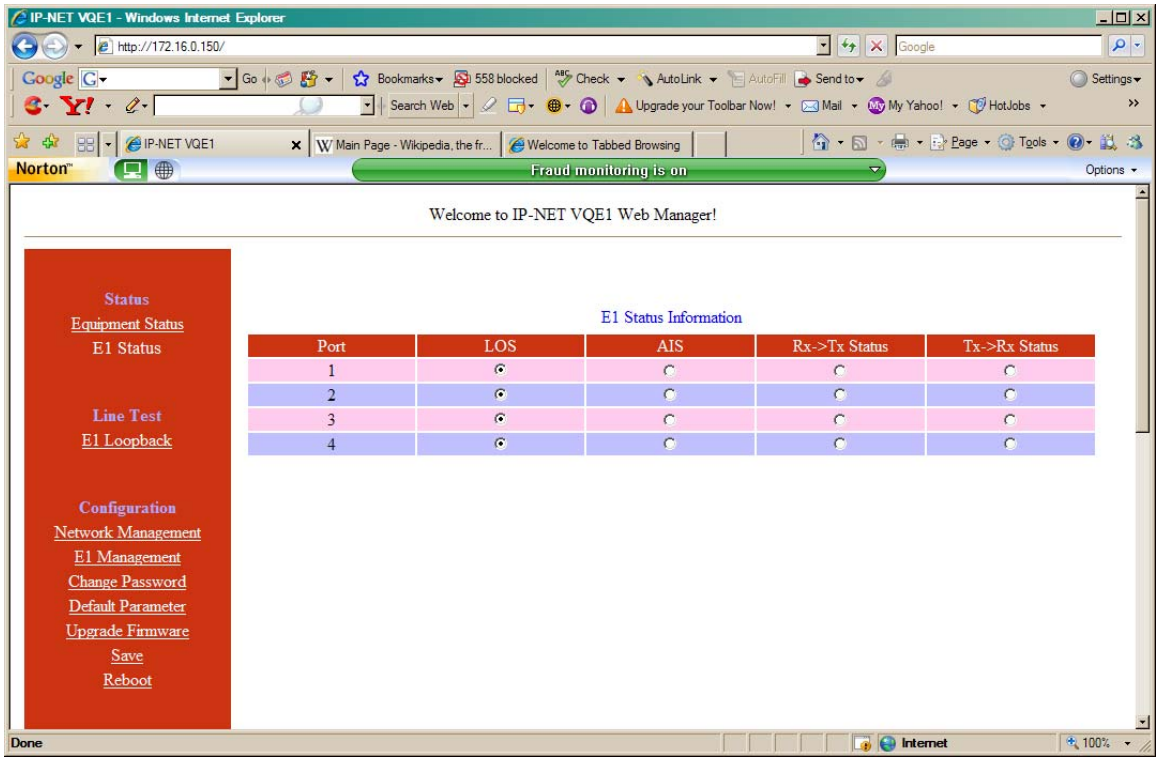



Fig.6.1-2 E1 Status Information

## 6.2 Line Test

Loop back controls provide E1 line loop test function.

The meaning of LLop (Rx-->Tx) and RLop (Tx-->Rx) is depicted in Fig. 6.2-1.

Four E1 ports can set separately by click "□" icon.

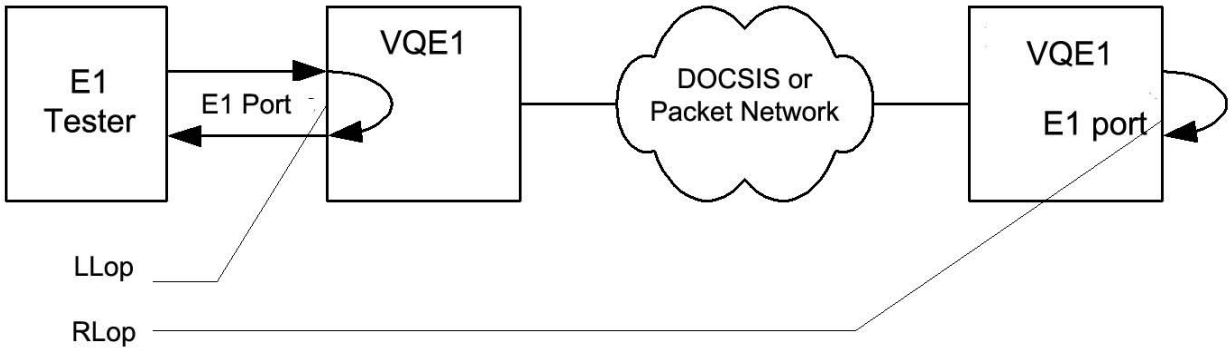



Fig. 6.2-1 Loop back definition

Clicking on E1 Loopback option will bring the window shown as fig. 6.2-2. E1 setting can be valid after submitting but not saved, that is, four E1s will not loop back after restart.

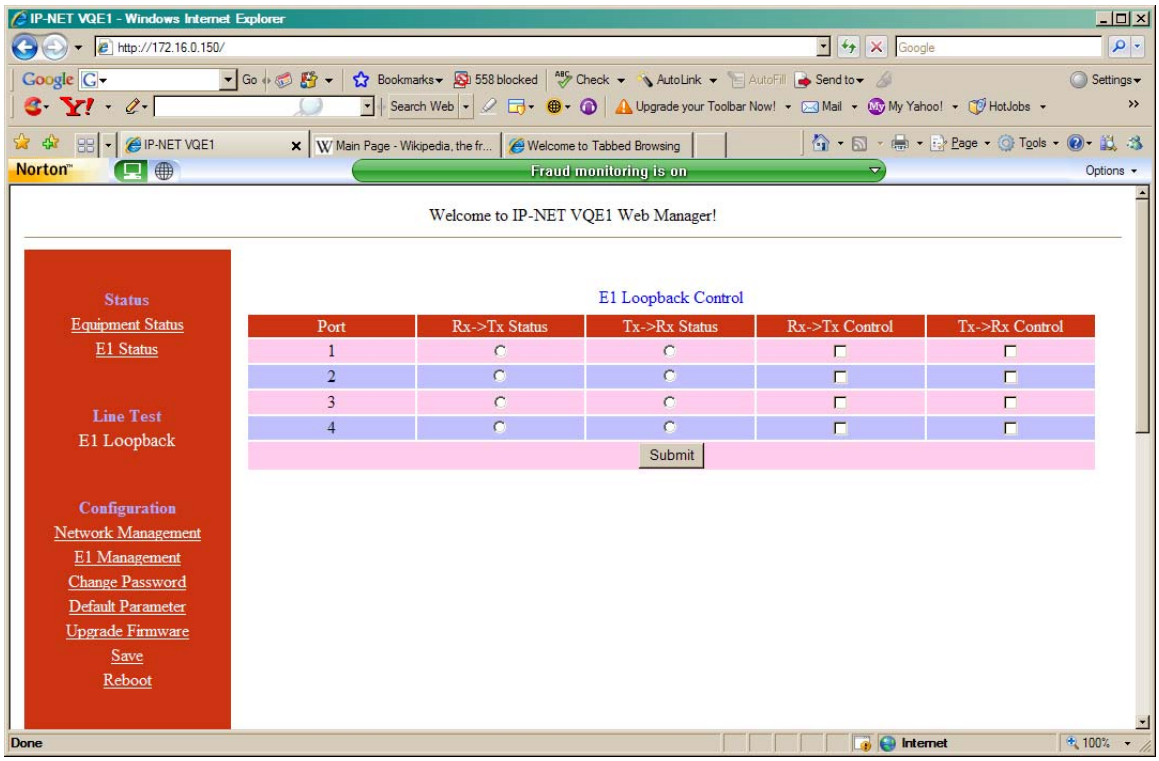



Fig.6.2-2 E1 Loop-back Management

## 6.3 Configuration

This section includes Network Management, E1 Management, Change Password, Default Parameter and Reboot. All the settings and parameters will be valid after reboot.

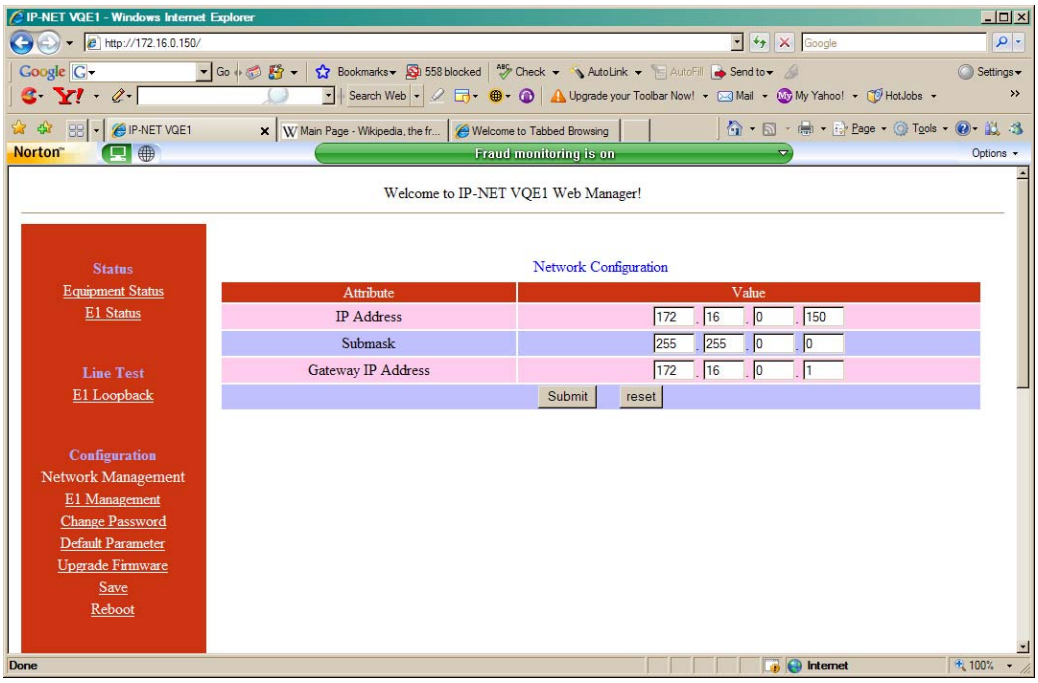



Fig.6.3-1 Network Management

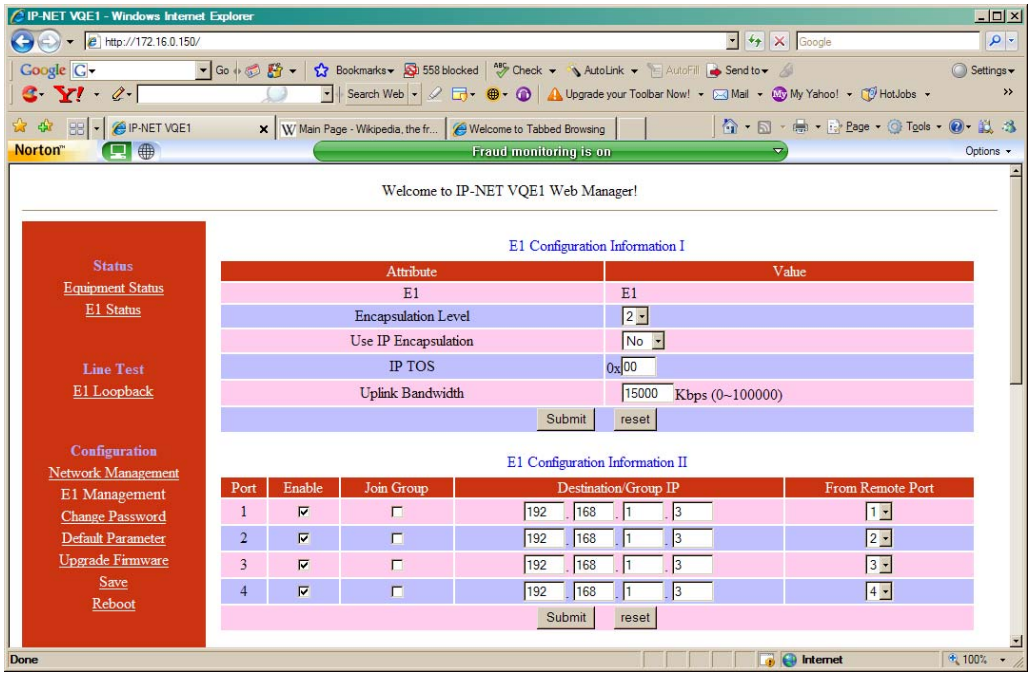



Fig.6.3-2 E1 management

Table 6.3-1 Main Parameter of VQE1

| Parameter | | Item | Specification |
|---|---|---|---|
| Network Management | IP Address | | Default IP address 192.168.1.2 |
| | Submask | | Make calculation for source IP address and submask, and destination IP address and submask respectively. If identical result can be got, the source and destination are in the same subnet. Otherwise, they are in different subnet and the connection should go through gateway.<br>Default :255.255.255.0 |
| | Gateway IP Address | | If the source and destination are in different subnet, gateway IP address should be set.<br>Default:192.168.1.1 |
| E1 Management | E1 | E1<br>T1 | Options are for four E1<br>Default E1 |
| | Encapsulation Level | 1~5 | E1 data size，N=1~5，corresponding to 256×Nbyte（E1）、192×Nbyte（T1）. The bigger the packet is ,the more data is encapsulated in each packet, and the lower overhead it has. Bandwidth efficiency will be raised and delay will be increased.<br>Default :2 |
| | Use IP Encapsulation | Yes<br>No | Yes：IP encapsulation，source and destination IP address should be set. Bandwidth efficiency will be reduced<br>(default)No：do not use IP encapsulation，high bandwidth efficiency |
| | IP TOS | | Customers can define IP service type，<br>Default 0x 00 |
| | Uplink Bandwidth | | Set full duplex bandwidth for uplink Ethernet port，actual bandwidth should be higher than this value.<br>Default 10000Kbps |
| | Destination IP | | Remote end IP address；4 E1 line IP addresses can be set separately<br>Default 192.168.1.3 |

| Parameter | | Item | Specification |
|---|---|---|---|
| | Timing Mode | Adaptive | Default :E1timing from remote E1 stream； |
| | | Loop back | E1 timing comes from local E1 stream |
| | Jitter Buffer | 4~120ms | Coming packets buffer to eliminate jitter. Range：4~120ms。 Default 16ms |
| | Enable VLAN | | Yes：with VLAN label，support the VLAN network with priority to guarantee E1 QoS； (default)No：no VLAN label |
| | VLAN ID | | Add 4 byte before Ethernet frame when VLAN is enable. First two bytes are 0x8100，and second two bytes are VLAN ID，which can be set by customer. |

**Note：**

1.- The actual output rate should correspond to the transmission bandwidth. If the transmission bandwidth is smaller than actual uplink rate, E1 errors will occur. So we set the maximum bandwidth of uplink line. When the uplink is higher than actual E1 rate, the difference value is Ethernet access rate. When the uplink is lower than actual E1 rate, the Ethernet rate is 0.

For example：the transmission line can provide 6M bi-direction bandwidth. If we use two E1 channels, the local uplink should be set smaller than 6M.If not, the actual rate may be higher than the transmission bandwidth. E1 errors may occur.

2.- Bandwidth auto adaptation for E1 depends on the connection of E1. If there is no signal loss for E1, system will allocate bandwidth for it. When E1 port is free, bandwidth will be released ,which can be used for local Ethernet access.

3.- The MAC address of VQE1 is fixed in the device. ARP is supported and the remote end MAC address can be obtained through auto-negotiation. So it is unnecessary to set the MAC address for the remote end, but IP address is needed.

**NOTE：Each device should have only one MAC address in the multicast area!**

Click in on the Change Password option will bring the widows as follows:

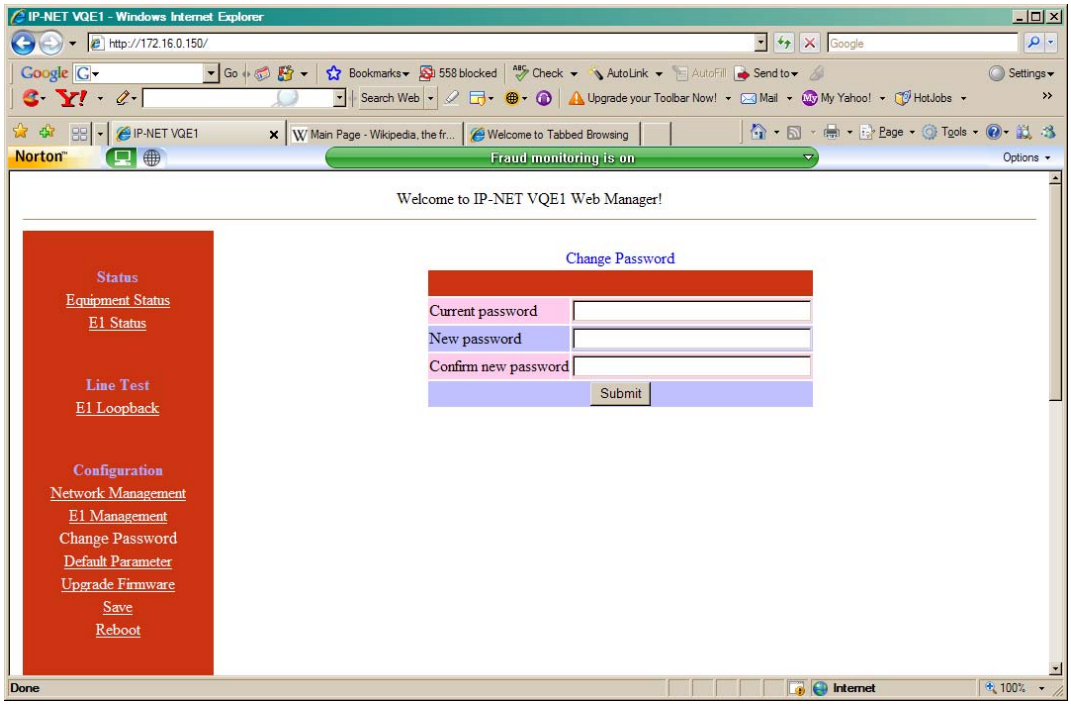



Fig.6.3-3 Change Password

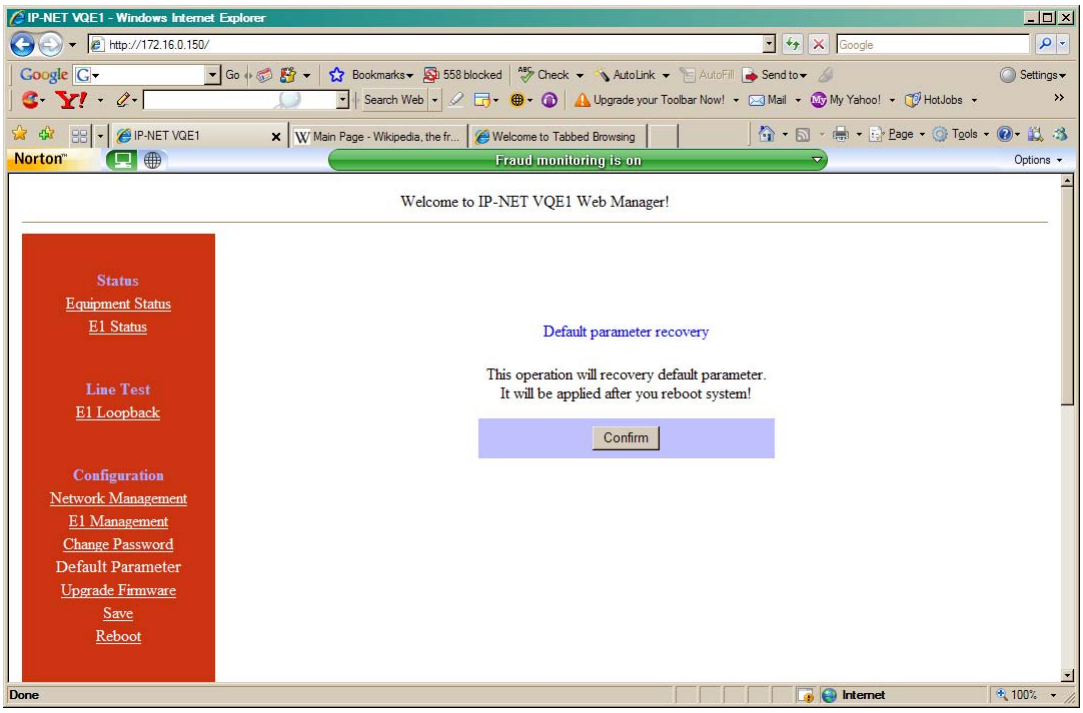



Fig.6.3-4 Default parameter recovery

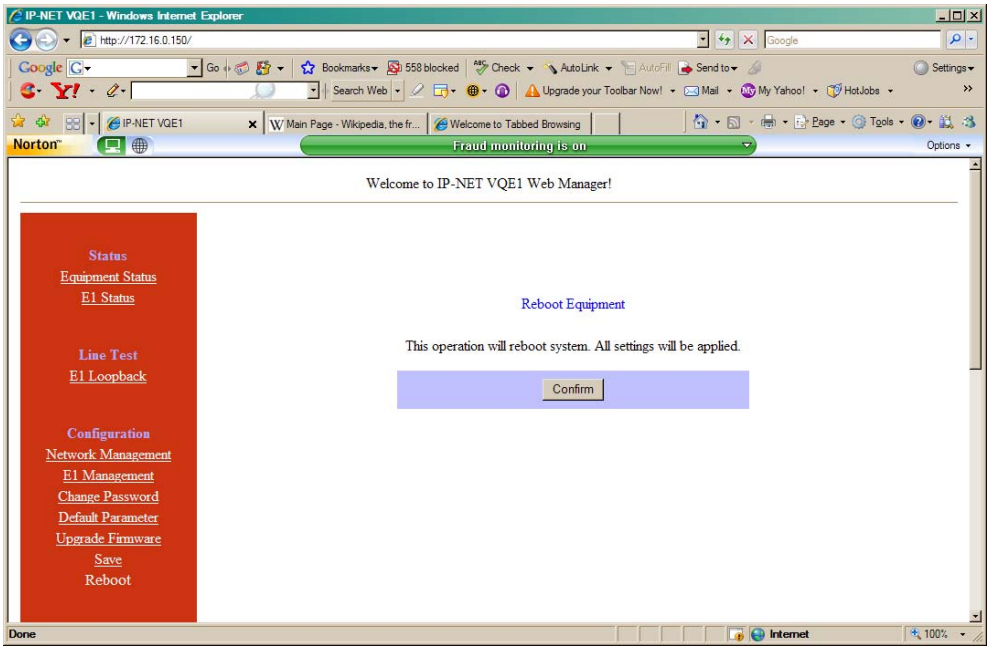



Fig.6.3-5 Restart operation

Clicking on "confirm" will make all the parameters valid.

# 7. 🕮 Specification

## 7.1 Capacity

The VQE1 supports four E1 ports, two 10/100Base-T uplink Ethernet ports and two 10/100Base-T local data Ethernet ports.

## 7.2 DOCSIS RF Interface

DOCSIS 1.0, 1.1, 2.0 compatible

Please see DOCSIS Specs and IP-NET Corporate Services DOCSIS ANNEX

## 7.3 E1 interface

Complies with ITU-T G.703 recommendation

Four E1 Ports Supported. E1 or T1 (future) easily selected by Web Manager

E1 port impedance E1-120Ω for twisted pair cables or 75Ω for coax (The RJ45 E1-120Ω are default for all ports)

End-to-end delay (minimum delay setting) ≤ 5ms

Output frequency offset (adaptive timing, stabilized) ≤5 ppm

Output jitter (adaptive timing) ≤ 0.1UI

## 7.4 10/100Base-T port

Complies with IEEE 802.3 - 10M/100M Adaptive

Half/Full Duplex Adaptive

Support 802.1Q MAC

Uplink ports 1+1 backup supported

Two user data ports supported. And Web manager supported through anyone of two user data ports.

## 7.5 Power

AC： 165V~265V/50Hz or

DC： -38V ~ -62V (optional) or dual power supply

Power Consumption： ≤15W

## 7.6 Operating condition

Temperature: (0～50) °C

Humidity: ≤90% (non-condensing)

## 7.7 Dimensions

Width × Height × Depth： 440 × 44 × 231 mm

## 7.8 Weight

2.5 kg (5.5 lbs.)