XtendLan

TDM2E1M

E1 over Ethernet Multiplexer

User's Guide

1.1 Overview

The E1 over Ethernet Multiplexer can be used to provide E1 communication channels over Ethernet or IP networks.

It can be used to emulate transparent E1 channels over an Ethernet with adequate QoS, so that most of the existing E1based applications can be readily setup over Ethernet LANs and WANs. One particular suited application is to build E1 links with low cost wireless LAN bridges, replacing much more costly microwave radios.

1.2 Features

- User-friendly Web server supported for easy setup and maintenance
- Support SNMP V1 and V2 network management
- Point to point and point to multipoint supported
- Uplink ports 1+1 backup supported
- provide one E1 Port and
- Stable E1 clock recovery, low jitter and wander
- Low processing delay for E1 channels, high bandwidth usage efficiency
- Resist to packet loss, with PCM frame synchronization protection
- User definable encapsulation packet size for different application
- Support Ethernet encapsulation and UDP/IP protocol encapsulation
- Support VLAN settings for E1 service and in band VLAN management.
- Enough jitter buffer to resist packet delay variation (PDV)
- Local and remote E1 LOS and AIS and packet loss indication for trouble-shooting and maintenance
- Hardware and software program online upgrade

1.3 Timing modes

To emulate a clear E1 channel over a packet network, it 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. it uses its 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 adopted 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 e1 over eth are depicted in Fig.1.4-1.

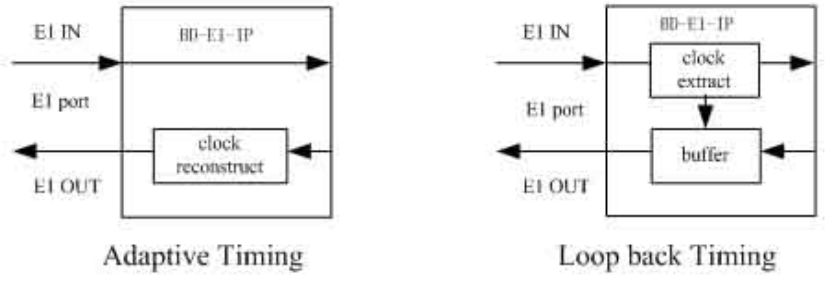

Fig.1.4-1 E1Timing modes

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 E1 over Ethernet mux 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 will support such operation no mater how the timing modes are set.

Note that E1 channel 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 E1 over ethernet Timing mode	B side E1 over ethernet 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 Description

The heart of e1 over eth 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 the uplink ports. 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.

2.2 Front panel

2.2.1 Diagram

The front panel is shown as below:

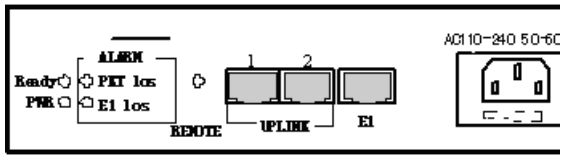

Fig. 2.3.1 E1 over Ethernet Multiplexer (220V AC)

2.2.2 LED's

Label	Color	Qty.	Definition	Note
Ready	G	1	System work state indicator: On: System abnormal or system initialization. Off: System abnormal or system not work. Blink: Normal operation	Located at the box panel
PWR	R	1	Power failure indicator Off: Normal On: Power Off / Failure	
PKT los 1～2	R	2	Packet loss indicator for 1~2 E1: On: E1 packet loss Off: no packet loss Blink: not receive packet	
E1 los 1～2	R	2	LOS indicator for 1~2 E1 ports On: LOS Off: Normal or disable Blink: AIS	
REMOTE 1～2	G	2	1~2 E1 addressing of remote equipment link state indication: On: E1 obtain MAC address of remote equipment; Off: E1 have not obtained MAC address of remote equipment;	
Link/Act	G	2	Ethernet link activity indicator On: Link Blink: Data Off: Inactive	located at the Ethernet socket
FDX	Y	2	duplex indicator On: Full duplex Off: Half duplex Blink: Conflict	

When power the device on, PWR indicator will be lit, indicator Ready will be on temporarily, which indicate the system is starting now. If the Ready light doesn't blink as above, which indicate the process runs abnormally, please restart the system again.

2.3 Dip Switches Definition

There are one 10-bit Dip Switch at the box bottom, the definition show as Table 2.4.1.

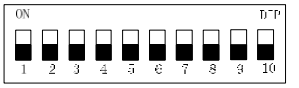

Fig 2.4-1 10-bit dip switch

Table 2.4-1 Dip Switches Definition

Dip		label	Definition
DIP-1	ON	CGND	E1 75Ω output terminal outer shield grounded
	OFF	OPEN	E1 75Ω output terminal outer shield open
DIP-2	**DIP-3**		E1interface impedance set
ON	OFF	120Ω	E1: 120Ω
OFF	ON	75Ω	E1: 75Ω
DIP-4～6		reserve	Reserved
DIP-7～9		reserve	Reserved
DIP-10	ON	IP Deflt	ON: Default IP address 192.192.192.192
	OFF	IP normal	OFF: User set IP address

2.4 Ethernet ports

There are two RJ45 Ethernet ports on TDME1M/TDM2E1M panel, anyone could support uplink connection or access to NMS PC. Interface mode support auto-negotiated, 100M full duplex, 100M half duplex, 10M full duplex and 10M half duplex. RJ45 Ethernet socket pins defined as:

Table 2.5-1 RJ45 socket definition

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

Note: 10/100Base-Tx interface has HP auto-MDIX function and it can check the transmission and receiving sequence and make configuration. So both MDI and MDI-X interfaces are supported and both cross line and direct line can be selected.

2.5 E1 Port

There are 1 or 2 E1 ports on the rear panel, adopt RJ45 connector. The E1 ports impendence are E1-120Ω, but could be convert to 75Ω unbalanced by external impedance matcher. Default E1 ports are 120Ω. RJ45 connector and wire sequence and signal defined as below:

Table 2.6-1 RJ45 120Ω-E1signal definition

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

2.6 Power

support ~220V AC or -48V DC power supply. It should be specified at the time of purchase.

3. Installation

3.1 Electrical

3.1.1 Power connection

it consumes less than 10W of power.

***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 may also damage the interface ports.**

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

3.1.2 E1 connections

1/2 E1 Ports Supported. E1 ports impendence are E1-120Ω for twisted pair cables or 75Ω for coax. **The E1-120Ω RJ45 sockets are default for ports.**

The E1-120Ω connection cable is made with RJ45 connectors and a length of 4-pair twisted cable.

Table 3.1-1 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, when the 2nd and 3rd dip of 10-bit dip switch should be set to ON and OFF respectively; When the 2nd and 3rd dip of 10-bit dip switch are set to OFF and ON respectively, E1 interface impedance will be 75Ω.The cable BH4.851.122 is for one RJ45 connecter to two BNC (F) sockets conversion.

Fig. 3.1-2 75Ω converting cable

By NMS, E1ports provide local loop back and remote loop back, 1/2 E1 ports loop back can be

set independently, and by the dip RA on front panel E1 indicators can be controlled to indicate local or remote ports LOS and AIS status. The local and remote loop back definition is shown as Fig 3.1-3:

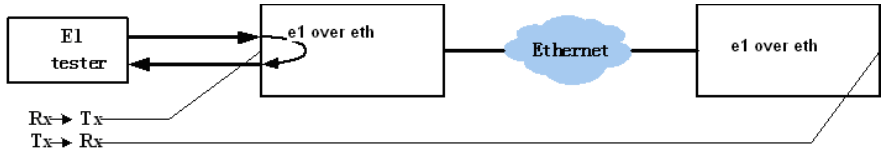

Fig 3.1-3 E1 loop back

Rx->Tx can test E1 connection cable, and Tx-> Rx is used to test the whole circuit including e1 over eth in the two ends and the link between them.

3.1.3 Ethernet connection

Connect the uplink Ethernet port to the Ethernet transport network, such as the wireless LAN bridge, and connect the local data port to computers or an Ethernet switch for local data applications.

The signal definition of the two local Ethernet ports is given in Table 3.1.3-1.

Table 3.1.3-1 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 3.1.3-2.

Table 3.1.3-2 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 is strongly recommended. Poor earth connection may also hinder the operation of the Ethernet port, causing severe packet losses.**

4. Common faults

This paragraph describes common mistakes and faults that may occur during installation and maintenance.

4.1 E1 Alarms

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

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

- The downstream equipment such as telephone exchange or PCM terminal is powered off.
- The E1 cable connection looses 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 red LEDs indicate **remote** E1 LOS state. When RA Dip Switch OFF, the red LEDs indicate **local** E1 LOS state.

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

4.2 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.

4.3 Ready LED does not blink

After power on, the Ready LED should start to blink. If not, try switch power off and on again. If this error persists, call for support.

4.4 Can not built communication

Two ends of equipments are in one Ethernet broadcast domain, check the IP dual relations is right and MAC address should be unique.

4.5 Downstream reporting slips

Check if the downstream equipment has correct clock mode. At least one of them must be clock master. Set the EthMux 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.

5. Web Manager

Both Web Server and SNMP management are supported through anyone of two Ethernet ports of e1 over eth

The management has four sections: Status, Line Test, Configuration and System. User name and password are required to enter the sections of Line Test Configuration and system. Both the default user name and password are "admin". Customers can modify the user name and password in the System section.

After input the device's IP address (for example,192.168.1.3),the following menu appears,

then input user name and password.

Fig5 Enter Menu

Note that the modifications of system will be valid after submit and reboot, while the modifications of Line Test (E1 loop-back setting) and Configuration can be valid only after submit.

5.1 Show current status menu

After input the IP address, status information of TDME1M will be displayed such as hardware version, software version, IP address, subnet mask, gateway address and MAC address. Details are shown in fig.5.1-1.

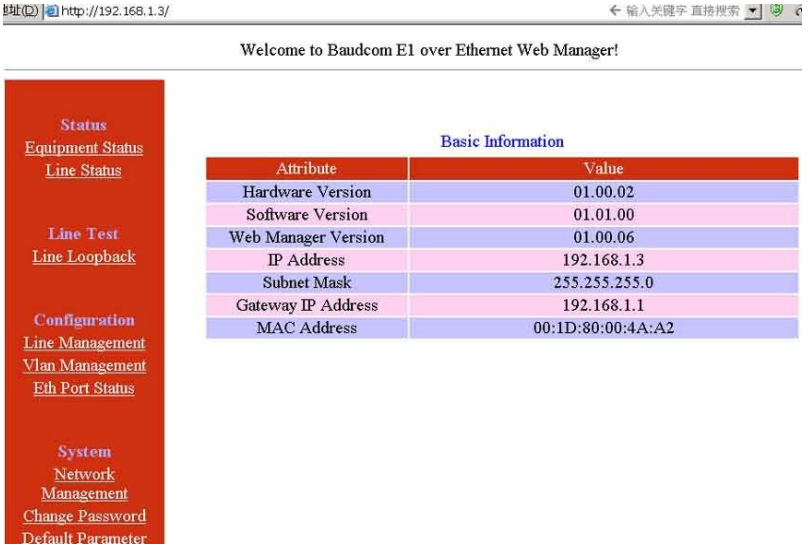

Fig5.1-1 Status Menu

Click on the line status option will bring the E1 line Status Information window showing LOS, AIS, loop-back status and power fail. The alarm could be masked by related Alarm Mask settings, once alarm mask is set, alarm log, panel alarm indicators and alarms in SNMP will all be masked, shown as Fig.5.1-2.

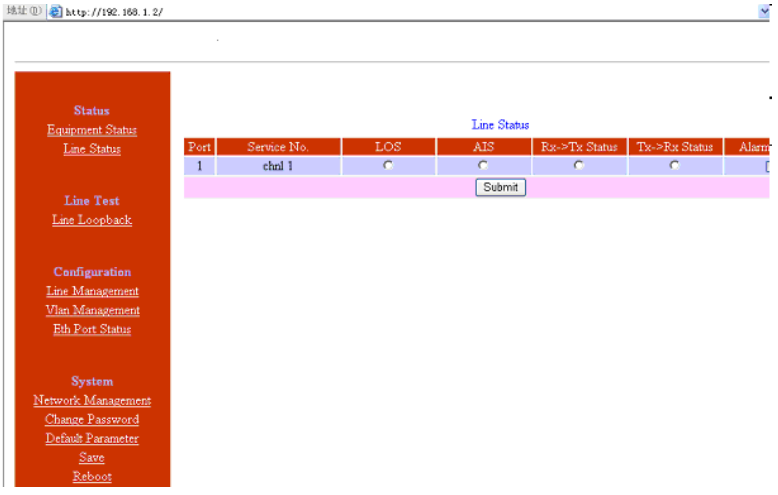

Fig.5.1-2 E1 line Status Information

5.2 Line Test

Loop back controls provide E1 line loop test function.

Click on E1 Loop back option will bring the window as fig5.2-2. E1 setting can be valid after submit but not saved, that is, Eight E1s will not loop back after restart.

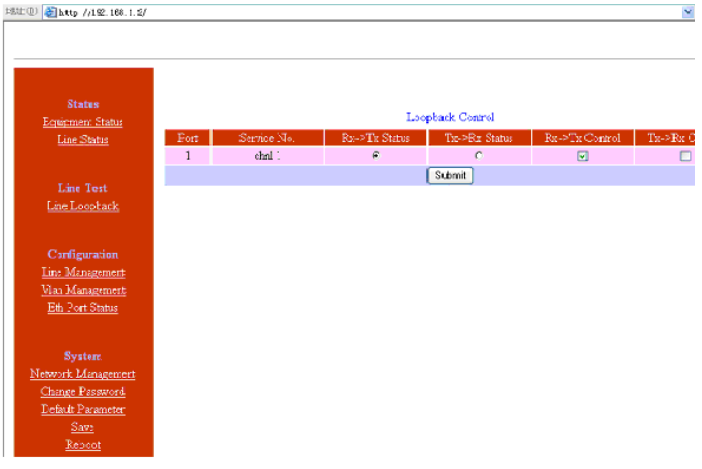

Fig.5.2-1 E1 Loop-back Management

5.3 Service Configuration

5.3.1 Service configuration and parameters instruction

This section includes E1 service management, VLAN management, Ethernet Management, SNMP configuration. Every section has many parameters setting. As Fig5.3-1.

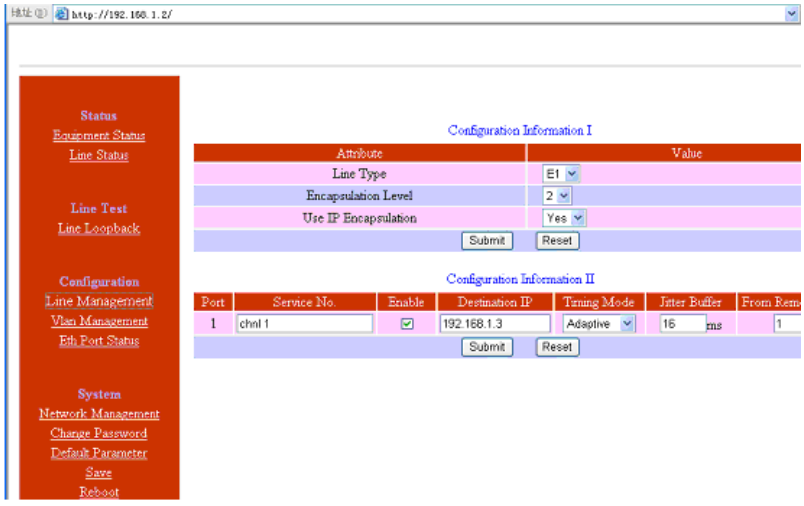

Fig.5.3-1 E1 service Management

In the E1 service management menu, customers could set each E1 service number (Service No), service number support capital letter/small letter, digits and some special characters input, maximum 20 bits or 2 Chinese characters. Note: Service No. should not be some special characters such as "/", "\" etc. E1 service managed parameters settings are described as below:

Table 5.3-1 E1 service management parameters

Parameters		Selections	Explanations
E1 Management	E1	E1	For TDM2E1M, E1 set is for both 2 channels of E1 service. Default: E1
		T1	
	Encapsulation Level	1~5	E1 data size encapsulated in E1， N=1~5 optional，corresponding to 256×Nbyte（E1）.The bigger the packet is the more data each packet encapsulated, the lower overhead it has. Bandwidth efficiency will be raised and delay will be increased. Default :2
	Use IP Encapsulation	Yes	Yes：IP encapsulation，source and destination IP address should be set. Bandwidth efficiency will be reduced
		No	(default)No：do not use IP encapsulation，high bandwidth efficiency
	Bandwidth	Uplink	Uplink: Set full duplex bandwidth for uplink Ethernet port，actual bandwidth should be higher than this value. Default 30000bps. Then data port bandwidth= Uplink bandwidth=Uplink bandwidth-E1 occupied bandwidth. Data: limit local Ethernet ports full duplex bandwidth. Then Uplink bandwidth=data port bandwidth+E1 occupied bandwidth.
		Data	
	Enable		Enable this E1 channel. Default: enable
	Destination IP		Remote end IP address；4 E1 line IP addresses can be set separately Default 192.168.1.3
	Timing Mode	Adaptive	Adaptive mode:E1 timing from remote E1 stream； Loop back mode:E1 timing comes from local E1 stream
		Loop back	

Parameters		Selections	Explanations
	Jitter Buffer	2~120ms	Jitter absorption buffer: worked with the link with bigger jitter, used to buffer the receiving packets. Coming packets buffer to eliminate jitter. Range：2~120ms。 Default 16ms
	From remote port		Select coresponding relation of local E1 ports to remote E1 port service.

Note: The sentence with underline is default settings.

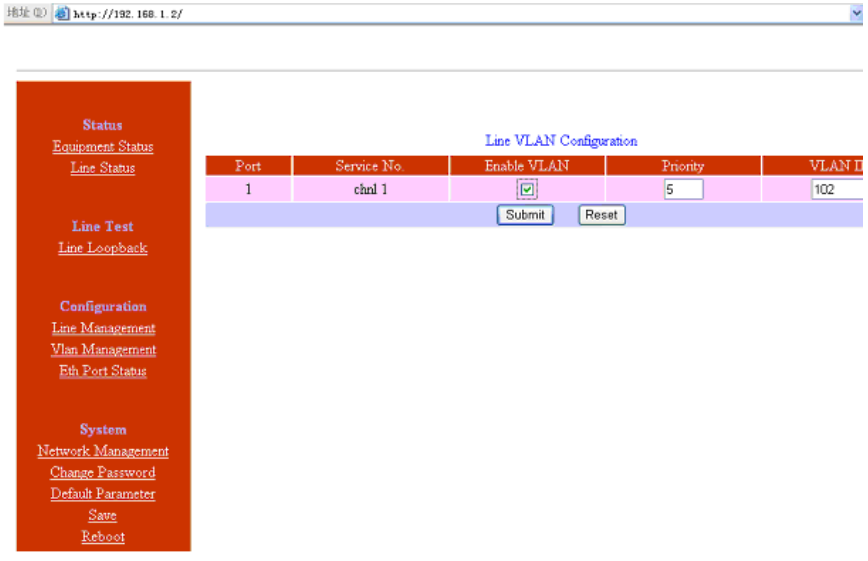

Fig.5.3-2 VLAN management

Table 5.3-2 VLAN management parameters

Parameters		Selections	Explanation
VLAN Management	E1 VLAN Configuration	Enable VLAN	Yes：with VLAN tag，support the VLAN network with priority to guarantee E1 QoS； (default)No：no VLAN tag
		Priority	Define users priority, including 8 levels (0-7), the number is bigger, the priority is higher. Default: 5
		Van ID	VLAN identify section, support 4096 VLAN identity. Range (0-4095). Default: 2662.
	Local Data VLAN Configuration	Data2	Add vlan tag in local Ethernet service packet, the selection is as E1 VLAN Configuration default: disable vlan, priority 0, valn ID:1
		Data1/ monitor	

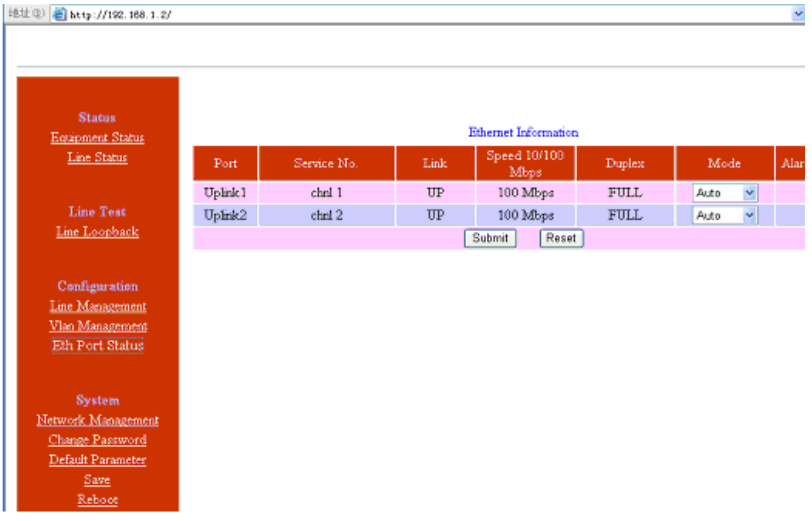

Fig.5.3-3 Ethernet management

Table 5.3-3 Ethernet management parameters

Parameters		Selections	Explanation
Eth Port Status	Port		2 Ethernet ports status indication: Port: 2 Ethernet ports. Link: indicate current Ethernet link(Up/Down) Speed 10/100Mbps: indicate current Ethernet port speed Duplex: indicate current Ethernet work mode (half/full)
	Link		
	Speed 10/100Mbps		
	Duplex		
	Mode		2 Ethernet ports work mode configuration: adaptive (default) 100Mfull 10Mfull 100M half 10M half
	Alarm mask		Set Ethernet port alarm mask

5.3.2 Service configuration indication

1. The MAC address of TDME1M is fixed in the device. ARP is supported and the remote end MAC address can be got 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 broadcast domain!

2. In order to improve the E1 data transmission service quality, according to Ethernet provided transmission support IEEE 802.1Q and 802.1por not, TDME1M can set whether to add VLAN tag with priority in the encapsulate process. According to 802.1Q/802.1p standard to packing, the encapsulation overhead is bigger (more 4 bits is added in each Ethernet packet), but it also can be transmit according to priority level. But to the network which doesn't support 802.1p, it is no sense to set VLAN but increase unnecessary bandwidth, so here should set VLAN to NO.

5.4 Network configuration

The system configuration includes network configuration, change password, default

parameters settings, save parameters and reboot the equipment. The interfaces are shown as below:

5.4.1 System network management

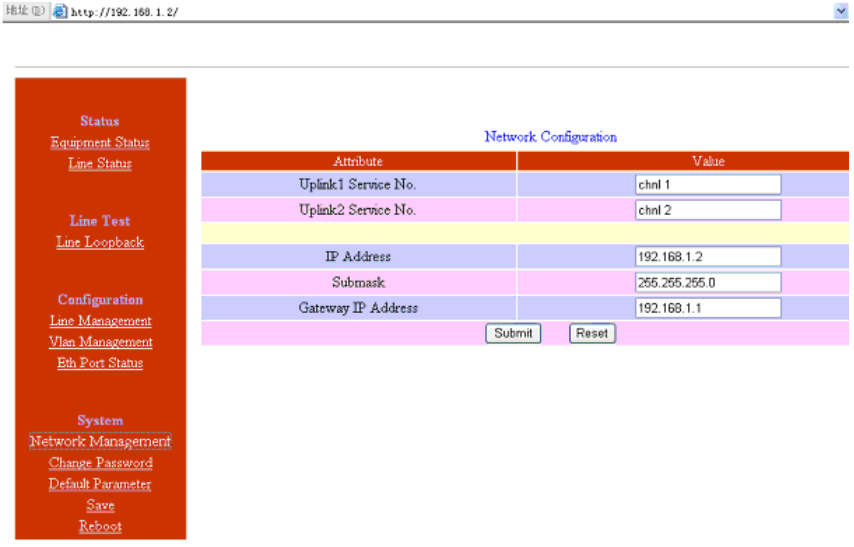

Fig 5.4-1 network configuration system

Table 5.4-1 system network management parameters

Parameter	Options	Description
Network Management	Uplink1 Service No	Set uplink port service number
	Uplink2 Service No	
	IP Address	Set equipment IP address; default 192.168.1.2
	Sub mark	It is used to judge the resource and destination IP is in one subnet or not, please and the resource and destination IP address by bit, they are in one subnet if the result is same, otherwise, they are in different subnet, should use gateway router; default 255.255.255.0.
	Gateway IP Address	If resource and destination is not in one subnet, gateway IP address should be set, and gateway address should be in the same subnet with resource equipment. ARP is used to get address. Default 192.168.1.1

Same as E1 service No in E1 service management menu, Node ID, uplink Service No. and Data service No. also support capital letters/small letters, digits and some special characters input, maximum 20 bits or 2 Chinese characters. Note: Node ID and Service No. should not be some special characters such as “/”, “\” etc.

5.4.2 Change the password

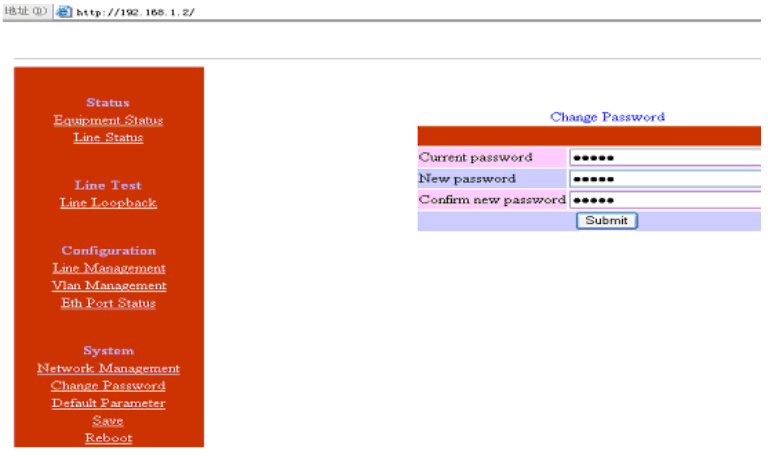

Fig 5.4-2 change the password

The change will be valid after confirm the submitting.

Default parameter recovery

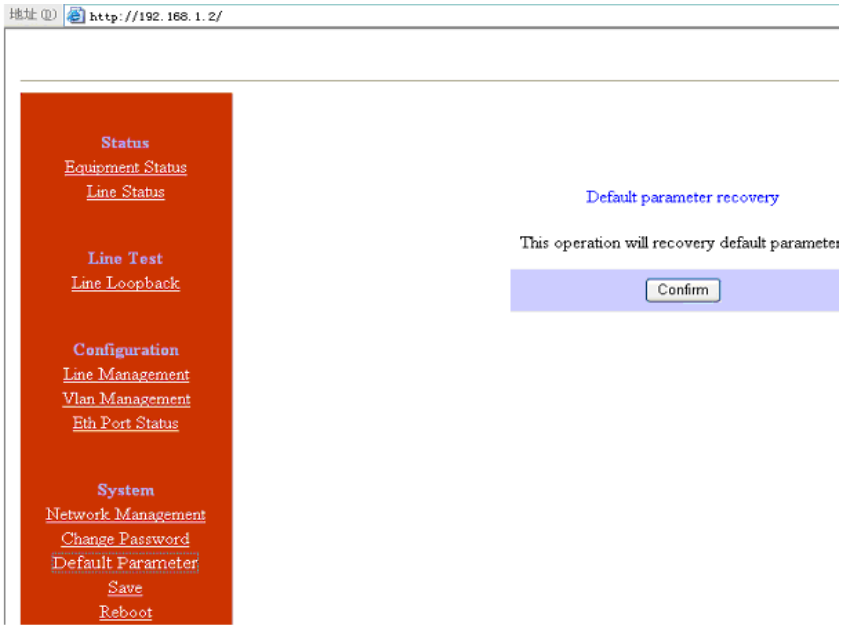

Fig 5.4-3 default parameters menu

5.4.3 Save parameter

Fig 5.4-4 Save parameter

5.4.4 Reboot system

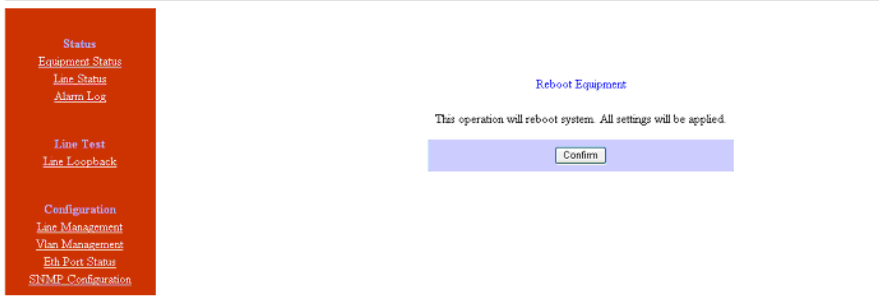

Fig5.4-5 Reboot equipment

6. Specification

6.1 Capacity

It supports 1~2 E1 ports, two 10/100Base-Tx uplink Ethernet ports.

6.2 E1 interface

Comply with ITU-T G.703 recommendation

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

End-to-end delay (minimum delay setting) ≤ 10ms

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

Output jitter (adaptive timing) ≤ 0.1UI

6.3 10/100Base-Tx port

Comply 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.

6.4 Power

AC： 100V~260V/50Hz (fuse: 1A)

DC： -38V ~ -62V (optional)

Power Consumption： ≤4W

6.5 Operating condition

Temperature: (0～45) ℃

Humidity: ≤90％ (non-condensing)

6.6 Dimensions

Width × Height × Depth： 185×35×138 mm

6.7 Weight

≤ 1 kg