Tsunami™ GX800
Installation and Management Guide

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Chapter 1 - Introduction

About Tsunami™ GX800

Tsunami™ GX800 is a licensed microwave Point-to-Point link with up to 600Mbps aggregate throughput with ultra low latency of 100µs offering unparalleled capacity and reliability for Carriers, Service Providers and Enterprise Markets. It supports a wide frequency bands from 6-38 GHz with range of user configurable channel bandwidths from 7-56 MHz to match licensing regulations. The product has an extremely small foot print and is designed with a split-mount architecture which includes an Outdoor Unit (ODU) and a Compact Indoor Unit (IDU) that are a snap to install and easy to maintain.

Device Features

The features of the device are as follows:

- Supports wide frequency bands from 6 – 38 GHz with range of user configurable channel bandwidths from 7 - 56 MHz to match licensing regulations
- Supports QPSK/16QAM/32QAM/64QAM/128QAM/256QAM Modulation schemes along with user-defined Adaptive Coding and Modulation (ACM)
- Features built-in Spectrum Analyzer for interference avoidance, Built-in Bit Error Rate (BER) tester, Automatic Transmit Power Control (ATPC) and Adaptive Coding Modulation (ACM) for the best throughput performance
- User traffic interface with Gigabit Ethernet port for data payload
- User/Management traffic interface with fast Ethernet port for Data and/or Network Management System (NMS)
- High Speed Interface 2xE1/T1 or E3/DS3 extension module
- Forward error correction (Reed-Solomon/ Convolutional/ Pragmatic Trellis/ Parity Check code)
- Adjustable output power in the range -10dBm to +26 dBm according to the set frequency and the selected modulation scheme
- Device management through Telnet, HTTP and SNMP

Chapter 2 Hardware Overview

Product(s) Covered in this Guide

Model	*Product Description*
GX800-6U/L	Tsunami GX800, 6U/6L GHz Microwave Link Series
GX800-07	Tsunami GX800, 7 GHz Microwave Link Series
GX800-08	Tsunami GX800, 8 GHz Microwave Link Series
GX800-10/11	Tsunami GX800, 10/11 GHz Microwave Link Series
GX800-13	Tsunami GX800, 13 GHz Microwave Link Series
GX800-15	Tsunami GX800, 15 GHz Microwave Link Series
GX800-18	Tsunami GX800, 18 GHz Microwave Link Series
GX800-23	Tsunami GX800, 23 GHz Microwave Link Series
GX800-26	Tsunami GX800, 26 GHz Microwave Link Series

Product Package

The product's shipping boxes should be left intact and sheltered until arrival at the installation site. Carefully unpack the shipment and check for any shipping damage or missing parts.

Each shipment includes the items listed in the following table.

What s in the Kit	*Image*
Tsunami™ GX800 IDU Unit (2 Qty)	
Tsunami™ GX800 ODU Unit (2 Qty)	
IDU Rack Mounting Kit (2 Qty)	
Ethernet Cable for IDU (2 Qty)	

Grounding Kit for IDU (2 Qty)	
Quick Installation Guide	

Please verify that you have received all the parts in the shipment, prior to the installation.

Tsunami™ GX800 Wireless Radio System

The Tsunami™ GX800 product has an extremely small foot print and comes in a split-mount design, which includes a Compact Indoor Unit (IDU) and an Outdoor Unit (ODU).

Indoor Unit (IDU)

The Indoor Unit (IDU) act as a Data Multiplexer and at the same time as the Digital Modem (DSP) of the whole system. The core feature of the IDU is the DSP module, which generates a signal for the intermediate frequency output to the Outdoor Unit (ODU) and processes intermediate frequency input from the ODU.

Proxim's GX800 IDU is shown below.

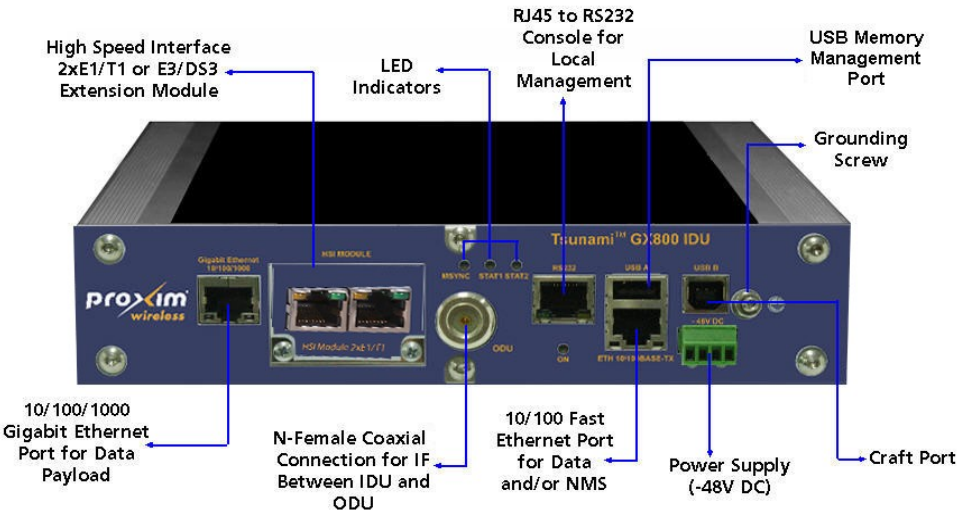


Figure 1: Front Panel View of the IDU

The IDU consists of the following components:

Components	*Description*
10/100/1000 Gigabit Ethernet Port	User traffic interface with Gigabit Ethernet port for data payload

10/100 Fast Ethernet Port	Management/user traffic interface with fast Ethernet port for data and/or Network Management System (NMS)
RS232	RJ45 to RS232 Serial port (ASCII console) for local management
USB A	USB memory management port
USB B	Craft port. This port is used for production only and not by the end user.
HSI MODULE	Slot for additional HSI module
ODU	N-type Female connector for IDU-ODU connection
Power Supply	Power supply connector for -48V DC
LED Indicators	**MSYNC**: Sync indication **STAT1**: Local alarm **STAT2**: Remote alarm
Grounding Screw	A provision to ground the IDU

For more information on the IDU functionality, refer to Appendix C - IDU Functionality .

Outdoor Unit (ODU)

An ODU performs the up-conversion from Intermediate Frequency (IF) of IDU (350MHz) to the desired transmission band, and vice versa; performs the down-conversion from received frequency band to IF frequency (140MHz) for the receiving part of the IDU. Power is supplied to the ODU through the IF cable (used for IDU – ODU connection). The software access to ODU, its management and configuration is possible only from the IDU. ODU management is integrated directly in the command set of the IDU and it is an integral part of the IDU software. For an easy primary set-up of the optimal received signal level, the ODU is fitted with the BNC connector, where the measured DC voltage [mV] is directly proportional to the level of Received Signal Strength (RSSI).

Proxim's GX800 ODU is shown below.

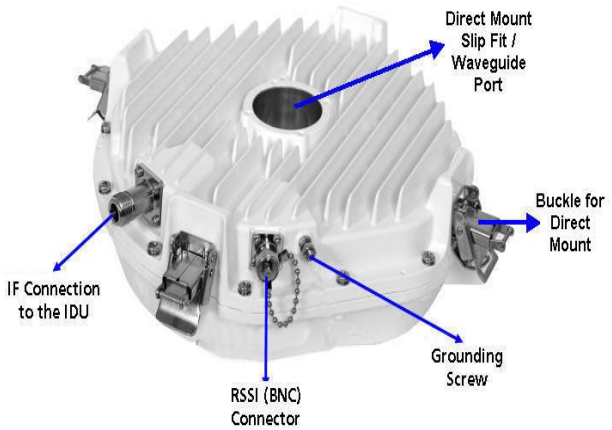


Figure 2: ODU

The ODU consists of the following components:

Components	*Description*
IF Connection to the IDU	Connector to connect ODU to the IDU
RSSI (BNC) Connector	RSSI (BNC) connector to obtain RSSI readings
Grounding Screw	A provision to ground the ODU
Direct Mount Slip Fit / Waveguide Port	**Direct Mount:** A provision to directly mount the ODU to the antenna **Remote Mount:** Depending on the frequency, a provision to connect the ODU to the antenna through Waveguide or Coaxial N-Type SMA Connector.
Buckle for Direct Mount	Buckle to secure the ODU onto the antenna interface in the direct mount.

Due to the tuning limitations of hardware filters within an ODU, different ODU pairs will be required within any particular frequency band. Given the large amount of spectrum within most frequency bands, it is required to create smaller ranges as Sub-Bands. ODUs are tunable within each of the sub-band. It is important to note that ODU pairs are made up with a Hi (High) unit and a Lo (Low) unit. The Hi unit transmits on the higher channel and receives on the lower, while the Lo unit transmits on the low channel and receives on the higher.

Accessories

For perfect installation, it is always recommended to use the following parts and accessories. You can use any other accessories, not approved by the manufacturer or distributor, at your own risk.

Power Supply

The recommended power supply is 120W, regulated switching PS-230/48, power supply with -48VDC and 2.5A output. From one switching power supply PS-230/48, it is recommended to power only one side of the GX800 link, that means 1Power Supply x IDU + 1Power Supply x ODU. When you connect other devices, it may cause power supply overload to the entire GX800 link.

IF Cable

To connect an IDU and an ODU, we recommend you to use low-loss 50 Ohm coaxial cable designed for outdoor installation. For a distance greater than 50 meters, it is recommended to ground the cable every 50 meters.

IF Cabling between ODU and IDU must be terminated with N-Male coaxial connections at each end. Proxim provides 25, 50, 100foot lengths. Custom cables can be made but should be tested for shorts and overall performance prior to installation.

Surge Protectors

Whenever the coaxial cable enters the building, always install a RF Surge Protector, which greatly eliminates the risk of high power surge damage.

It is important that the surge protection device permit supply voltage to the ODU. This type of

device is known as DC-Passing. It is also important that the IF frequencies of 140MHz and 350MHz be supported by the device. Proxim offers a suitable model in the price list.

Grounding Kit

To ensure good lightning protection for the radio units, install grounding kits on every 50m cable (each 50 m for long cables) at the building entrance.

We recommend to ground the IDU to the rack cabinet and the ODU to the place, where these units are mounted such as mast mount, pole and so on. Make special effort to ensure the ground provides low resistance and avoid ground loops or differentials. Always obey local, state, provincial regulations with the power and grounding of such systems.

Antennas

A variety of different antennas are available from different manufacturers and in different sizes. Antennas can be used for horizontal and vertical polarization, the right-sided and left-sided assembly as well. A list of qualified antennas can be found in the GX800 ordering guide. If installing into an existing system with a non-direct mount, compatible antenna waveguide transitions are available. Check with Proxim or your distributor to accommodate this.

Furthermore, regulatory bodies such as ETSI and FCC have strict performance requirements which must be met by both the antenna vendor and the installer. Always make sure that the selected antenna meets the regulatory requirements of the locale of installation.

HSI Modules

The IDU comes with a standard 10/100/1000 Gigabit Ethernet RJ45 interface along with a 10/100 Fast Ethernet RJ45 interface for management. For additional traffic interfaces, check with Proxim for HSI modules. Proxim provides 2xE1/T1 or E3/DS3(G.703) HSI modules.

Dual IDU Mount Kit

The IDUs are designed for standard 19-inch cabinet mounting. Two IDUs can be mounted on a single rack by using Dual IDU Mount kit.

Chapter 3 Installation and Initialization

Introduction

The device must be installed either by a trained professional familiar with radio frequency planning and the regulatory limits. The equipment must be installed in accordance with the country national electrical codes.

Required Installation tools

Listed below are the installation tools necessary for installation of the GX800 link. These are not included in the product package:

- Flat tip Screwdriver
- Cross Screwdriver
- Set of Allen Keys
- Engineer´s Wrench M7, M13, M17
- Vulcanize Isolation Tape
- DC Voltmeter
- BNC Reduction for RSSI Measurement

IDU Installation

The IDU is designed to mount to a standard 19-inch cabinet.

Single IDU Installation

To rack-mount a single IDU, follow the following steps:

1. Fix the small L-shaped clamp (supplied with the product package) to any one side of the IDU with the provided screws and washers.
2. On the other side of the IDU, fix the big L-shaped clamp (supplied with the product package) with the provided screws and washers.
3. Next, fix the IDU to the rack.

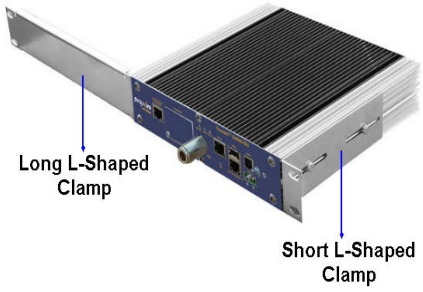


Figure 3: Single IDU Mounting

Pair of IDUs Installation

To rack-mount a pair of IDUs, follow the following steps:

1. Fix the small L-shaped clamps (supplied with the product package) to any one side of the IDUs with the provided screws and washers.
2. Connect both the IDUs with the Dual IDU Mount kit (not supplied with the product package)
3. Next, fix the connected IDUs to the rack.

Figure 4: Dual IDUs Mounting

!! CAUTION !! Do not forget to ground the IDU to the rack cabinet with the help of Grounding kit (supplied with the product package).

ODU Installation

!! Note !! Prior to the installation, carefully remove the cap present on the ODU without tampering the protective film present inside it.

Direct Mount

In the direct mount, the ODU is fitted to the antenna directly with an ODU interface and secured using clips.

!! ATTENTION !! Always fasten 2 latches which are adjacent to one another at the same time.

Figure 5: Direct ODU Mount

Setting the Polarization

The polarization depends on the ODU position. An arrow symbol on the ODU identifies the polarization.

Polarization	*ODU Position*
Vertical Polarization	
Horizontal Polarization	

!! ATTENTION !! During installation, please ensure that the ODU waveguide slot matches with the Antenna ODU Interface slot.

Remote Mount

Follow these steps for remote mount:

1. Fix the ODU remote mounting kit (not supplied with the product package) to the pole
2. On the ODU side of the Flange Adapter, fix the ODU.
3. On the flex side of the Flange Adapter, connect one end of the Waveguide. The other end of the Waveguide is connected to the antenna.

Figure 6: Remote ODU Mounting

!! NOTE !! Depending on the frequency, the connection between the antenna flange adapter and the ODU flange adapter should be through a waveguide or coaxial N-type SMA connector.

Cabling

Connect IDU and ODU

Connect IDU and ODU by using a low-loss coaxial cable (not supplied with the product package) with the specified impedance of 50 Ohm, terminated on both sides with the N-type Male connector. Please note that the maximum cable length between the IDU and ODU should be 200m (Additional distances may be permissible but should be verified with Proxim's technical team).

!! ATTENTION !!

- ***Do not plug in ODU while IDU is powered on as this may damage the ODU.***
- ***Before connecting the coaxial cable to the ODU and IDU, please measure the cable impedance or measure the cable adjustment.***

Figure 7: IDU - ODU Cabling

Connect to the Gigabit Ethernet Port

To manage the entire system (link), plug in the Ethernet cable into the 10/100/1000 Gigabit Ethernet Port of the IDU. The connector wiring is shown below.

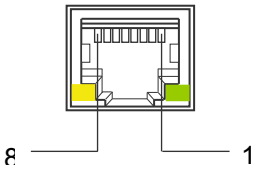


Figure 8: Pin Assignments for Gigabit Ethernet Port

Pin 1 - DA+, Pin 2 - DA-
Pin 3 - DB+, Pin 6 - DB-
Pin 4 - DC+, Pin 5 - DC-
Pin 6 - DD+, Pin 7 DD-

!! Note !! Before connecting the Ethernet cable to 10/100/1000 Gigabit Ethernet port, make sure that the Ethernet cable is not connected to the 10/100 Fast Ethernet Port.

Connect to the Fast Ethernet Port

For primary configuration and to manage the entire system (link), plug in the Ethernet cable into the 10/100 Fast Ethernet Port of the IDU. The connector wiring is shown below.

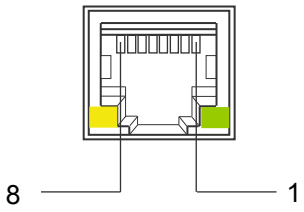


Figure 9: Pin Assignments for 10/100 Fast Ethernet Port

Pin 1 - TX+, Pin 2 - TX-
Pin 3 - RX+, Pin 6 RX-

Connect to RJ45 to RS232 Port

For local management, plug in the console cable into RJ45 to RS232 port. The connector wiring is shown below.

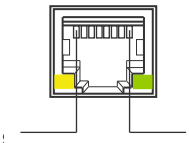


Figure 10: Pin Assignments for RJ45 to RS232 Connector

Pin 3 RxD (PC input)
Pin 6 TxD (PC output)
Pin 1 - CTS, Pin 8 RTS (internally connected)
Pin 2 - DTR, Pin 7 DSR (internally connected)
Pin 5, 6 GND

Power Supply

The device is powered from a DC source (-48V DC) where the positive pole is grounded. By using adequately gauged cable, properly ground the ODU to the best earth ground available. Similarly, properly ground the IDU to the cabinet.

LED Indicators

When the device is powered on, it performs startup diagnostics. It is necessary to wait for about 30 seconds before the IDU gets into normal operating state after powering up. When the device starts up, watch the status diodes MSYNC, STAT1, STAT2. You should see only the diode STAT1 flashing after the device starts up (if the alarms are not configured, the LED may remain lit permanently).

LED State	*MSYNC LED*	*STAT1 LED*	*STAT2 LED*
OFF	No Power or Loss of Synchronization	Local IDU Status - ERROR	Remote IDU Status – ERROR or No Communication
Continuous Blinking	Boot Process	Local IDU Status – WARNING	Remote IDU Status – WARNING
ON	Sync of Modulation	Local IDU Status – OK	Remote IDU Status– OK

You can proceed with the initial link configuration and antenna alignment when the IDU starts up.

Basic Configuration

For the initial configuration, use a Personal Computer (PC) with an Ethernet interface, and current Web Browser (Mozilla, Internet Explorer, Chrome and so on). The operator should have administrative rights on the PC, with the ability to change the adapters IP address and other interface settings.

Follow the following steps to perform basic configuration of the device:

1. First set your computer's IP address to the range which corresponds to the default IDU factory setup. Each IDU unit has the pre-set primary IP address 10.0.0.1 for A-side or 10.0.0.2 for B-side with the network mask 255.255.255.0. Therefore it is necessary to set the IP address of your computer in the same range of 10.0.0.3 - 254, except for the device IP address. Configure your computer's IP address (For example 10.0.0.3) and subnet to 255.255.255.0.

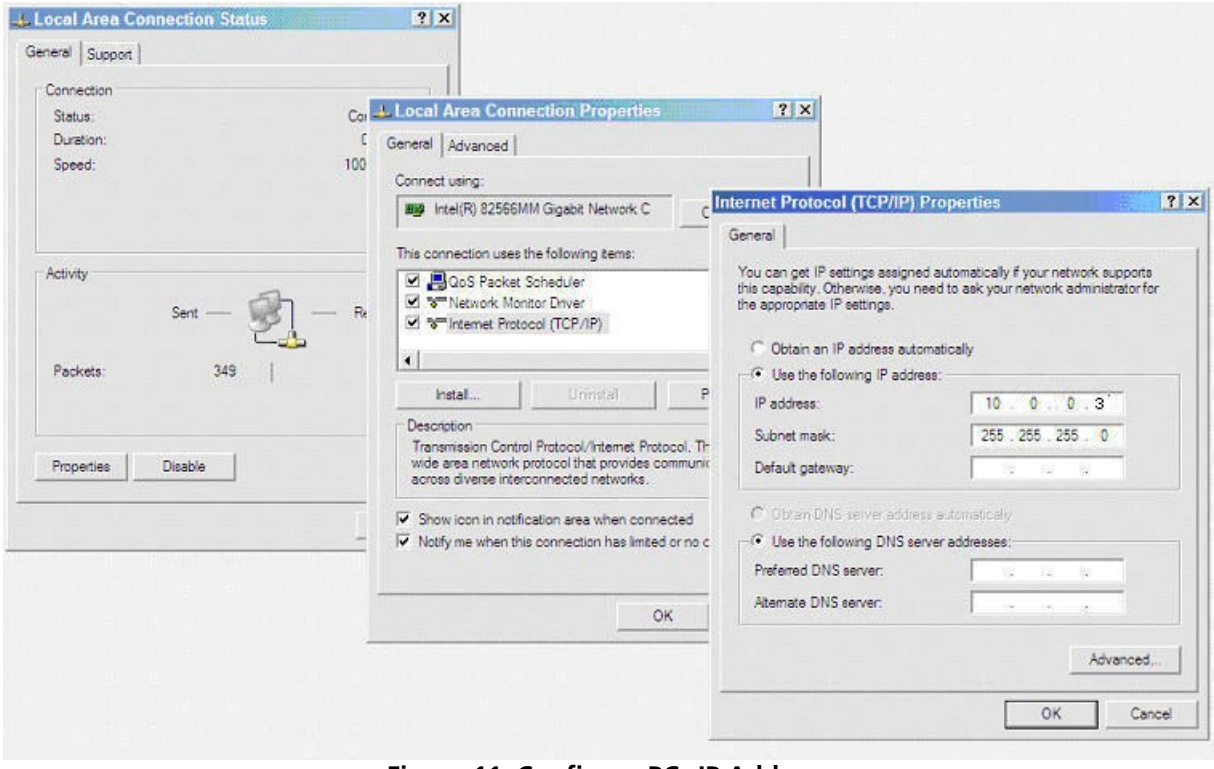


Figure 11: Configure PCs IP Address

2. The Login screen appears. Open a web browser and log on to the device by entering http://10.0.0.1 for A-side and http://10.0.0.2 for B-Side in the address bar. The Login screen appears.

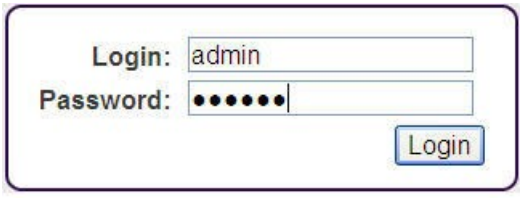


Figure 12: Login Screen

3. In the Login Screen, enter the User Name and Password and then click **Login**. For user

modes and their passwords refer to Access Rights. Upon successful logon, you are directed to the device home page.

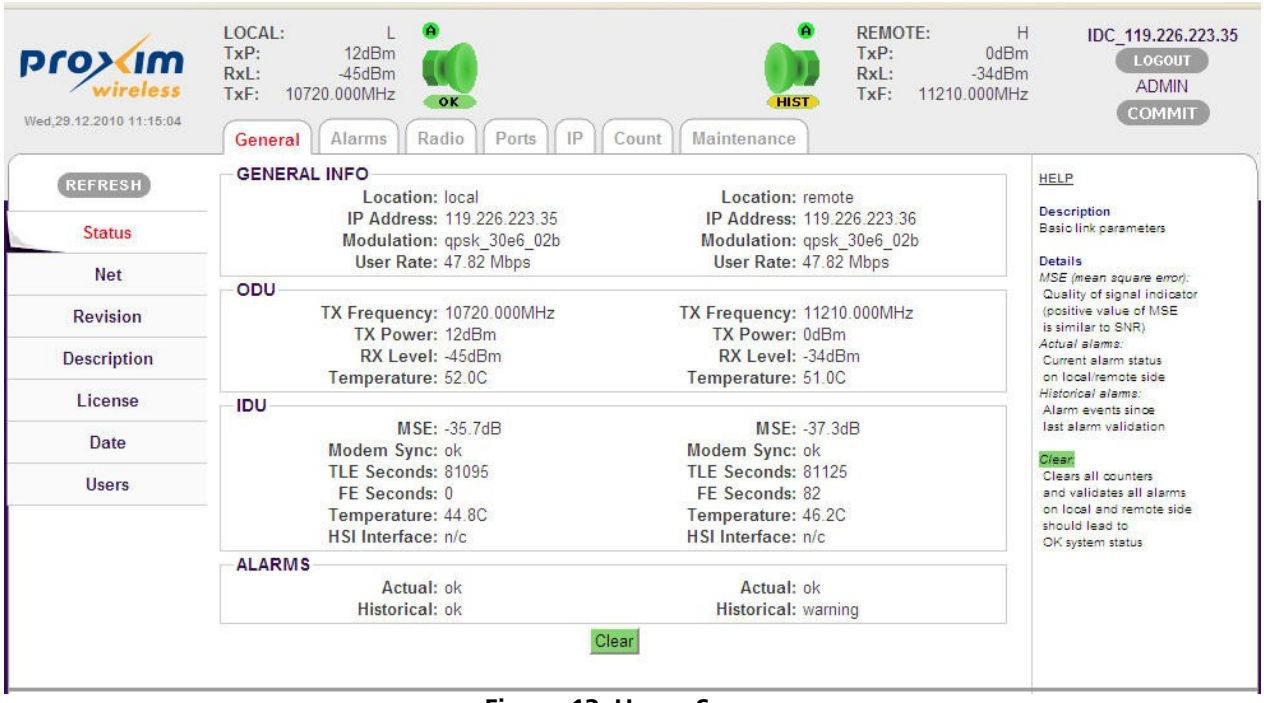


Figure 13: Home Screen

4. Navigate to the **IP** tab and change the Primary IP address. When complete, click **Apply**.

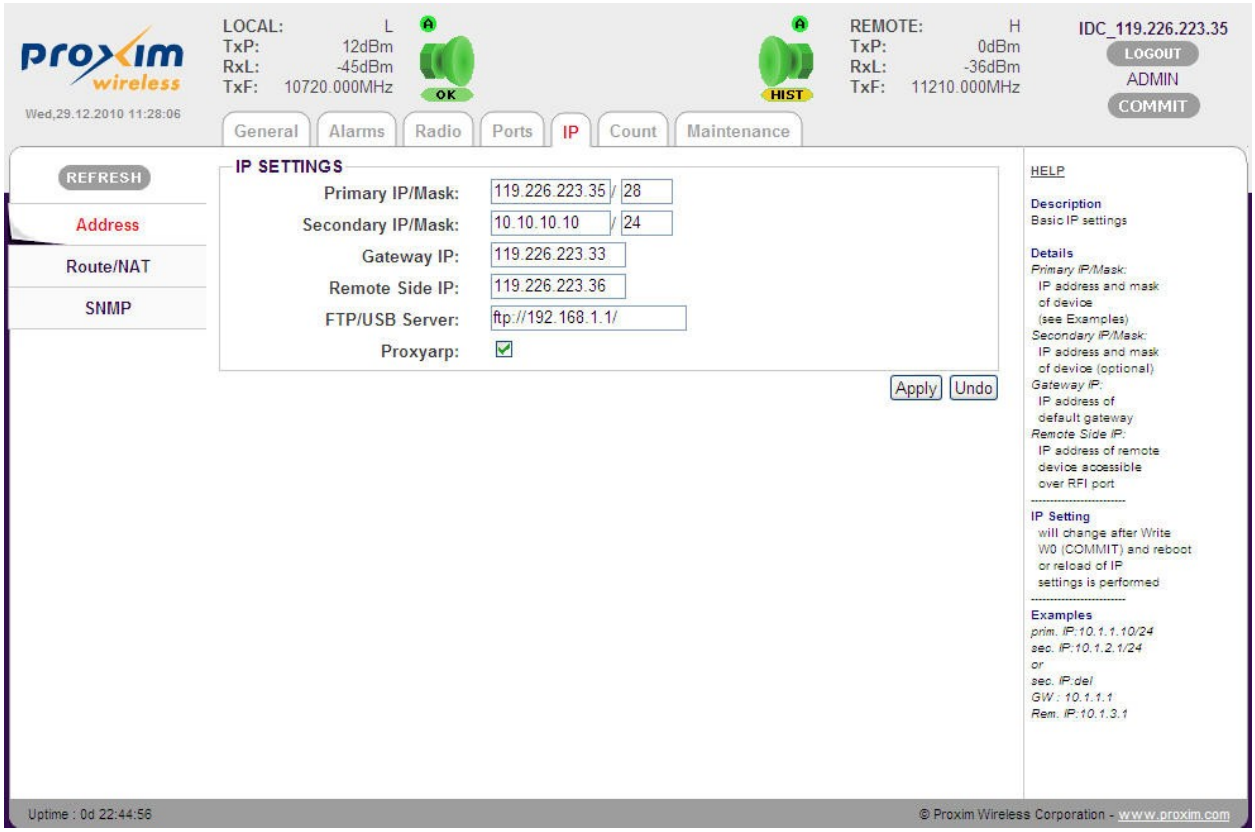


Figure 14: Change IP Address

5. You are now prompted to **Write and Reload** the device. Click **Write_and_Reload** for the IP change to take effect.

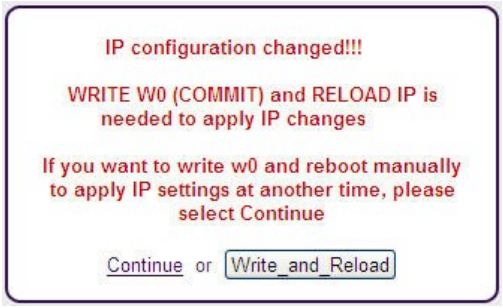


Figure 15: Save IP Configuration

6. Log back into the device by using either the Primary or Secondary IP address.
7. Navigate to the **Radio** tab and perform the following:
    - Under ODU Configuration, verify if Tx and Rx center frequencies match your license.
    - Under Modem Configuration, select the Modulation and Channel Bandwidth in accordance with the link design and licensed operation.
        - If you are using Adaptive Modulation, check the Enable ACM box and select the appropriate High, Mid, Low modulation settings.
    - Click **Apply**.

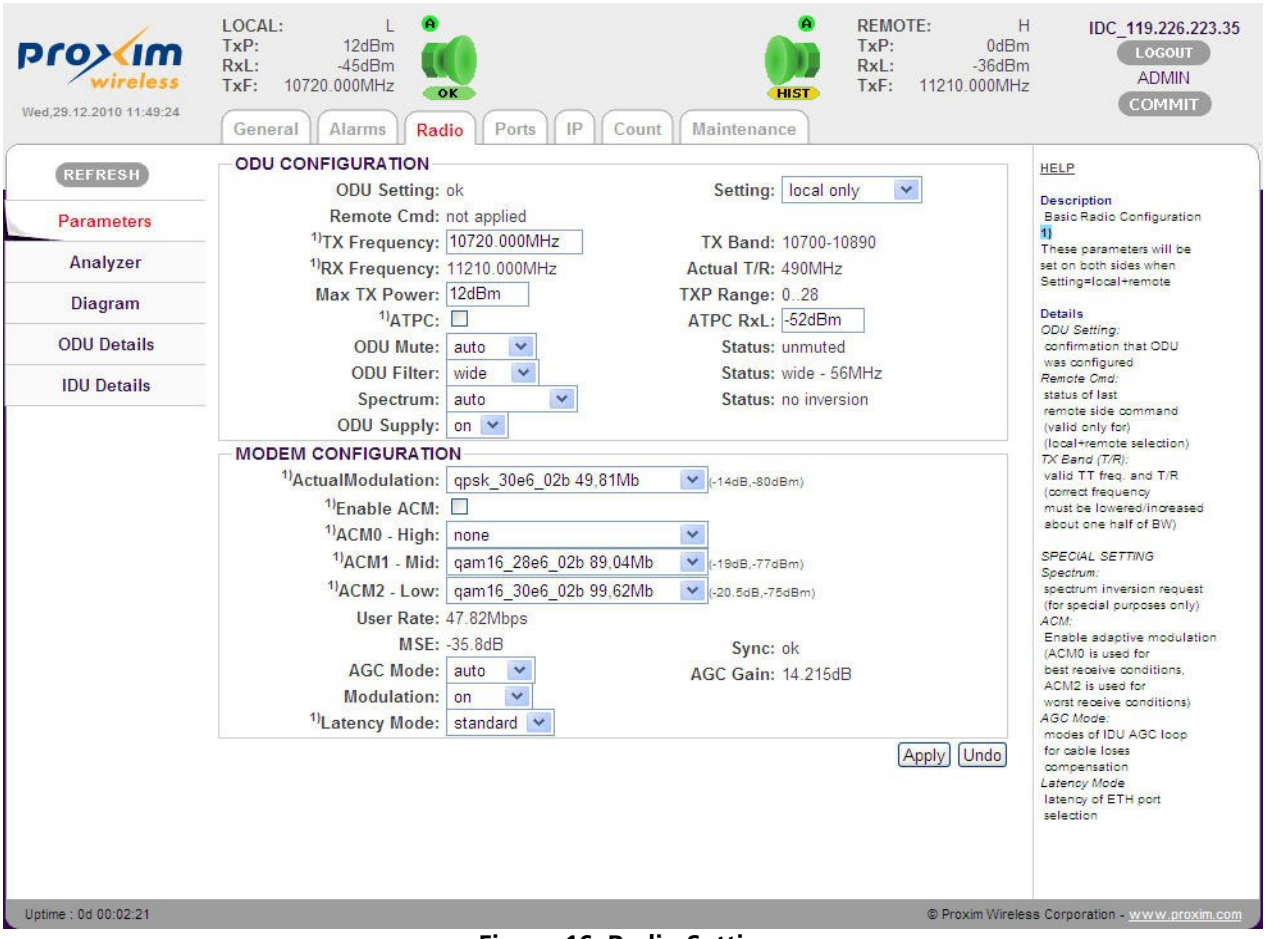


Figure 16: Radio Settings

8. When you complete all the settings, click **COMMIT on** the upper right corner of the

screen. To logout, click **LOGOUT** and repeat the same steps on the remote side of the link.

!! ATTENTION !! Do not forget to save the configured parameters by performing a "COMMIT" operation.

Aligning the Antennas

Align the antenna (not supplied) only when both the terminals are operating in normal weather conditions.

Antenna alignment can be done in both horizontal and vertical directions by using a DC voltmeter. The higher the measured voltage is, the highest is the received signal level. The voltage is measured directly on the output BNC connector on the ODU (RSSI - Received Signal Strength Indication). It is recommended to use an appropriate BNC adapter for your DVM.

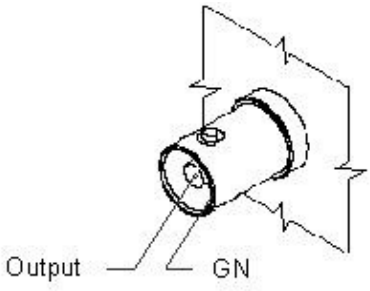


Figure 17: RSSI Connector

Given below is the typical Receive Signal Level Voltage for licensed bands.

RSL(dBm)	-20	-25	-30	-35	-40	-45	-50	-55	-60	-65	-70	-75	-80	-85	-90
V_{bnc} (V)	4.50	4.19	3.87	3.56	3.25	2.94	2.65	2.31	2.0	1.69	1.37	1.06	0.75	0.44	0.12

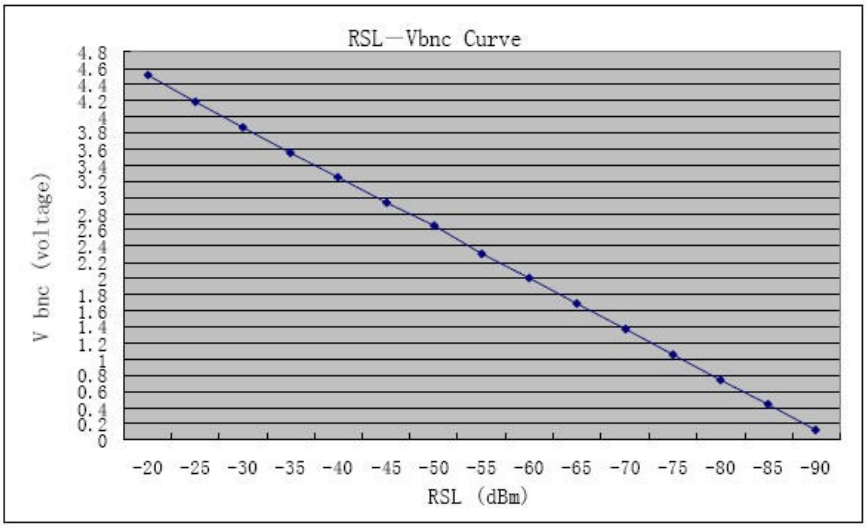


Figure 18: RSL Vbnc Curve

Antenna alignment should be done only during favorable weather conditions. During adverse weather conditions such as rain, fog, snow and smog, antenna alignment should not be done as

the value of the measured signal varies significantly, and so the measurement risks becomes inaccurate.

!! ATTENTION !! When aligning the antennas watch out for the possibility of "false" alignment on the side lobes of remote antenna. It is important to identify main lobe antenna, by rotating the antenna to have the maximum RSL voltage. The value of RSL should always correspond to expected calculated value of input signal strength.

The Basic Link Function Test - Verification

Before connecting to the user's ports, it is good to quickly perform a basic test that verifies proper GX800 link installation and its error-free condition.

Obtaining the Basic Link Information

To obtain basic link information, navigate to **General** menu and **Status** sub-menu in the Graphical User Interface (GUI) and evaluate the following parameters:

Key Parameters	*Description*
TX Power	Data should have a value corresponding to the assignment (Telecommunication Authority)
RX Level	Data should be in the range -35 to -50 dBm and should correspond to the expected level resulted from calculation tolerance + / - 3dBm). Approximately the same value (+ / - 3dBm) should be measured on the opposite side too.
Mean Square Error (MSE)	Data should be in the range -40 (better) to -32(worse) dB (the lower the better) The Mean Square Error (MSE) refers to the average of the square difference between the actual received symbols and the idealized points. The closer the points are in the state diagram - the better.
Modem sync	The synchronization status of the modem part should be set to **OK**.

MSE threshold for each modulation is as follows:
128QAM : - 26 dB
64QAM : - 23 dB
32QAM : - 20 dB
16QAM : - 17 dB
QPSK : - 10.5 dB

The same evaluation needs to be done on the other side of the link.

!! Note !! As final adjustment of the GX800 link parameters is not yet done (especially IP address), you may find the icon of the opposite terminal not yet glowing green.

If the measured values do not match the above said values, it is necessary to perform a detailed check of the link adjustment.

Five Minute Link Quality Measurement (Optional)

The next step is a five minute BER measurement test of the link. Note that to perform this test, data interface connection is not required.

To perform this test, do the following:

1. Click **Clear** in the **General** tab to clear all counters and validate all alarms on local and remote side of the link.
2. Wait for 5 minutes and then navigate to **Count** tab and select sub-menu MUX.

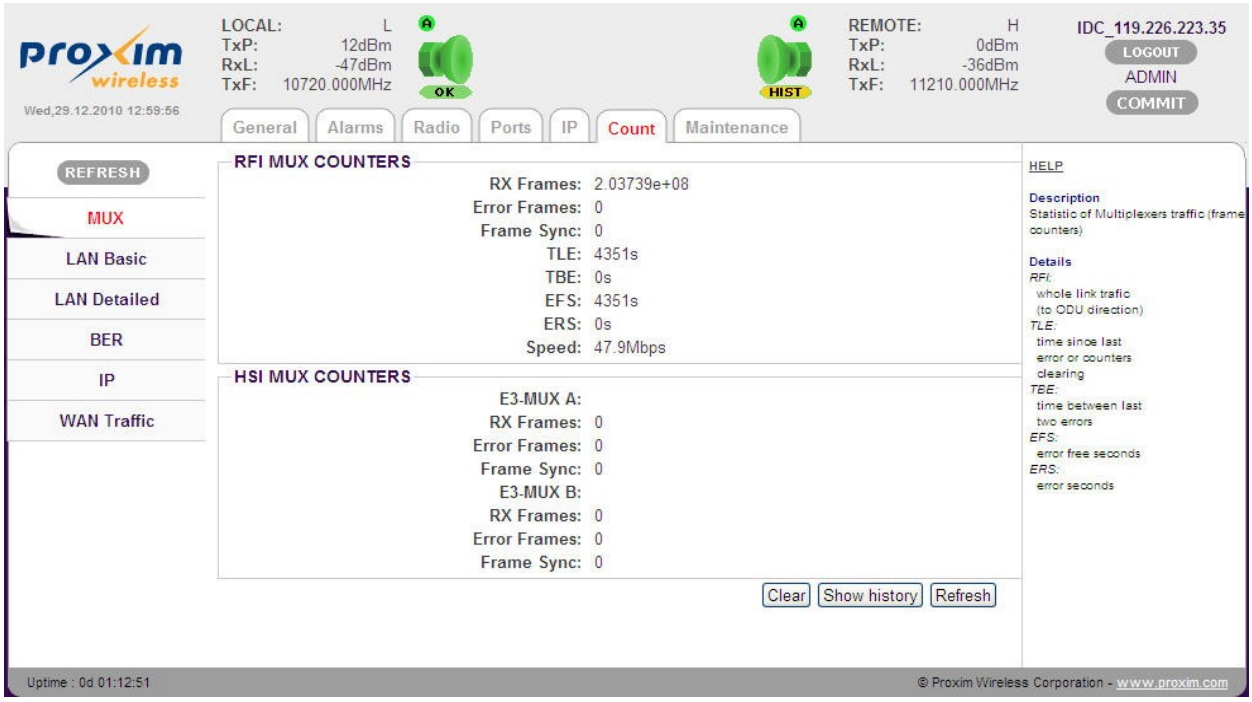


Figure 19: MUX Statistics

The results should be:

- **RF Frames** - The number of correctly received frames
- **Error Frames** - The number of error frames; it value should be 0
- **TLE** - Time in seconds since last error occurred; it should be same as EFS.
- **EFS** - Error free seconds; it should be same as TLE.
- **ERS** - Error seconds; time in seconds during which the errors occurred. The value should be “0”.

Similar results should be seen on the opposite side of the link as well.

If test results vary, you have to perform a detailed check of the link installation and configuration.

Connecting IDU to External Equipments

Connecting External Equipments through HSI port

Depending on the configuration (customer´s order) the IDU is equipped with specific HSI module.

To extend the functionality of GX800 system with 1-2 E1/T1 ports, use IDU configuration with inserted HSI-2E1/T1 module. You can directly connect to a maximum of two E1/T1 lines or devices through RJ48 connector.

Figure 20: HSI 2xE1/T1 Module

To extend the functionality of GX800 system with 1 E3/DS3 (G.703) ports, use IDU configuration with inserted HSI-E3/DS3 module.

Figure 21: HSI E3/DS3 Module

Chapter 4 - Commissioning

Introduction

After the installation of the link, it is necessary to carry out the complete setup of all the required link parameters including IP management. It is recommended to save the parameters such as IP addresses, Tx Frequency, Tx Power as these parameters can be restored easily in case of the device replacement.

This section covers the method to set up GX800 link by using Web Interface. The link setup by using text commands is covered in Appendix A – Command Set.

Access Rights

Log on to the GX800 link system, either locally or remotely to mange and monitor the link. Based on the type of user logged in, relevant access rights are automatically granted to the user. These access rights are applicable both in web and command line interfaces.

GX800 supports three levels of login modes.

Guest

A Guest user can,

- Monitor the traffic on the GX800 link, the Quality of the frequency tuning and the configured parameters of the link (Tx Power and so on)
- Clear BER tester and so on

The link system supports a maximum of three guest user logins at the same time. The login name is **guest**. Please note that a Guest can login without a password.

User

A User has the same access rights as the Guest user, with additional rights to configure and set the GX800 link parameters. The link system supports only one User login at the same time. With User logged in, a maximum of three Guest users can login to monitor the device.

The login name is **user** and password is **test**.

Administrator

An Administrator has the same rights as that of the Guest and User, with additional rights to upload a new firmware, control user's database, and change the user name and password.

Administrator user posses the superior level of user access and management of the link. When the administrator user logs in, all the other users are logged out automatically.

The login name is **admin** and password is **secret.**

The following alert message is displayed, when a user is already logged in and an Administrator tries to login.

Figure 22: Admin Login – Alert Window

Restore Defaults

To restore the default access names and passwords (admin/secret, user/test, guest/-) including the secondary IP address, follow any one of the below methods:

- **Restore using RS232 Console:**
  - Establish a serial connection
  - Enter Login name as **default**
  - Enter Password as **restore.** Please note that password should be written within two minutes of providing the user name.
  - On providing the correct user name and password, the user is immediately disconnected and passwords along with the IP address are restored.

- **Restore using USB Flash:**
  - Check the SN number of the IDU
  - Copy the rfwATH.afw file (or appropriate file) on USB disk into directory “/restoreFW” and rename this file to “rfwSN.afw”, where the SN is the serial number of the IDU.
  - Turn off the IDU
  - Turn on the IDU
  - Wait for the LED to blink during the boot process
  - Insert USB disk into port USB A
  - Wait for 1 minute until the process termination (the indication LED on USB disk should blink during this process)

Configure, Manage and Monitor using Web Browser

Open a web browser and log on to the device by entering http://10.0.0.1 for A-side and http://10.0.0.2 for B-Side in the address bar. The Login screen appears.

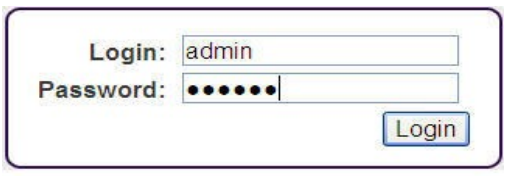


Figure 23: Login Screen

The login section is active until the logout. It is not possible to configure the IDU from two terminals at the same time (only one terminal can be active in the setup (enable) mode), that is the user with access rights User or Administrator.

The device has an automatic time-out option, which automatically logs out a user if no configuration/operation is performed in the past 10 minutes. A “User” can logout another logged in “User” but not an “Admin”. However, an “Admin” can logout any user.

!! ATTENTION !! During the setup or to view the previous screens, do not use the browser functions “back“ and “refresh“! Use only the tabbed menu of the device, always with a single click for a particular operation.

In the Login Screen, enter the User Name and Password, and then click **Login**.

For a Guest user, the login name is **guest** and password is **blank**.
For a User, the login name is **user** and password is **test**.
For an Admin user, the login name is **admin** and password is **secret.**

General Screen

Upon successful logon, you are directed to the device **General** screen.

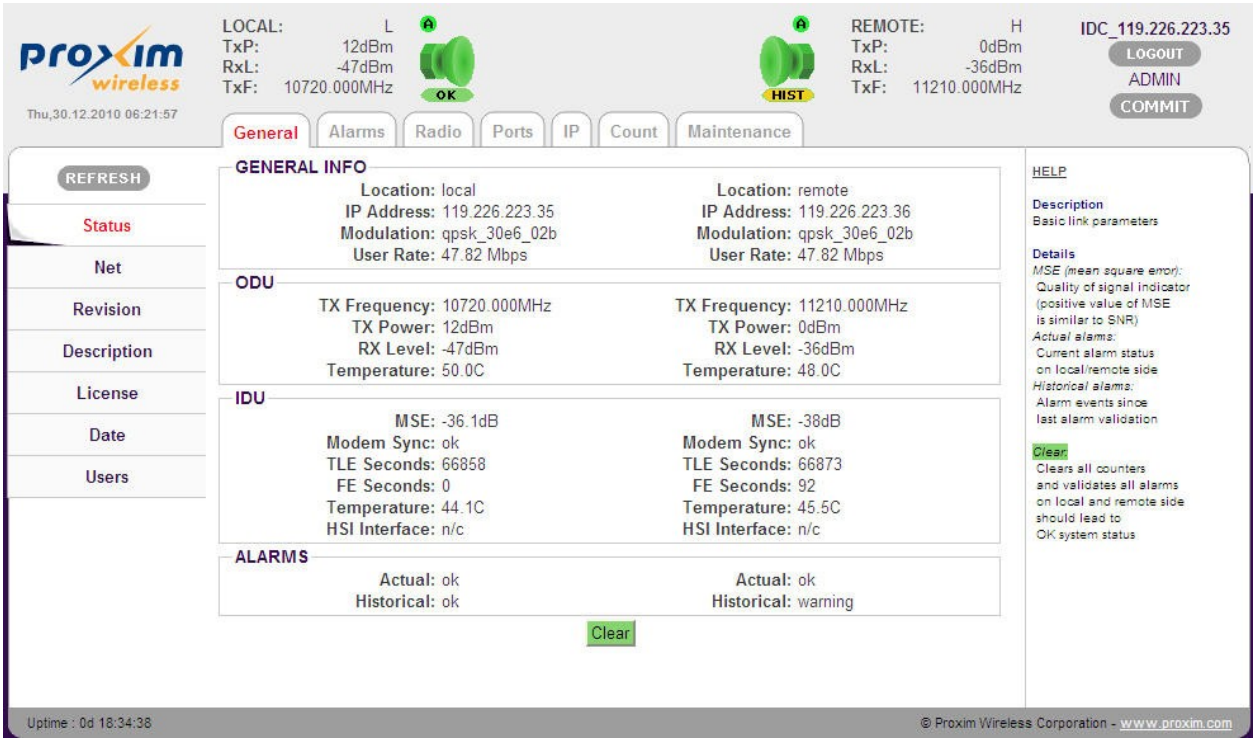


Figure 24: General Screen

The General page enables you to check the status of GX800 link. This screen contains information about the local as well as remote link, provided the remote side IP parameters are properly set on both terminals.

It displays:

- Current running modulation scheme
- Data Bit Rate (the net throughput in the range from 10 up to 310Mbps)
- TX frequency and output TX Power, the Temperatures of IDU and ODU
- Mean Square Error (MSE) - An absolute value proportional to the quality of signal at demodulation, that is, the lower the value the better is the signal. This parameter is

usually in the range of -12dB to -40dB.

- For QPSK modulation, the limit value is -10.5dB; for QAM128 modulation, the limit value is -26dB. (Well designed and installed link has usually MSE value of -32dB and lower, so the link runs without the errors in QAM 128 modulation). Note that MSE parameter might display unpredictable values, if Modem sync is not set to **OK** status,.)
- Modem sync - Modem synchronization (ok = correct; no = no synchronization)
- HSI Interface - The type of connected HSI module to the IDU
- Actual – The status of the overall link (ok=correct)
- Historical – The status from the last alarm acknowledgement (ok = correct; warning = there was an error in the past)

On the top of every screen, you can read the following:

- Color-coded radio icons together with colored flags and off-hand distinguished status of the local and remote link terminal.
    1. **Indication of the Radio Icon:** Green – OK; Red - error; Grey - inaccessible remote device; Yellow - warning status
    2. **Flag A:** “not-crossed A” – enabled auto restore configuration from start-up memory W0 after continuous 10 minutes error timeout (applicable if connection is lost)
    3. **Flag Status (flag below radio icon):** Green – OK; Yellow – WARN (an error occurred now); Yellow – HIST (information about previous error, the device is OK now); Grey – N/A (flag on local side – no communication between IDU and ODU on local side); Grey – N/A (flag on remote side – no communication between local and remote device)
    4. **BAND:** Indicates the low/high frequency on the local and remote side of the link
    5. **TxP:** Transmit power
    6. **RxL:** Received level (preferably in the range of -30dBm to -50dBm)
    7. **TxF:** Transmitting frequency set in the allowed frequency range of each unit
    8. **COMMIT**: Stores configured parameters to the permanent startup memory

IP Address Setup

Each IDU in the network must have its own unique IP address, defined subnet mask and the primary route (gateway). For the link to function correctly (display of the remote device status) it is also important to set the address of the remote device.

To setup the IP address, navigate to the main menu “**IP**” and the sub menu “A**ddress**”.

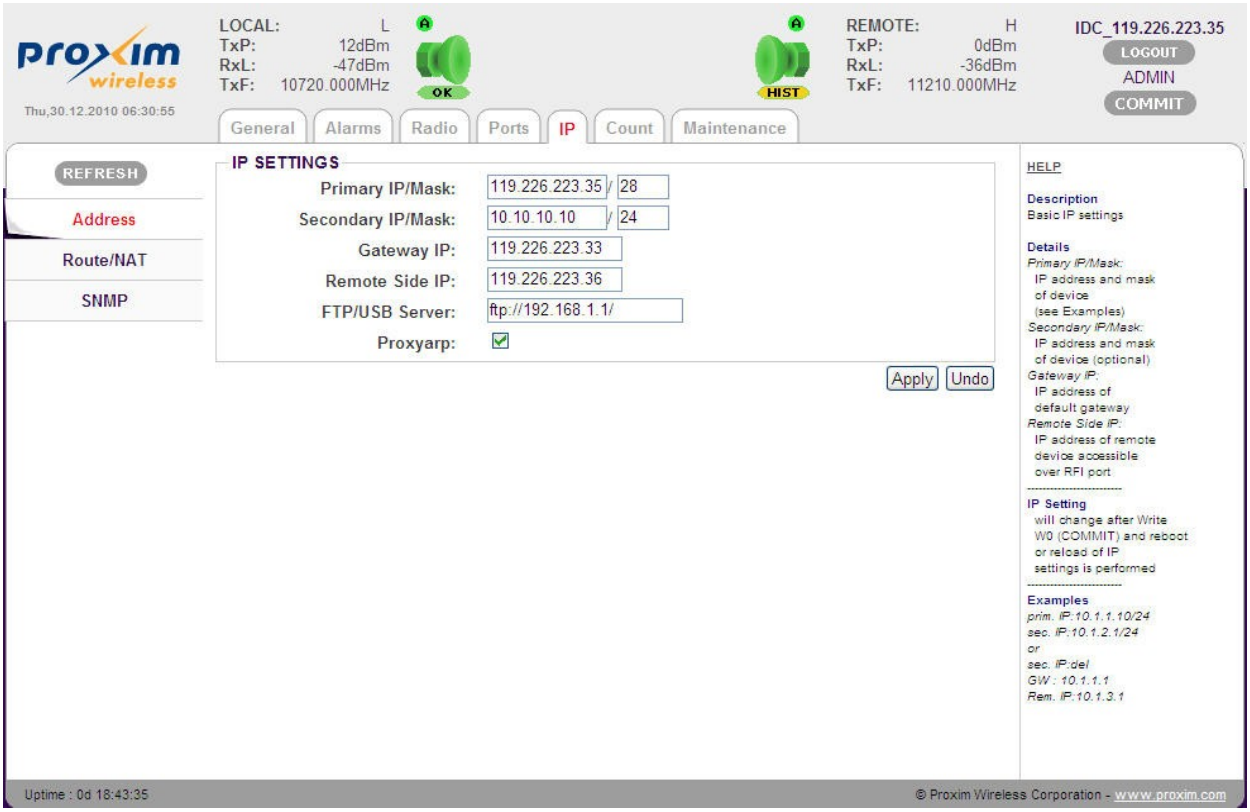


Figure 25: IP Address

For example, a device in the network has IP 192.168.3.0/24, gateway 192.168.3.1. The management data can be transmitted together with the user data through the common cable connected from the same switch into single Gigabit Ethernet port (port for user data).

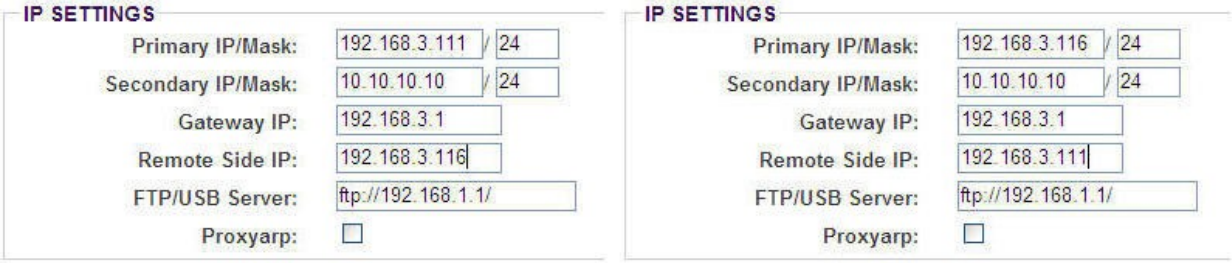


Figure 26: IP setup for device A (left) and device B (right)

After configuring the IP settings, click **Apply**. The following alert screen appears:

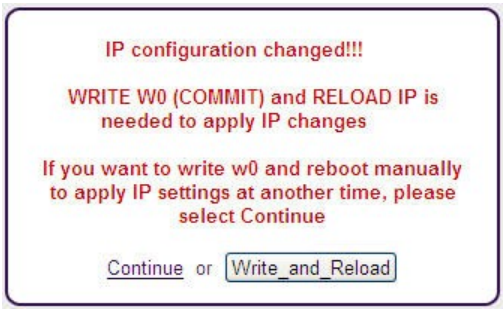


Figure 27: IP Configuration Change Window

Click **Write_and_Reload** to save the new configuration parameters onto Write_W0 startup memory.

!! NOTE !! Proxyarp feature is accessible in ADMIN mode only.

!! ATTENTION !! Any change or modification in the IP setting takes effect only after saving the configuration to "Write_W0" memory followed by device restart.

Interconnection of LAN A-B Ethernet Switches

For management through the Gigabit Ethernet port, it is necessary to enable (check) the interconnection of LAN A-B switches in both IDUs and set a minimum data rate (1Mbps) on Ethernet. To configure this setting, navigate to main "**Ports**" and sub-menu "**Parameters**".

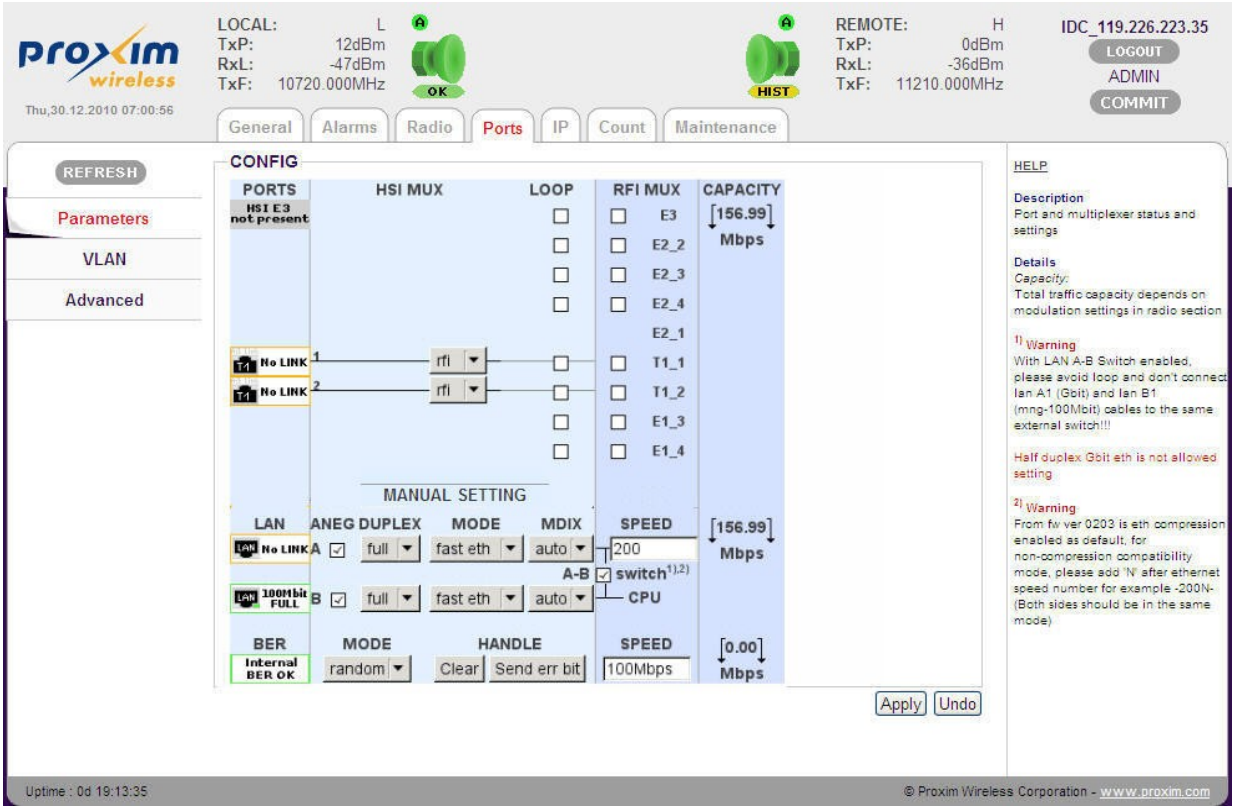


Figure 28: Enabling LAN A-B Ethernet Switches

In the above screen, do the following:

1. Check LAN **A-B** switch
2. Enter Ethernet speed (example 200Mbit) in the **LAN SPEED** box
3. Click **Apply**.
4. Click "**COMMIT**" to save the configured parameters.

Configure the same settings on the remote IDU2 as well.

Dual License - Design Type Setup

For all the modulations schemes and bandwidths, Proxim provides one unified firmware (from version 0207 and higher).

The firmware support two design types:

- Design type 301, which permits to switch between bandwidths in the range 7 – 30MHz
- Design type 303, which permits to switch between bandwidths in the range 28 – 56MHz

The firmware adapts automatically to uploaded license file in the device.

To configure these parameters, navigate to main menu "**Maintenance**" and sub-menu "**Miscellaneous**".

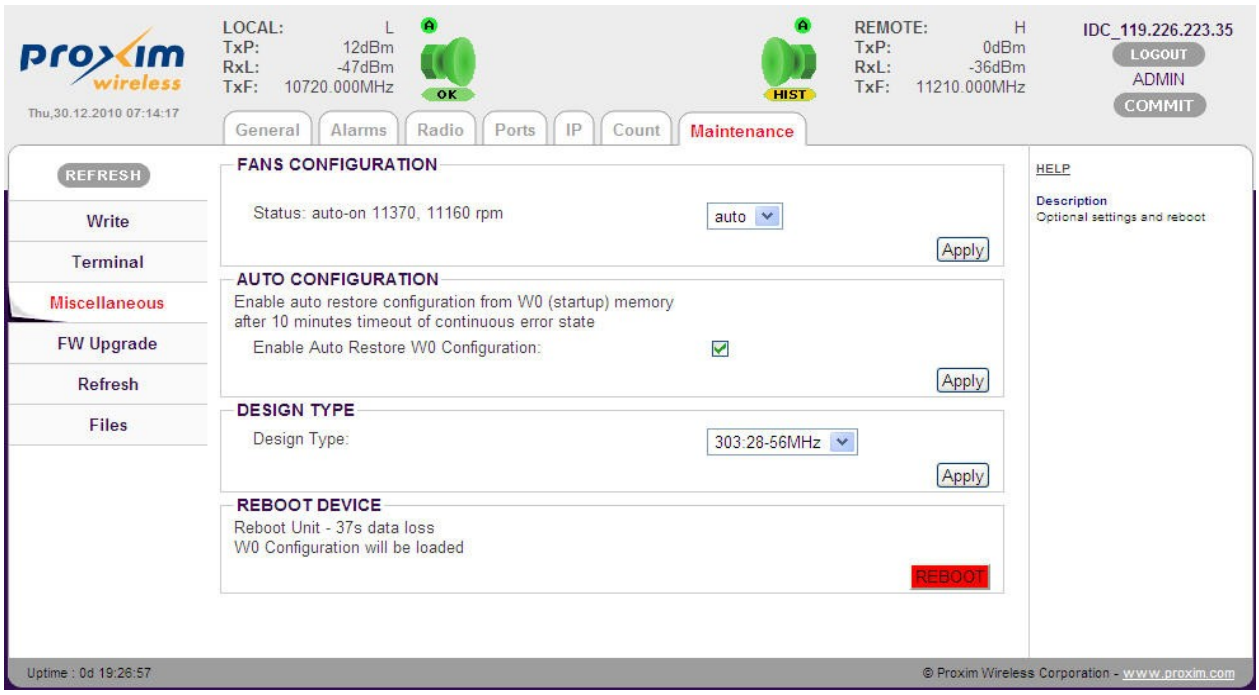


Figure 29: Design Type

After configuring the parameters, click **Apply**.

Click "**COMMIT**" to save the configured parameters.

!! Note !! IDU with license for 301 design only (Bandwidth 7 – 30MHz) can work with IDU with license for 303 design and also these IDUs should run on the specific modulations. The modulations with "b" index in 303 design can work with the same modulations in 301 design. Example, qam128_28e6_02b 163,24Mbps

Frequency, Modulation and ATPC Setup

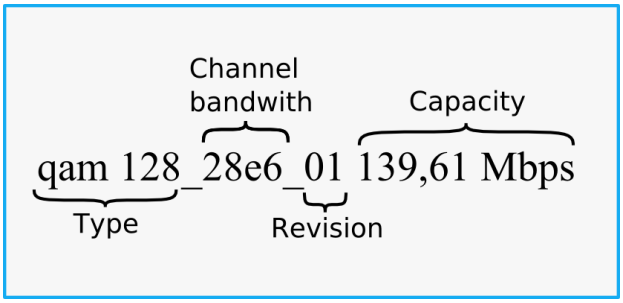
The set modulation scheme and the channel bandwidth affects the final data rate (data throughput) and sensitivity (bridging distance) of GX800 link. Generally, the narrow the band and lower modulation, the greater the sensitivity.

There are also used self-correcting codes in the modulations. It is the rule that in the same type

of modulation with a lower data rate there is better self-correcting security and thus a better sensitivity (revision _01 or _02).

Depending on the type of supplied license (limit for maximum data rate) the modulation type can be changed (type of modulation can be set / changed up to a maximum transmission capacity). Microwave link can be ordered in the different licenses in accordance with actual price list and business policy. Than the transmission capacity can be changed in the range from 10Mbps up to a maximum data rate of supplied license, maximum 310Mbps.

The modulations are named according to the combination of all the parameters as shown in the following figure.



To setup the demanded Actual Modulation and Adaptive Modulation (ACM), navigate to main menu “**Radio**” and sub-menu “**Parameters**”. In the parameters screen, navigate to “**MODEM CONFIGURATION”**.

Actual Modulation Setup (without ACM):

The Actual Modulation parameter represents the current modulation. For a link without ACM request, the desired modulation must be set directly in the Actual Modulation field as shown in the following figure.

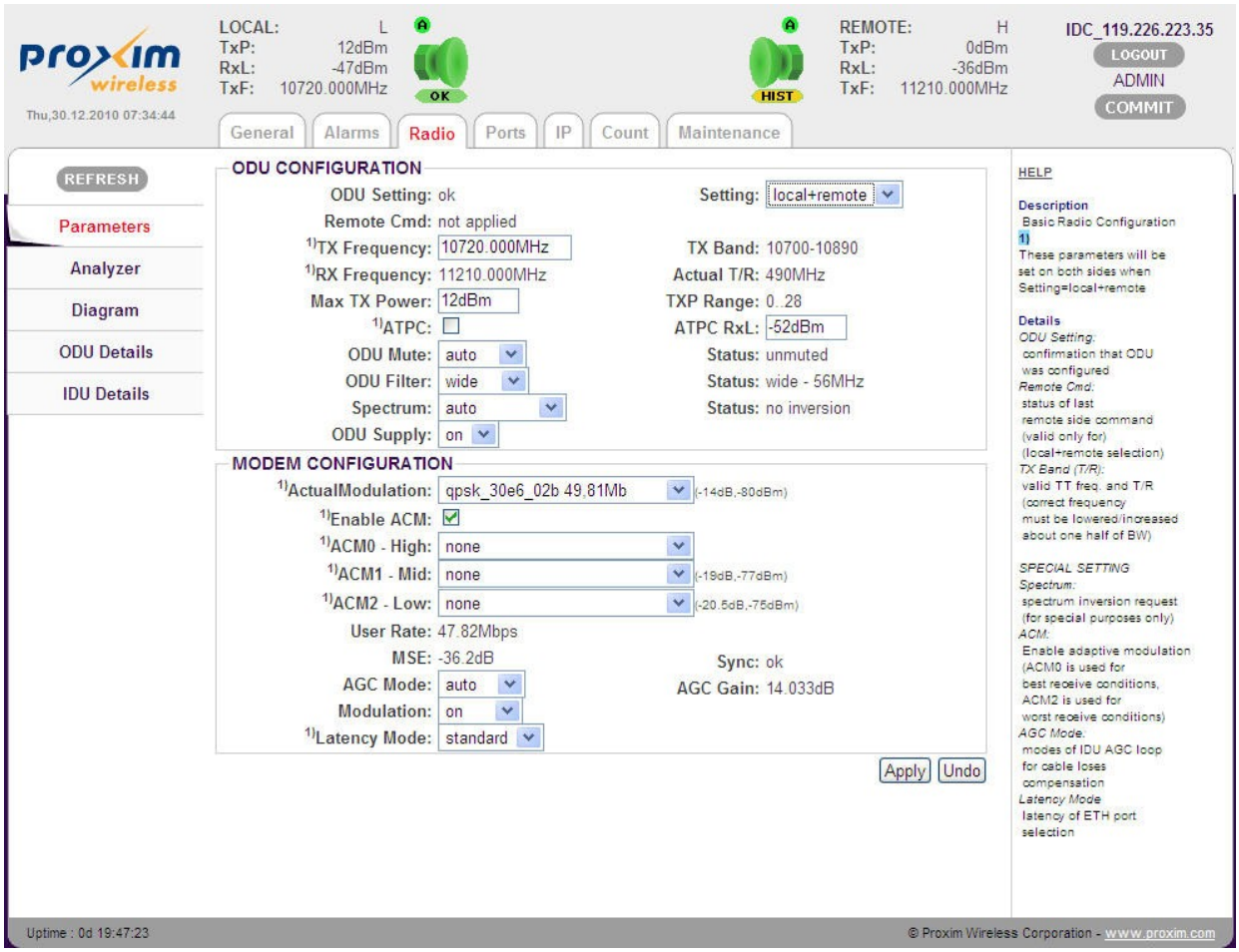


Figure 30: Modulation Setup without ACM

Adaptive Modulation Setup

ACM can be set by using the following three options:

- Adaptive Modulation 0 (ACM0) is for the highest throughput and the lowest security
- Adaptive Modulation 1 (ACM1) and 2 (ACM2) for the lower data throughput and better security.

The desired ACM steps should be set at least in two fields ACM0 – ACM1 (see the following figure). A user is allowed to set the ACM only when the **Enable ACM** box is unchecked. This guarantees that the Actual Modulation setup could not be performed manually during the active ACM.

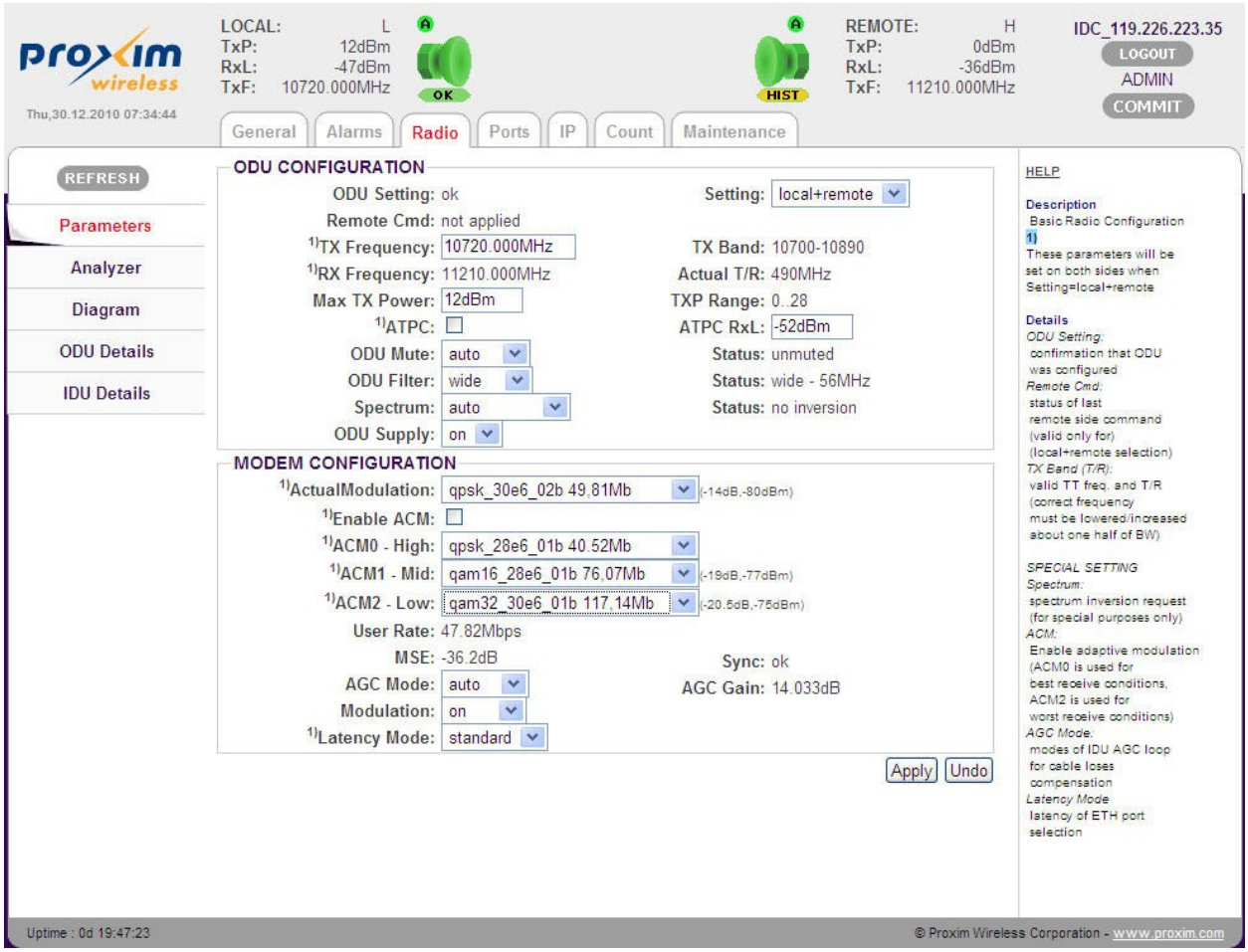


Figure 31: Modulation with ACM

After setting the ACM parameters, check the **Enable ACM** parameter and click **Apply**. On doing so, all the ACM parameters turn Grey. The currently modulation (Actual Modulation) is compared with the ACM options (ACM0-2). If the current modulation is included in the ACM options, the system will continue with this modulation without any drop-out (if it is not ACM0, the system will keep evaluating whether the modulation scheme could not be switched to higher ACM option (Example, from ACM1 to ACM0).

If the current modulation is not included in ACM options, the Actual Modulation will be switched to ACM0 option.

!! ATTENTION !! For proper operation of ACM, at least two ACM options (ACM0 and ACM1) must be selected. The rule is that ACM0 modulation is higher than ACM1 and ACM2!!

The same modulation (ACM options) must be set on both sides of the link.

!! Note !! The ACM can be configured by using either 301 or 303 design types. See Dual License - Design Type Setup

Click "**COMMIT**" to save the configured parameters.

Ethernet Advanced Configuration

To configure advanced Ethernet configuration, navigate to main menu “**Ports**” and sub-menu “**Advanced**”.

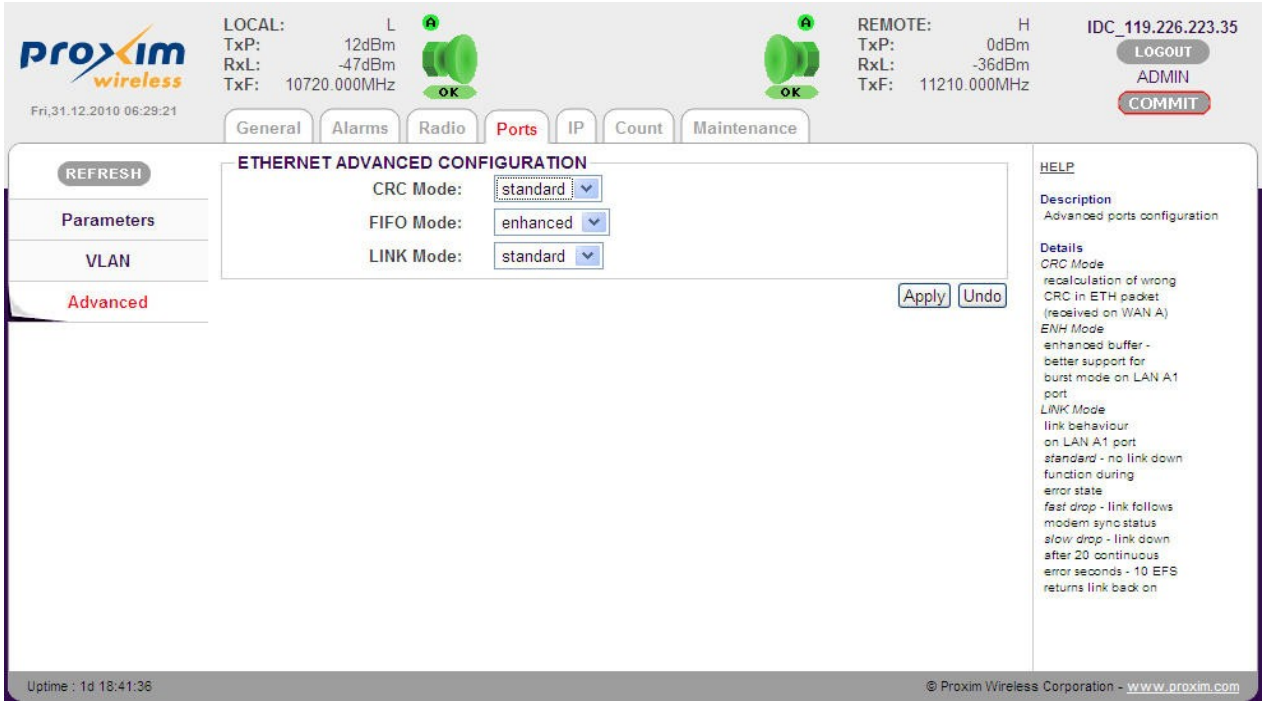


Figure 32: Ethernet Advanced Configuration

You can configure Gigabit Ethernet in the following modes:

- **CRC Mode**: Recalculates wrong CRC in Ethernet packets that are received on WAN A. When set to **standard**, the error packets are discarded. When set to **force**, the CRC calculation is done on the received packets.
- **FIFO Mode**: Enhanced buffer with better support for burst mode on LAN A1 port.
- **LINK Mode**: Represents the link behavior on LAN A1 port.
    - **standard** – Standard mode without any dependency on the radio link status on the Ethernet port behavior.
    - **fastdrop** – Ethernet port is set to mute (link status of local IDU and remote SWITCH port is “no-link”) when loss of synchronization of the link occurs (it duplicates the Modem Sync. Status).
    - **slowdrop** – Ethernet port is set to mute (link status of local IDU and remote SWITCH port is “no-link”) after 20 continuous error seconds and it is returned after 10 continuous error-less seconds.

Data Rate Settings for Connected User Interfaces

The data rates for connected interfaces can be set to a maximum transmission data rate over GX800 link.

The following two examples depict the interface setup possibilities.

Example 1

For Ethernet transmission, with a modulation scheme 128QAM and bandwidth 28MHz, the real user data rate is 156.99Mbps and the real data throughput is 163.24Mbps.

In the Web Browser, navigate to main menu “**Ports”** and sub-menu “**Parameters”** and set the LAN SPEED as 200 Mbps (the overall capacity is allocated to Ethernet data, which is 156.99Mbps; no other interface is detected).

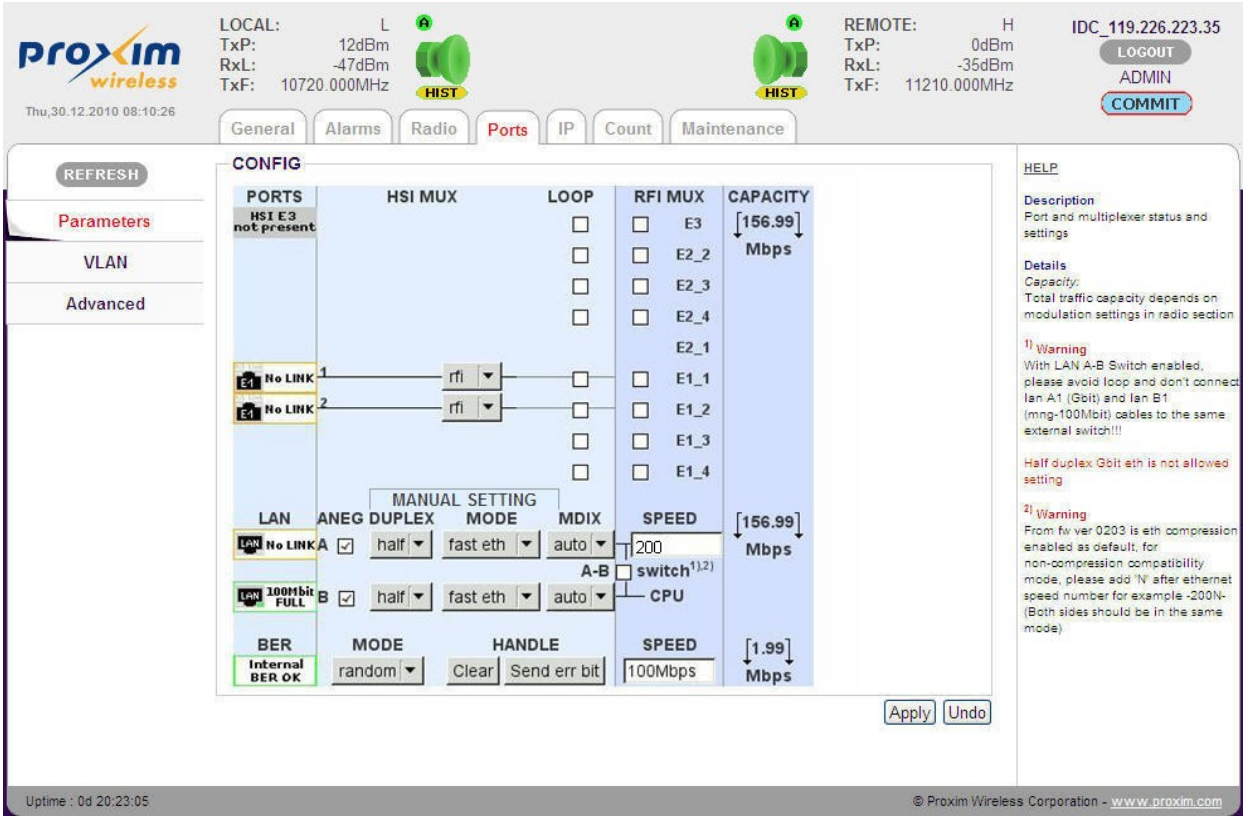


Figure 33: Data Rate

In the similar way, set the same values on the other side of the link.

Example 2

For Ethernet + 1xT1 transmission, with a modulation scheme 128QAM and bandwidth 28MHz, the real user data rate is 156.99Mbps and real data throughput is 163.24Mbps.

The inserted HSI module is automatically detected and displayed with graphical interconnection between PORTS and available RFI MUX channels as shown in the following figure.

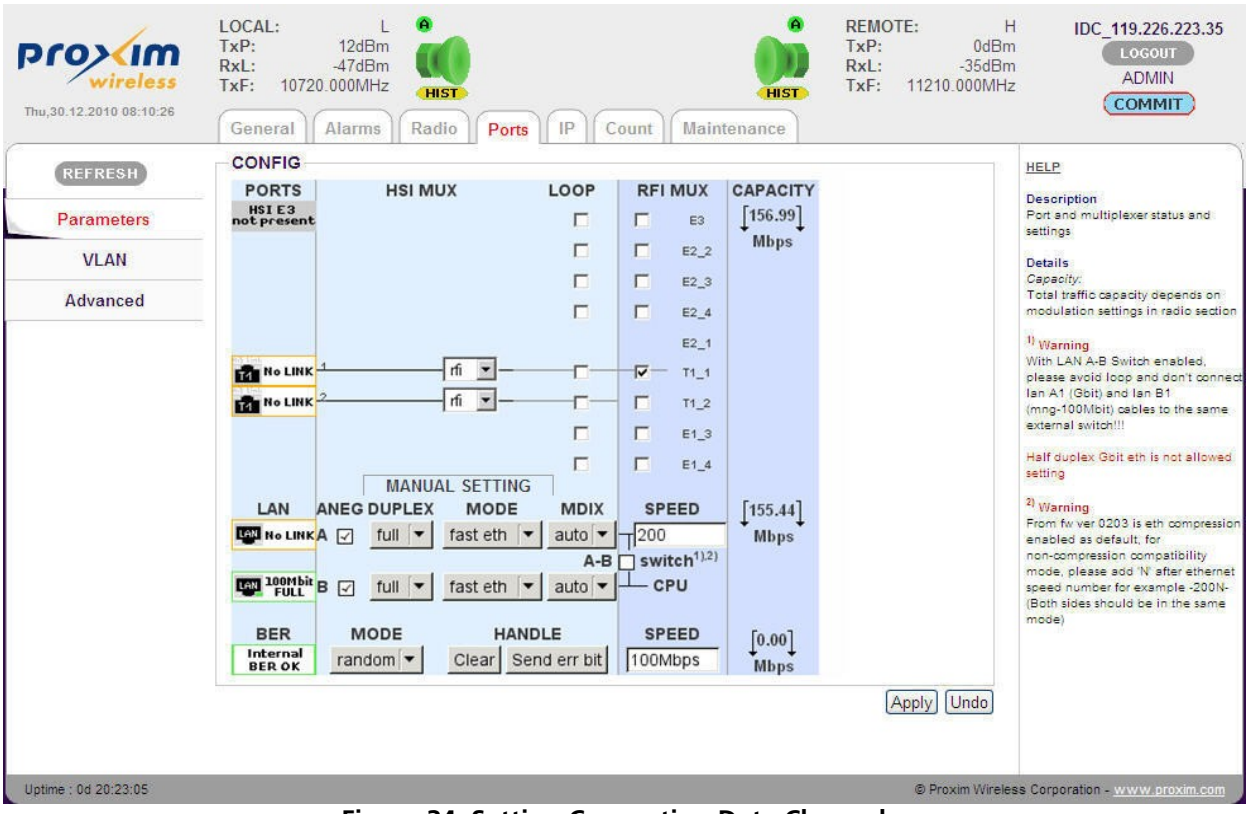


Figure 34: Setting Connection Data Channels

Check the box T1_1 to map available T1_1 channel onto T1 port. The T1 signal then takes 1.55Mbps from overall available user data rate. Remaining 155.44Mbps is allocated to Ethernet data. (Make sure “rfi” option is selected.)

Set Ethernet LAN SPEED to 200 Mbps (the remaining capacity (155.44Mbps) will be allocated to Ethernet data)

In the similar way, set the same values on the other side of the link.

Click “**Apply**” to commit the configured values.

Click “**COMMIT**” to save the configured parameters.

Save Configured Parameters

The configured parameters must be saved, so that they are valid even after the device restarts.

The IDU contains four memories. The first memory, referred to as W0, is the boot memory. During the device startup, the link parameters are uploaded from this memory. The remaining memories, referred to as W1, W2 and W3, can be used for configuration backup, testing configuration and so on.

IP configuration is saved independently into W0 reboot memory only. IP configuration could be saved either immediately after the IP setup or later in Web Interface under main menu "**Maintenance**" menu and sub menu "**Write**".

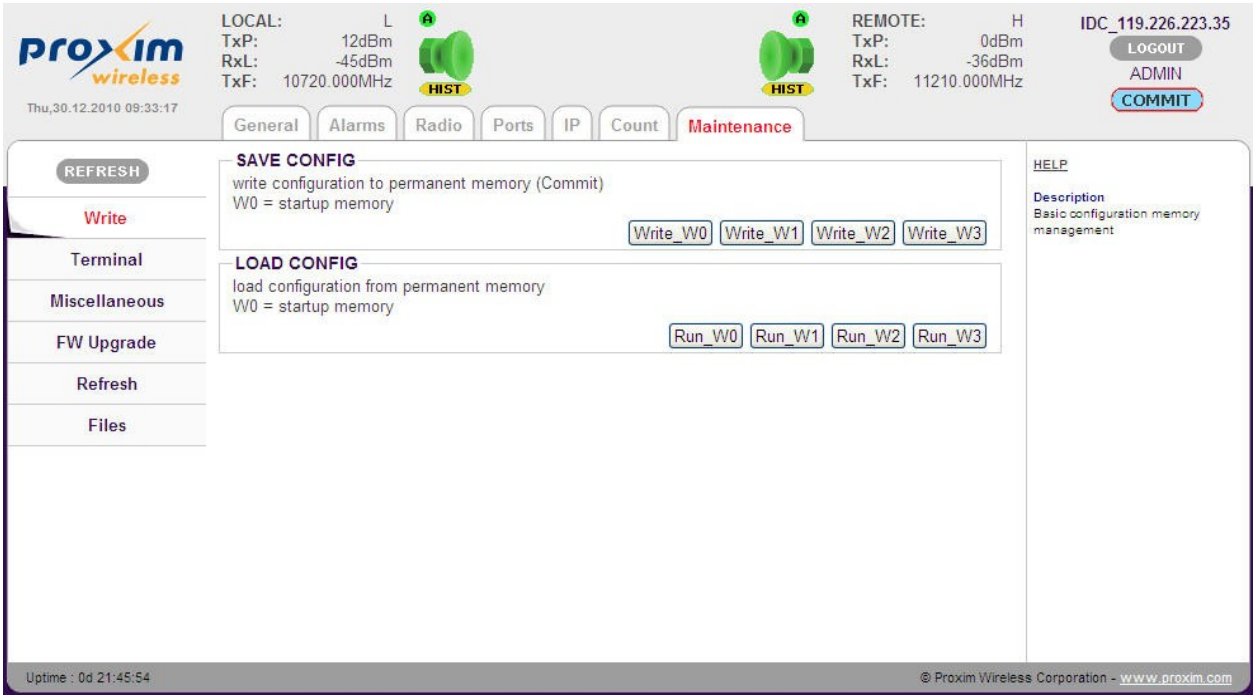


Figure 35: Save Configured Parameters

For saving into the memory, click the relevant button Write_W0 to Write_W3.

!! Note !! To save configuration parameters, you can also click the "COMMIT" button which is available on the top of every screen.

Save the new configuration into the relevant memory (Example boot memory W0) on the other side of the terminal as well.

To run any saved configuration, click relevant button Run_W0 to Run_W3.

BER Test – GX800 Link and User Lines Verification

Bit Error Rate (BER) test is used to test and verify the quality of GX800 link and the connected user lines by using internal BER tester.

GX800 BER Test:

A)
We recommend to allocate the full transmission capacity of GX800 to BER test for a limited period of time. This way, even accidental and momentary errors can be detected. Switch off the connected user interfaces (check out RFI MUX) and set:

LAN SPEED: 0 Mbps (no capacity for Ethernet)

BER SPEED: 100 Mbps (corresponding to maximum BER test data rate)

B)
During the vivid link operation, it is necessary to allocate least fractional capacity to run the BER test.

Navigate to main menu "**Port**" and sub-menu "P**arameters**" and configure the following parameters:

- RFI MUX
- LAN SPEED
- BER SPEED

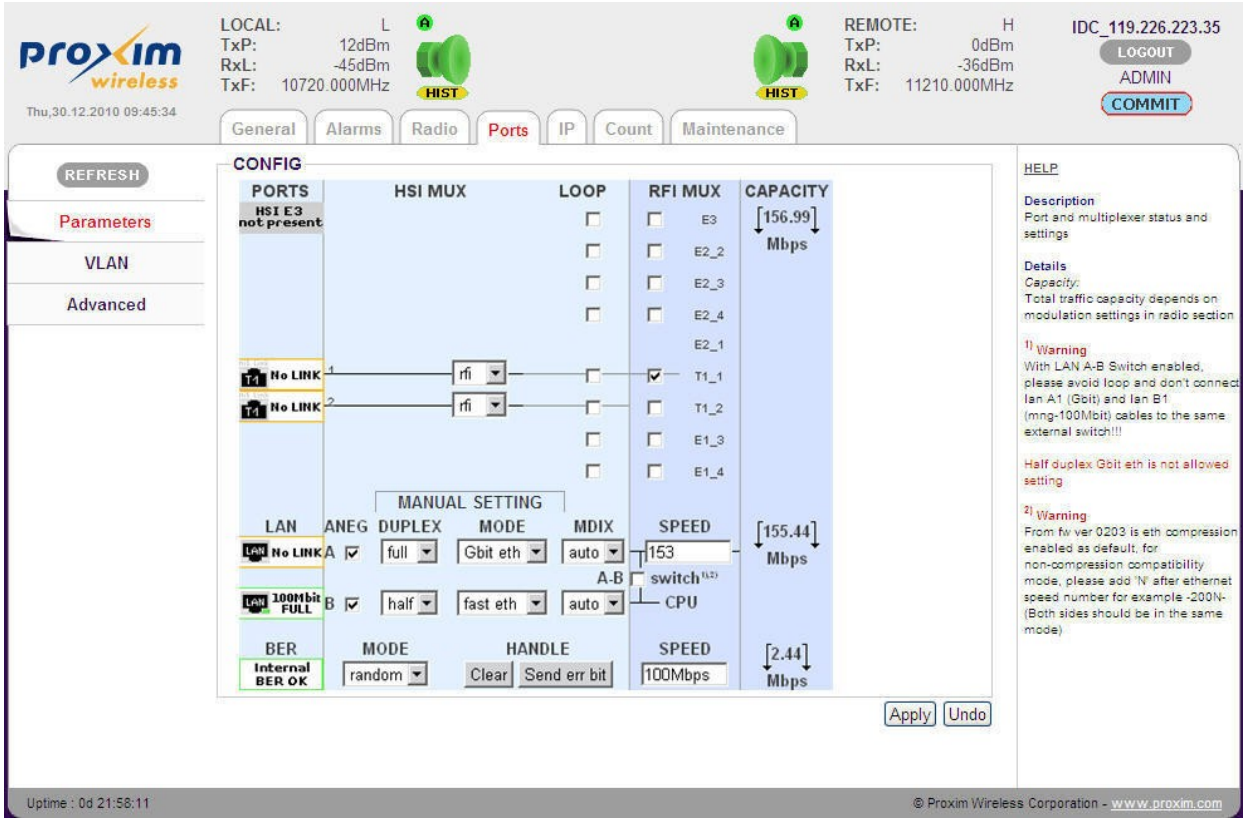


Figure 36: BER Test Setup during the Vivid Link Operation

!! Note !! For BER test, configure the parameters on both the terminals equally.

After configuring the parameters, click **Apply**.

User Line BER Test:

For the user line BER test, the full capacity of the line is devoted to BER tester. The BER signal is directed to the selected channel and sent in the direction of HSI module of the IDU. Use loop on the line to bring the signal back and verify the line quality.

Select the “ber” option instead of “rfi” in roll down menu of relevant user interface in HSI MUX section of the following figure:

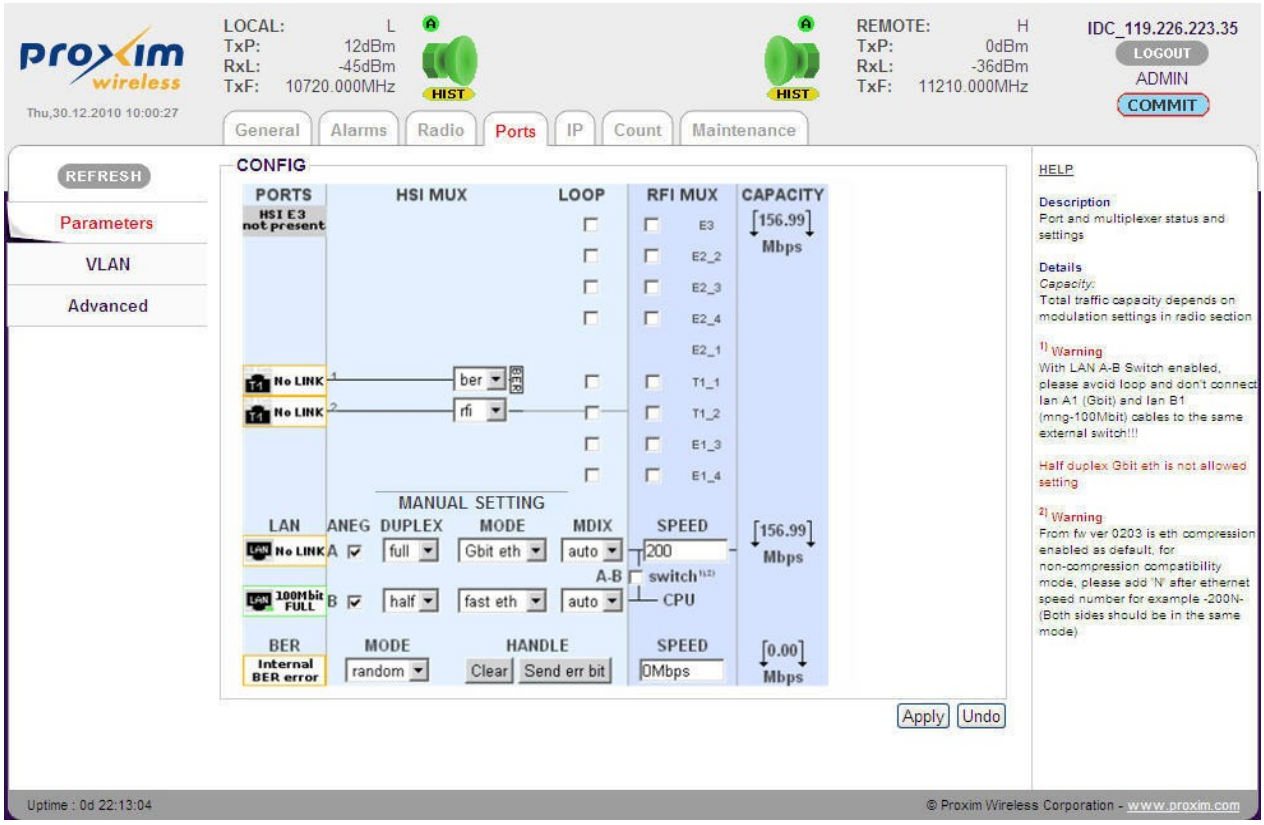


Figure 37: BER Test Setup for User Interface

Next, to monitor the running BER test on GX800 link or user line in the Web Interface, navigate to main menu “**Count**” and sub-menu “BER”.

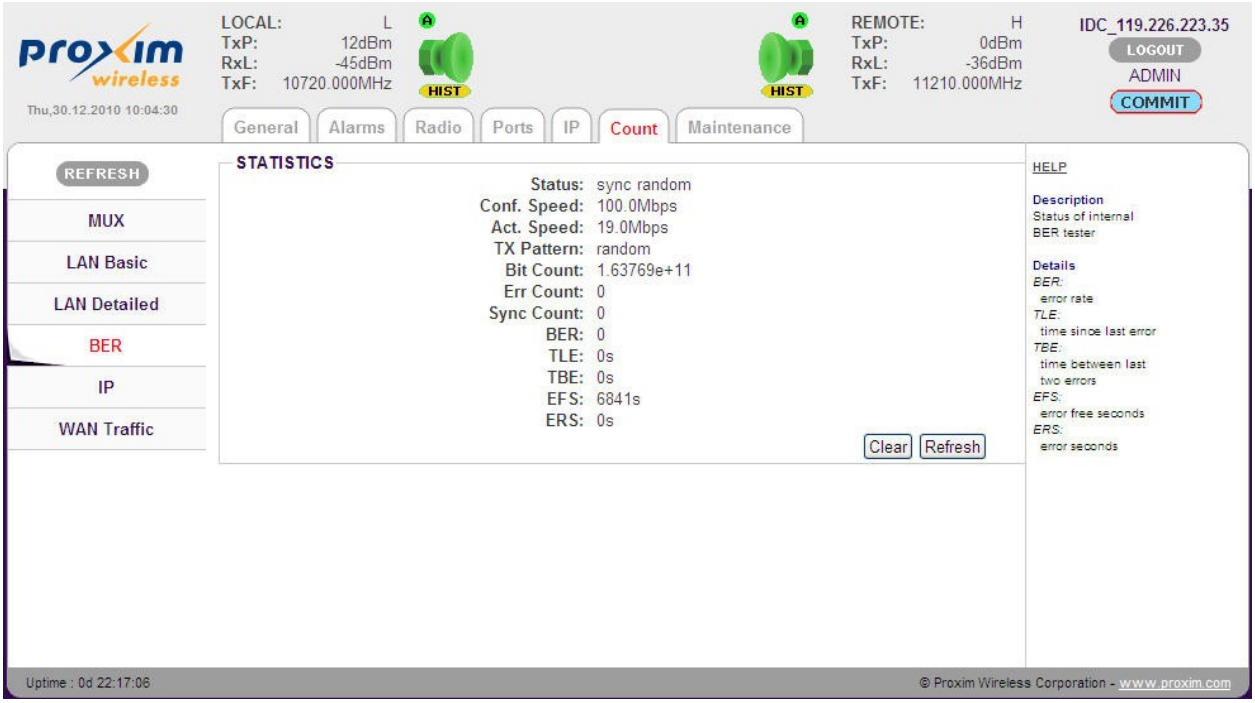


Figure 38: BER Tester Information

The STATISTICS screen is displayed which contains the following information:

- **Status**: Indicates the sync status and the received BER pattern
- **Conf. Speed**: Capacity set for BER tester
- **Act. Speed:** Real data rate dedicated for BER (automatically adjusted data rate)
- **TX Pattern:** Set of BER frame type (has to be set the **same** on both sides)
- **Bit Count:** Overall transmitted bits
- **Err Count:** Overall error bits
- **Sync Count:** Number of synchronizations since the last counters clearance
- **BER:** Error rate
- **TLE:** Time since last error occurrence
- **TBE:** Time between last two errors
- **EFS:** Time of error-free traffic in seconds
- **ERS:** Time elapsed while the link failed in seconds

Data Evaluation:

Clear the BER tester counters and check the results by clicking **Refresh** button.

For proper functioning of GX800 link, the values of EFS parameter, ERR Count, Sync Count, BER, TLE, TBE and ERS parameters should be equal to zero.

If the test results vary, and the link (line) fails, it is necessary to verify the link installation and configuration (verification of connected user line).

For GX800 link test, the same results must be read on both sides of the link.

Analysis of Interference in GX800 link

Integrated Spectral Analyzer is a suitable tool for finding free channels in a given frequency band, eventually for link interference. For licensed bands, you can use the Analyzer for the free frequency verification.

Spectrum Analyzer is available in ADMIN and USER mode.

Frequency Analysis at Local Side:

Before finding if the given frequency spectrum is free or occupied, you have to mute the transmitter on one side (ideally remote side). Exercise care as this will cause drop out of user data transmission.

Login to remote device and mute the transmitter for a specified period of time with an automatic revival. The interval for mute could be set from 1 to 3600 seconds. The remote unit will start transmitting again automatically as the specified time elapses.

Navigate to main menu “**Radio”** and sub-menu “**Analyzer**”, and enter the time in seconds and click **Mute ODU** button.

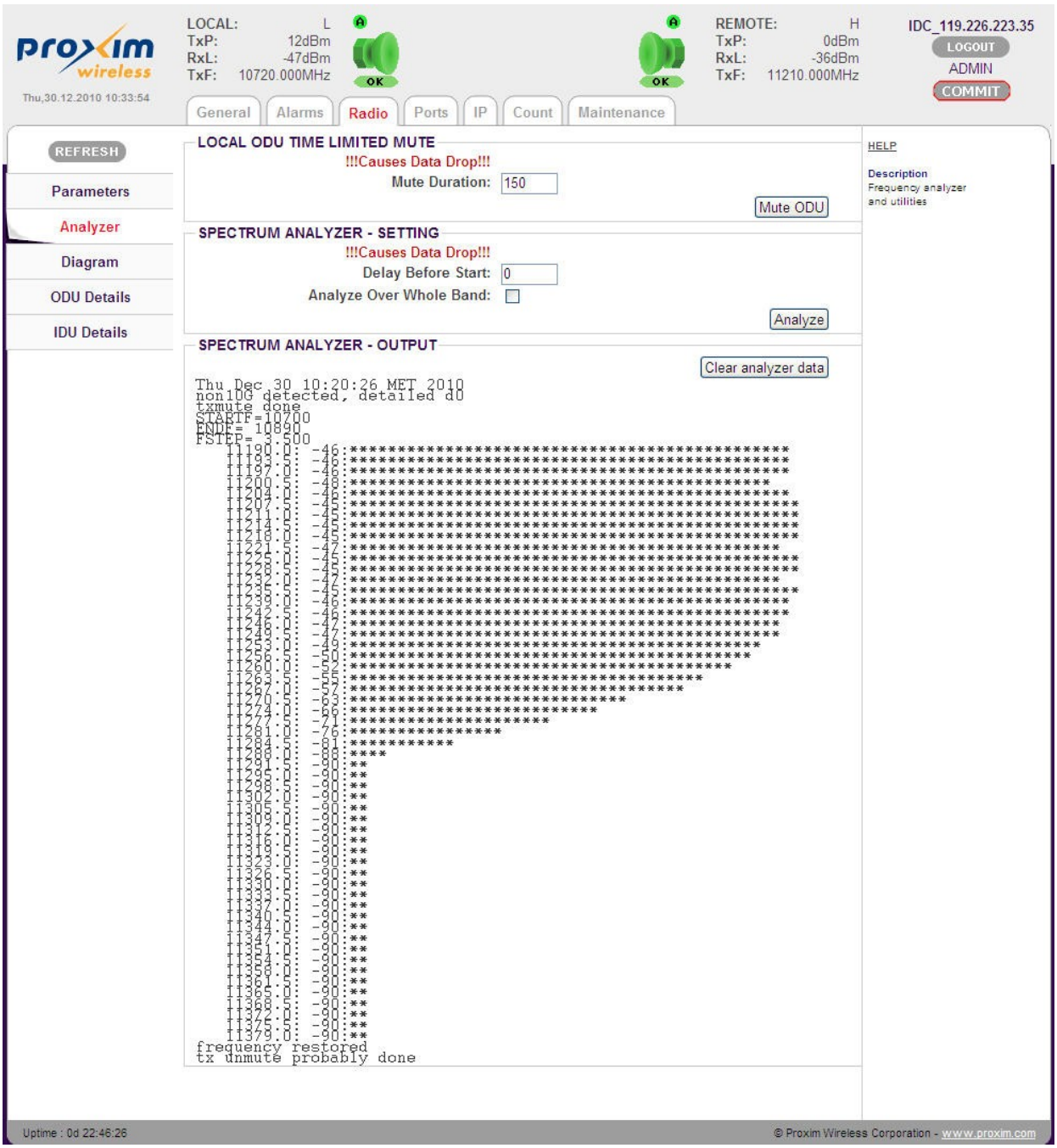


Figure 39: Spectrum Analyzer Setup and Output

Next, click **Analyze** to start the spectrum analysis at the local terminal. In licensed bands, the **Analyze over whole band** option causes analysis through the whole spectrum with a wider frequency spacing (14MHz), otherwise the analysis is made in 56MHz range only around the RX frequency with spacing 3.5MHz.

Frequency Analysis at Remote Side:

It is also possible to set a pause before scanning the spectrum. This is suitable for analyzing the remote device. Set the pause (for example 10 seconds and click **Analyze** at remote side – this will disconnect the management between the terminals and start the analysis after the specified period of time (pause).

Before the pause at remote side elapses, click **Mute ODU** on local side for a specified period of time (example 150 seconds) and wait for the analyze to finish. After that, the units should interconnect again and the management of remote unit will be possible again. Finally, check the frequency analyze at remote side.

!! Note !! Spectrum analysis for licensed bands last approximately for 150 seconds. During this time, no data passes through the link.

Firmware Upgrade, License Upgrade

!! Note !! An ADMIN user alone can upgrade the firmware and the license.

For every firmware release, it is not necessary to update all the parts, but only the ones which require an upgrade.

Basic Firmware Parts:

- **hwbase.afw** – Software for internal hardware parts
- **oskernel.afw** – Operating system
- **dev.afw** – Drivers for the Operating System
- **fwbase.afw** – Application software (WEB, SNMP, commands and so on)

Additional Firmware Parts:

- **patch001.afw** – Patch for enhancing the maximum length of the uploaded file. Applicable for firmware upgrades from versions 0208_02 onwards.
- **checkversions.afw** – Compares the firmware version with the newest version and prints the info that is necessary to upload.
- **fw_all.afw** – Compares the current version of firmware with the newest version and automatically uploads the different parts (used only from firmware 0208_02 or package patch001.afw).

Recommended Steps for Firmware Upgrade:

1. Log on to the web browser with ADMIN rights.
2. Click "**COMMIT**" (available on the top-right corner of each page) to save the current configurations. Alternatively, you can save the configured parameters by navigating to main menu "**Maintenance**" and sub-menu "**Write**" , and click "**Write_WO"**. By doing so, the configurations are stored in the start-up memory.
3. Compare currently running versions of each firmware parts (oskernel.afw, dev.afw, hwbase.afw and fwbase.afw) with the newest version by following one of the two below steps:
    - Manually compare data shown in main menu "**General**" and sub-menu "**Revision**" with the file **version.txt.**
    - Navigate to main menu "**Maintenance"** and sub-menu "**FW Upgrade"**, and select the file **checkversions.afw**. Take a print-out and check the parts that need to be upgraded.

Figure 40: Alert Window for Firmware Upload

4. Alternatively, navigate to main menu "**Maintenance**" and sub-menu "**FW Upgrade**", and select the file patch001.afw (if it is required) and increase the maximum limit size for the file upload.
5. Navigate to main menu "**Maintenance**" and sub-menu "**FW Upgrade**" and choose one of the following steps:
    - Select the file **fw_all.afw** from the provided software package. The entire file will be uploaded into the device, compares the different versions and writes the different parts of the firmware into flash memory. Please note that this procedure is not suitable for slow connections.
    - Gradually select the files hwbase.afw, oskernel.afw, dev.afw and fwbase.afw in this order (if there is not necessary to upload any part, please continue with another file) and wait for the process completion.
6. Once the files are uploaded, restart the device by navigating to main menu "**Maintenance"** sub-menu "**Miscellaneous"** and click **REBOOT**. Please note that while restart there is data transmission outage for about 35 seconds.

!! Note !! Upgrade the firmware files in both the terminals.

To view firmware details, navigate to main menu "**General**" and sub-menu "**Revision**".

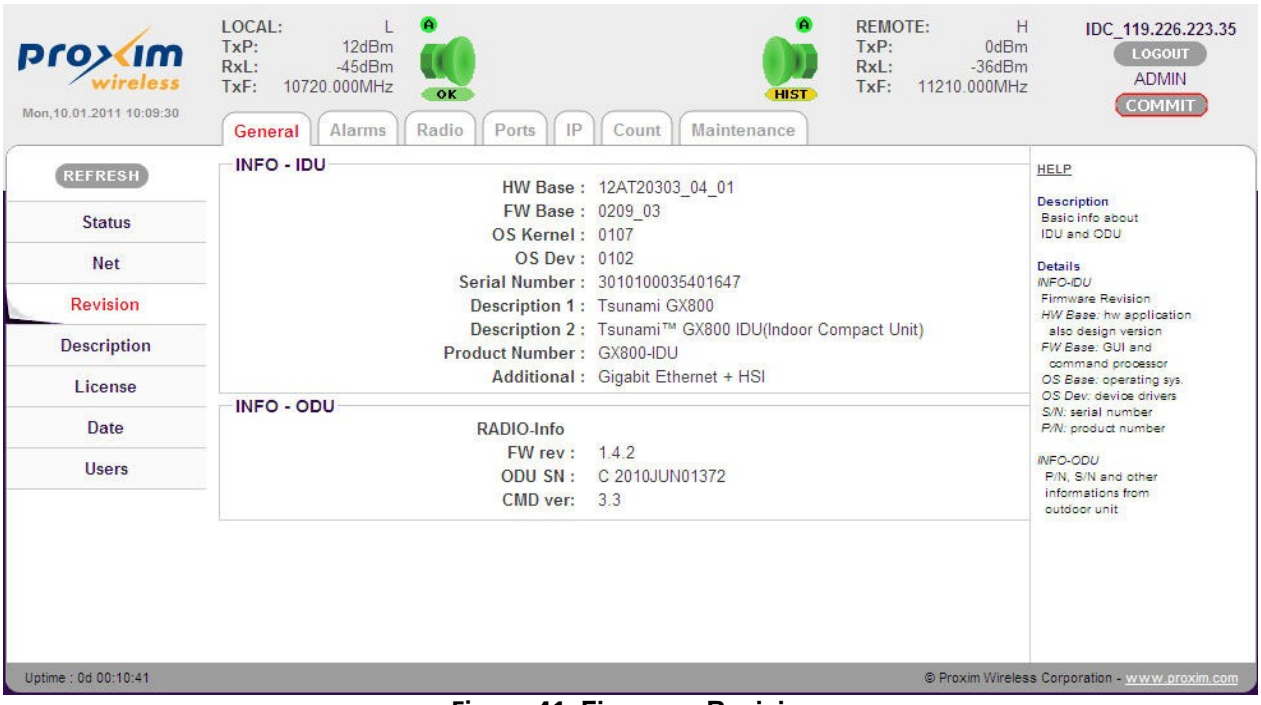


Figure 41: Firmware Revision

Upgrading the License

The license key comprises the list of available modulation schemes and bandwidths. Each license key is unique for each IDU with respect to SN number of the IDU.

To find the SN of the IDU where the license key will be uploaded, navigate to main menu "**General**" and sub-menu "**License"**.

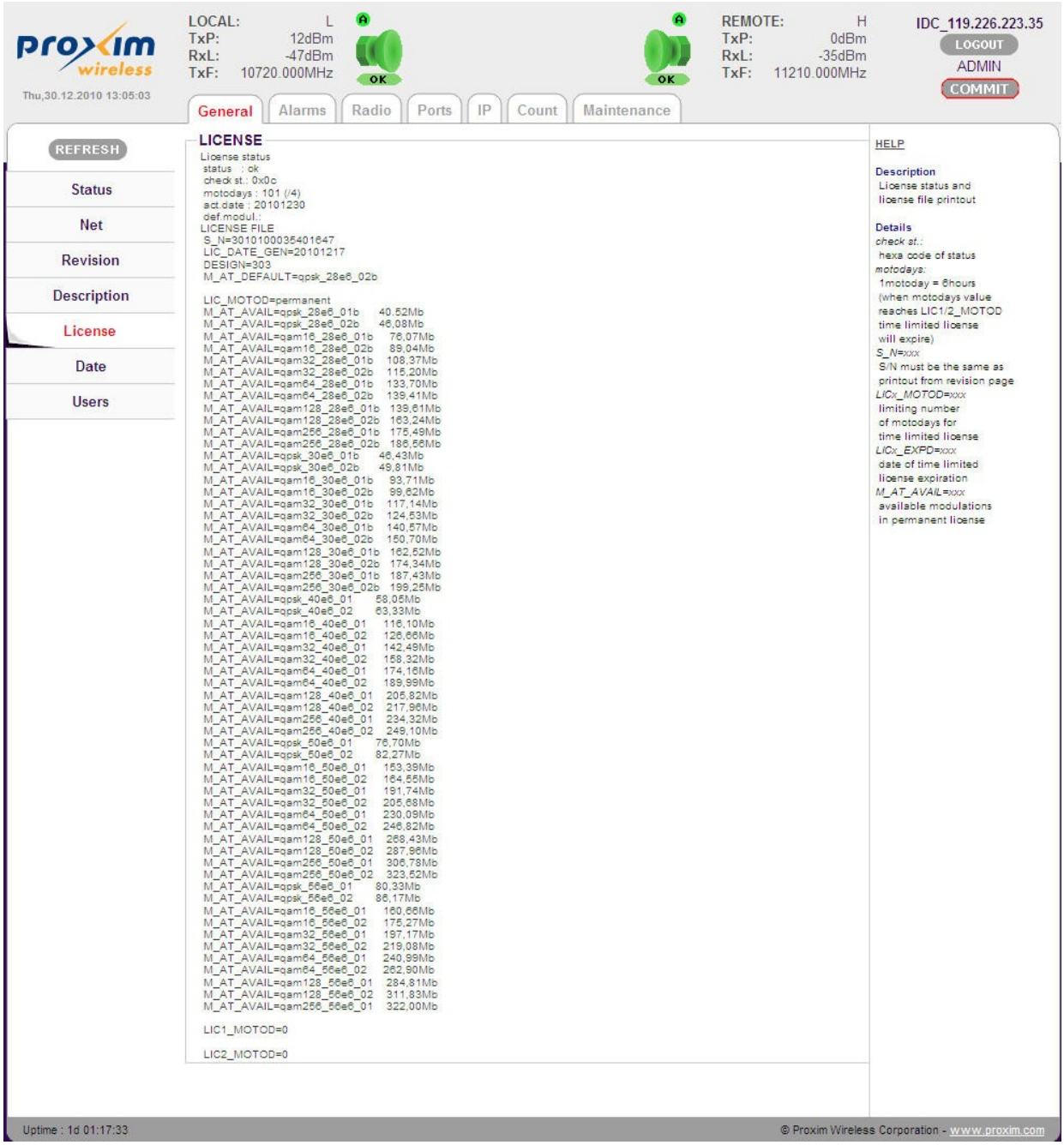


Figure 42: IDU license Information

The SN is in the line:
S_N=xxxxxxxxxxxxxxxx

Compare the SN of IDU with license key which appear as: licxxxxxxxxxxxxxxxx.afw

The string of “x” is the serial number of device for which the license key is generated.

The license upgrade is performed the same way as firmware upgrade described above.

Restart the IDU after the license upgrade. To restart, navigate to main menu “**Maintenance**” and sub-menu “**Miscellaneous**” and click **REBOOT.**

Alarms

GX800 generates the error messages (events) indicating its status and events. You can use an SNMP application to get these messages and events so that you can monitor your link or network.

Number	*Title*	*Description*
600	g703 p1 link	No valid E1 signal on p1 port
601	g703 p1 ais	Detecting sequence “1” (according to the ITU G.755 norm for E1) on p1 port
602	g703 p2 link	No valid E1 signal on p2 port
603	g703 p2 ais	Detecting sequence “1” (according to the ITU G.755 norm for E1) on p2 port
632	lana1 link	No valid signal on LAN A1 port (Gigabit user data port)
636	lanb1 link	No valid signal on LAN B1 port (100Mbit management port)
640	hsi los	Failure of frame/packet synchronization on HSI interface (fiber/4W)
641	hsi fer	Frame failure of HSI interface over limit
644	mse low	Bad MSE (SNR) – threshold can be set
649	mod los	Failure of frame/packet synchronization on modem interface
650	rfi los	Failure of frame/packet synchronization on packet based multiplexer (modem)
651	rfi fer	Frame failure of RFI interface above limit
652	idu_temp	Temperature of indoor unit is above limit (-5 through 60°C)
653	odu_temp	Temperature of outdoor unit is above limit (-25 through 60°C)
654	odu_RxL	Received level of outdoor unit above limit
655	odu_comm	Error while communicating with outdoor unit
656	odu_alarm	Outdoor unit has non-zero alarm byte
657	license err	License problem
658	safe design	N/A for HS – backup system run
659	reset	Reset underway
660	hw error	*Hardware error – with older units set mask of hardware presence (after firmware update), or servicing by Proxim necessary*
661	sw error	*Software error – try restarting, update firmware and restart*
662	system error	*Non-specified system error – contact Proxim*

Example of the printout:

E 649 192.168.3.52 GX800 mod_los Tue Jan 6 05:45:20 2009
event_status – *event_ID* – *IP_address* – device_type – event_ name – date_and_time

SNMP Settings

The system permits to set a maximum of three IP addresses to which the SNMP traps will be sent.

To set the IP addresses, navigate to the main menu “**IP**” and sub-menu “SNMP”.

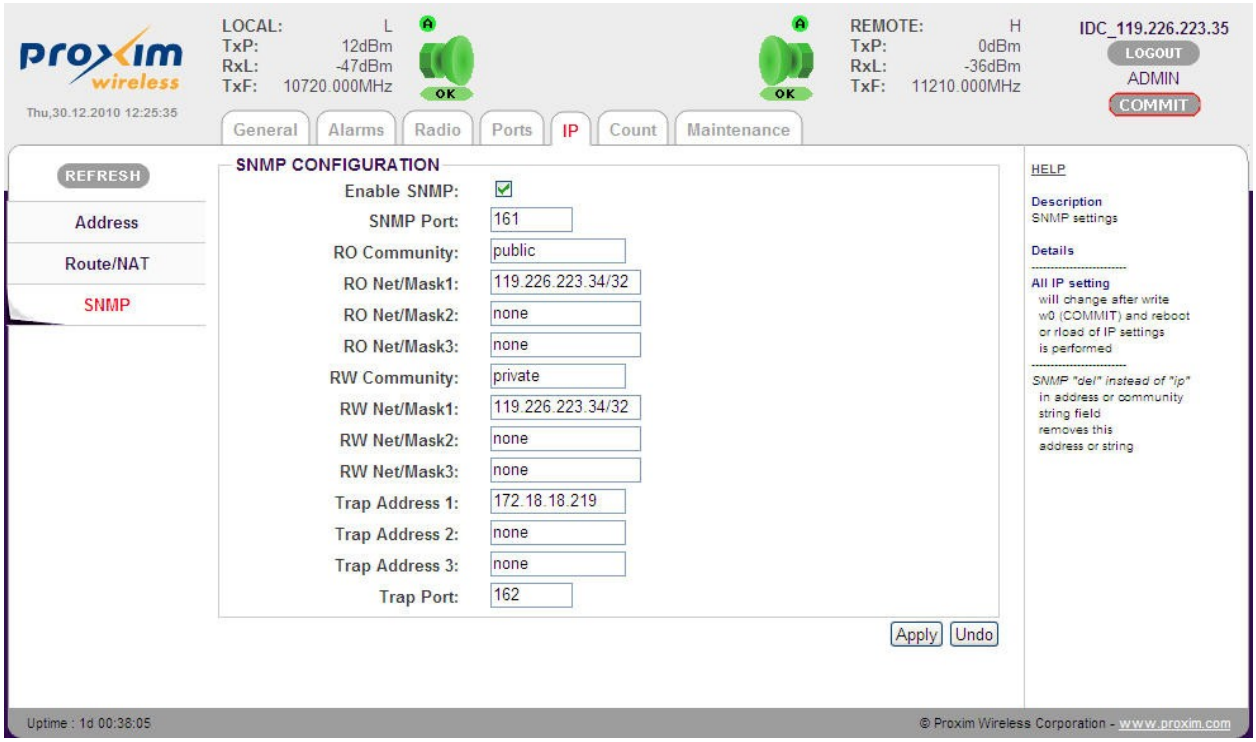


Figure 43: SNMP

The SNMP configurable parameters are,

- **Enable SNMP**: Indicates the access rights of an SNMP agent
- **SNMP Port**: Port number for IP-SNMP access
- **RO Community**: Community string for read-only access
- **RO Net/Mask1-3**: Accessible address/net for read access
- **RW Community**: Community string for write access
- **RW Net/Mask1-3**: Accessible address/net for write access
- **Trap Address1-3**: IP address for SNMP traps distributions
- **Trap Port**: Port number for IP-SNMP Trap messages

After configuring the parameters, click **Apply**.

Click **COMMIT** to save the configured parameters.

IP Management

To access the management port, use either the connection via 10/100 Fast Ethernet port, which is connected to the switch B, or with the LAN A-B switch interconnection set (LAN A-B switch on) or by means of a 10/100/1000 Gigabit Ethernet port. Other ports on the CPU are primarily used for connecting remote IDU or remote external device.

In-Band Management through Gigabit Ethernet port

In the simplest case, it is possible to supervise the entire system from one or both sides of the link via the Gigabit Ethernet port(s). The management data together with the user data are

brought via the common Gigabit cable from the external Ethernet switch to IDU (see IDU1 and IDU2 in Figure 44 below).

Given below is an example which illustrates the connection of individual management ports in the IDUs along with the method to configure IP settings of both the IDUs.

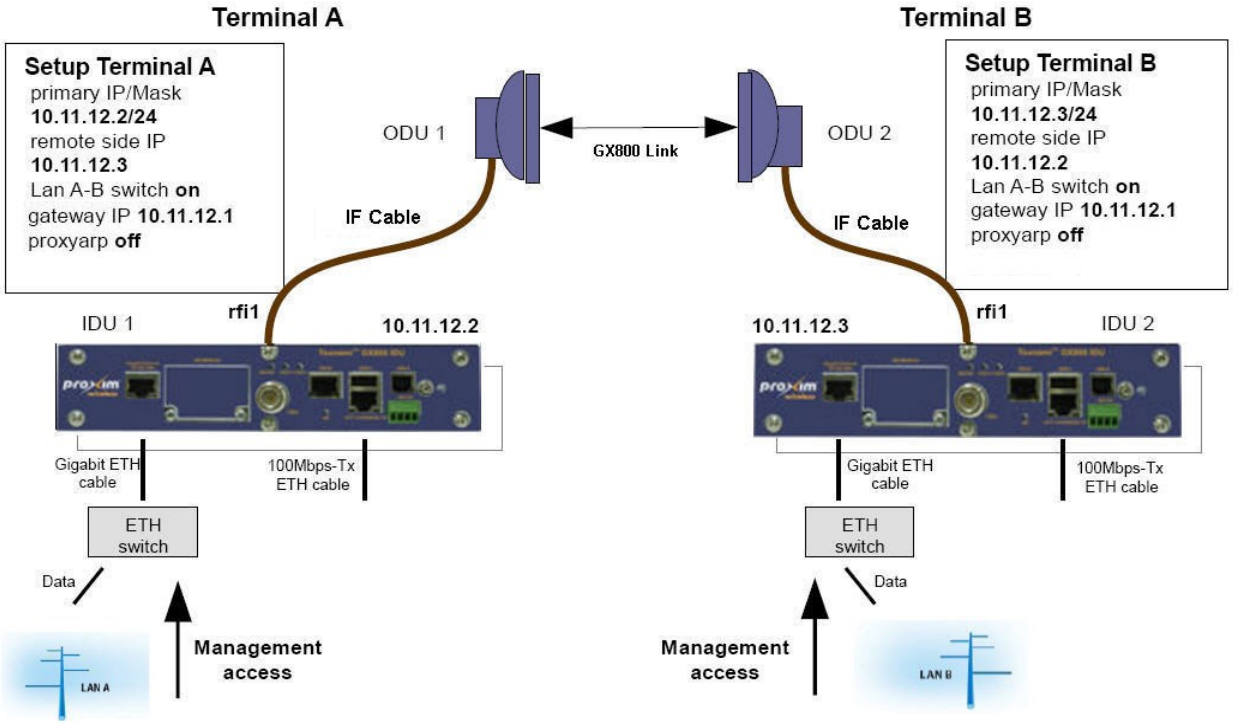


Figure 44: In-Band Management through Gigabit Ethernet Port

Out-of-Band Management through Fast Ethernet Port – Access from one side

Another option is to supervise the entire system from one side of the GX800 link separately from the user data through Fast ETHERNET port. The management data are brought independently from user data into the management port in IDU. Connect management PC into the Fast ETHERNET port on side A.

Given below is an example which illustrates the connection of individual management ports in the IDUs along with the method to configure IP settings of both the IDUs.

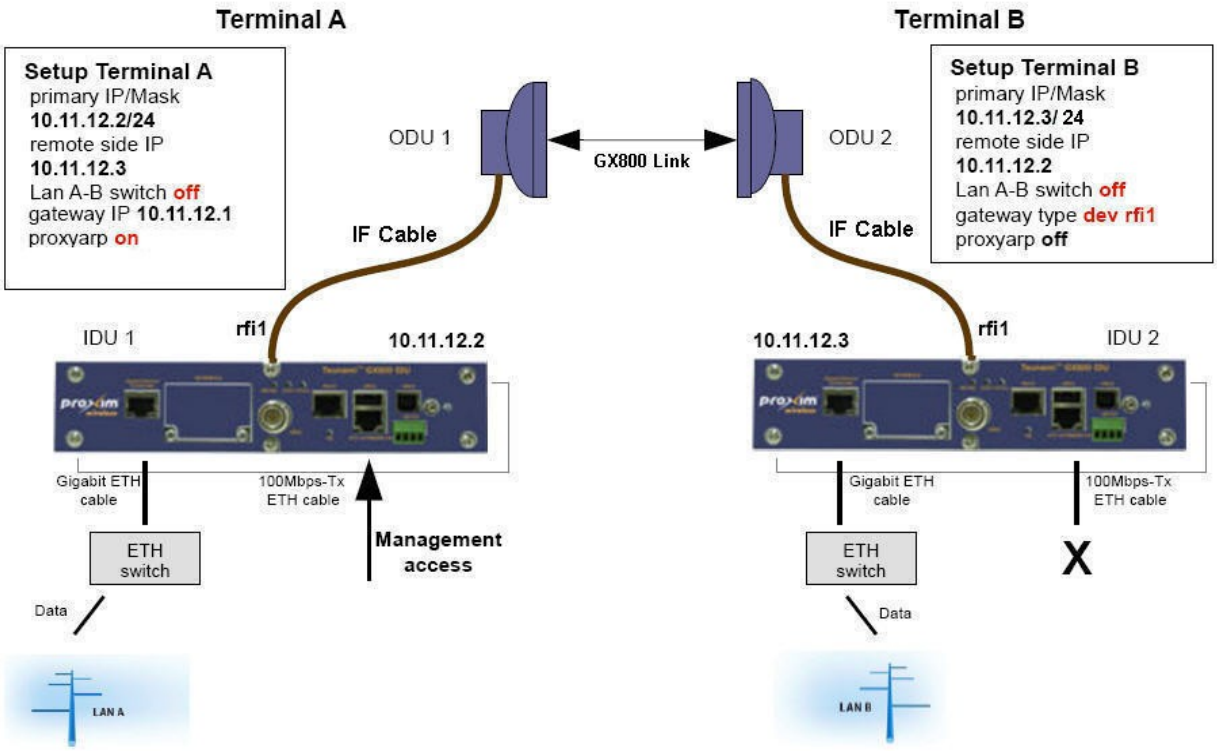


Figure 45: Out-of-band management over Fast ETHERNET port – Access from one side

By modifying this configuration, we can get limited access also from the second side of the link. For example, by setting the mask on the B-side to 30, the IP of the management PC on B-side will be 10.11.12.4/30 and it will have the gateway set to 10.11.12.3. Then set the static route of the device for the management PC on the A-side:

via IP/dev rfi1: dev rfi1

Routed IP/MASK: 10.11.12.4

Out-of-Band Management over Fast Ethernet Port – Standard Routing Scheme (two independent subnets)

For management access from both the sides of the link (where management data is separated from the user data) it is necessary to observe the rules of static routing. Further, it is necessary to have the IP addresses from different subnets on each side of the link. This technique is the most complicated, but the most neat one in terms of complex network projects. The block diagram of IDU in terms of IP is shown in the following figure.

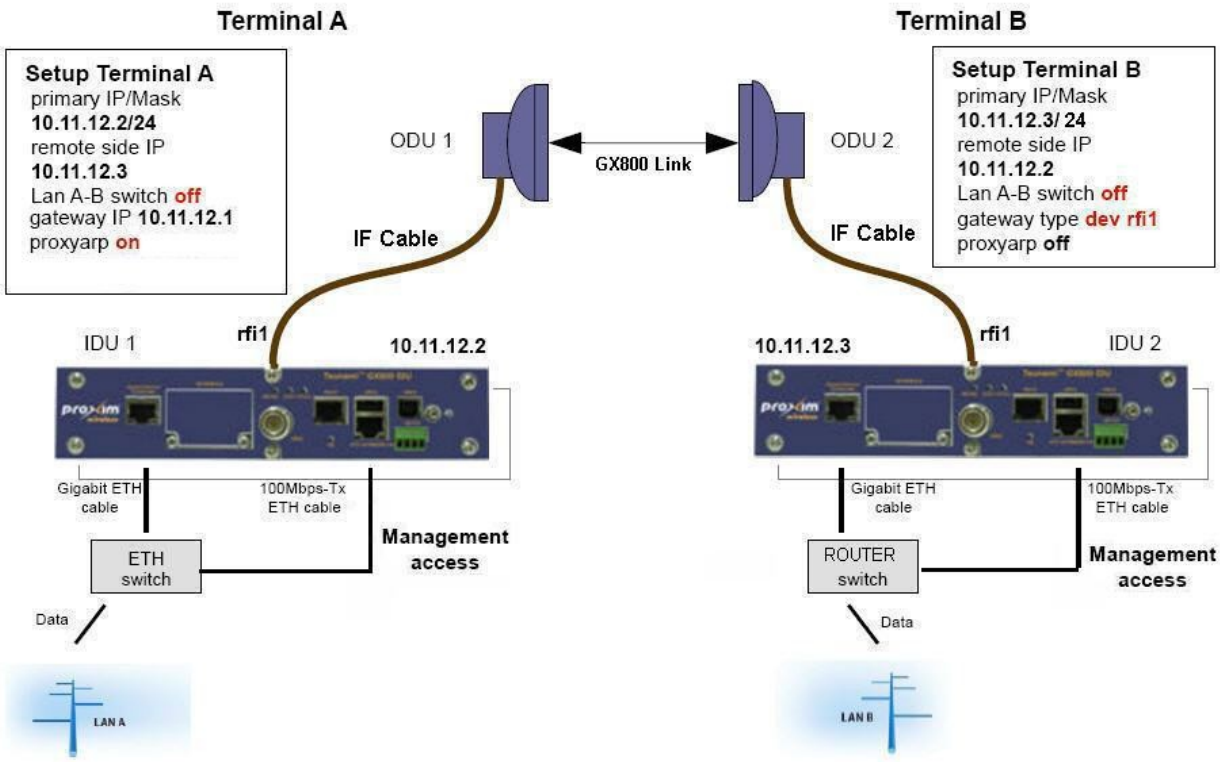


Figure 46: Out-of-Band Management over Fast Ethernet Port

The figure below indicates the IP settings for both the IDUs. The device A is in the subnet 10.11.12.xx/24 and the device B is in the subnet 10.11.13.xx/24.

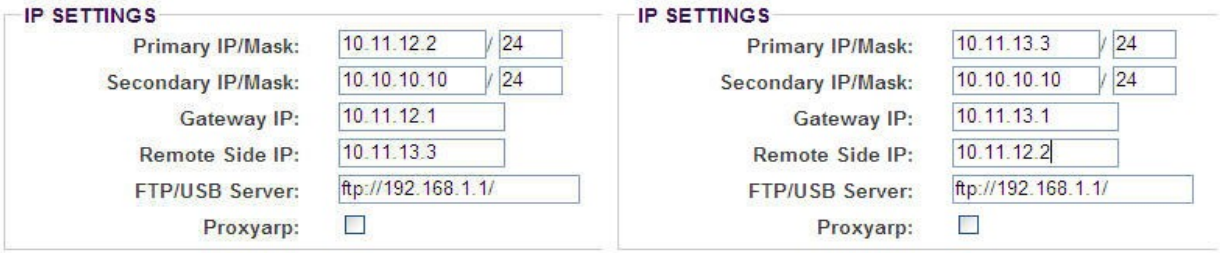


Figure 47: IP setup for device A (left) and device B (right)

The example of adding NAT and route rules is shown in the following figure.

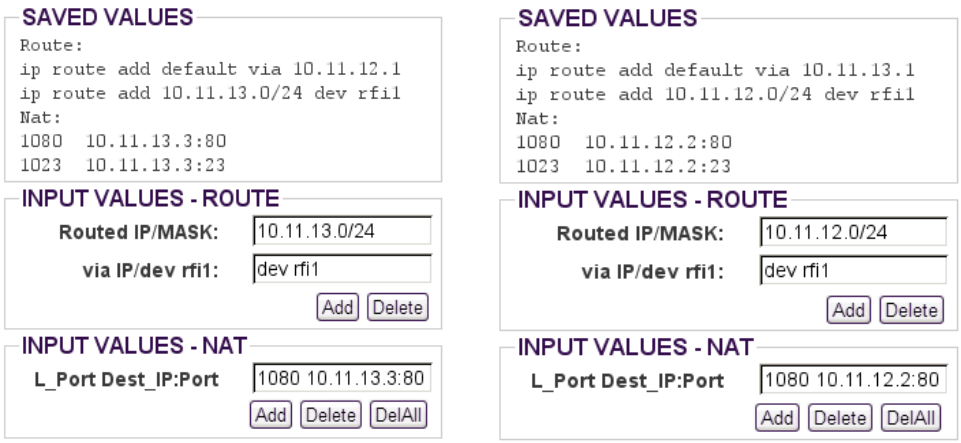


Figure 48: Static Routes and NAT Setup for device A (left) and device B (right)

In-band and Out-of-band Management – NAT

The simplest and the most recommended solution is a combination of in-band and out-of-band management. This solution permits access from one or both sides of the link via Gigabit ETHERNET port and also from Fast ETHERNET port (beware of and avoid possible loop on Ethernet).

The remote device can be managed via In-band management and Out-of-Band management.

In In-band management, the management traffic flows with the regular wireless user traffic. For example, direct access of the remote device by using remote device's direct IP address.

In out-of-band management, the management traffic will flow in a separate RFI channel and not as part of regular user traffic. For configuring the out-of-band management, you need to configure to access the remote device access on ports defined in NAT rules in the local device.

The following figure illustrates the connection of individual management ports in the IDUs along with the method to configure IP settings of both the IDUs.

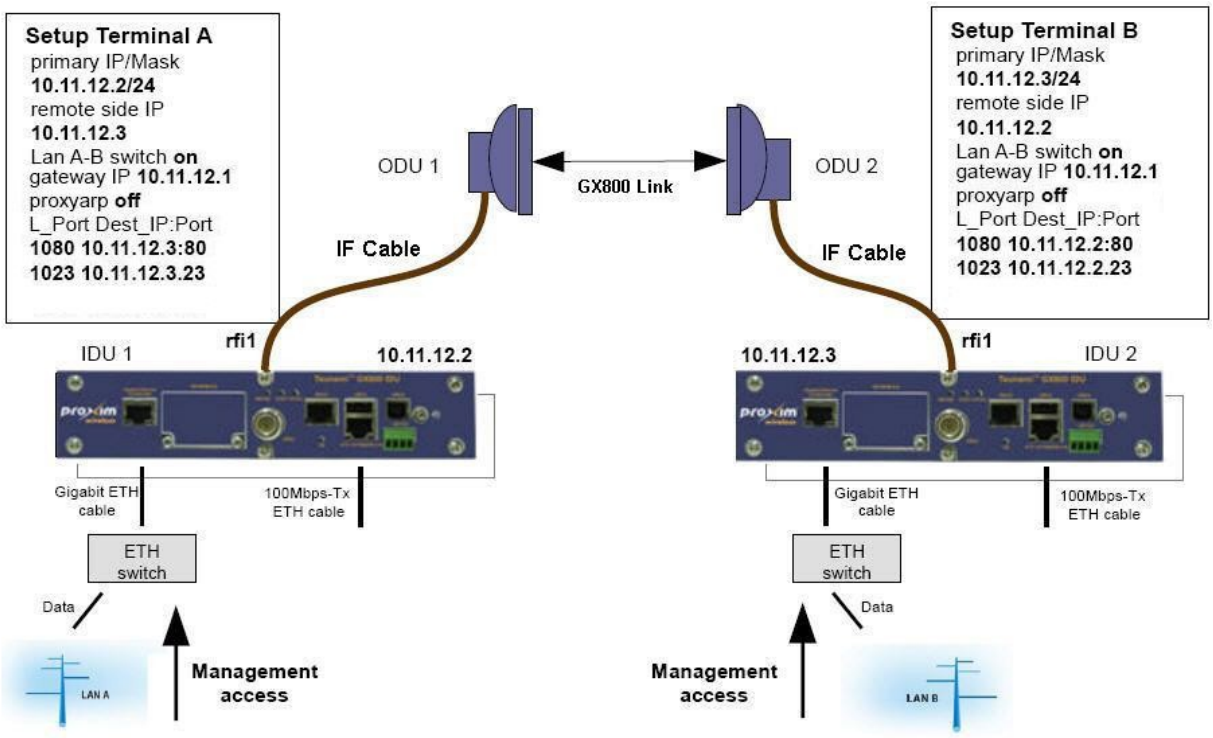


Figure 49: In-band and Out-of-band Management – NAT

Chapter 5 Troubleshooting

User Login Problems

A user logs out from the application without LOGOUT only when another user logs in and kill the current user. Please note that an Administrator user can kill USER/GUEST but vice-versa is not applicable.

To avoid login problems, do not use browser's “back“, “forward” or “refresh” buttons but only the links and buttons of the web interface.

A user might log out also when the link takes longer time to respond.

Login Problems While Device Restarts

- **Web Interface:** These problems occur when when the ODU is not connected and you tried to login before the connection got established. When the device restarts, wait for about 30-60 seconds, and then login.

- **Command Prompt:** When you try to login to the device after its restart using RJ45 to RS232 interface and a message is displayed at prompt saying “no access”. This happens probably when IDU does not communicate correctly with its own peripheries including ODU (typically disconnected ODU). This status can last about 30 seconds. If it happens for a longer period of time during the device operation, or if these commands cause terminal “freezing”, use the command “reset killmonitor” (it causes shorter drop out – approximately 5 seconds), or restart device (“reset system” - longer drop out – approximately 35 seconds).

Problems in Communicating with the ODU

When you face these problems, disconnect the IF cable from ODU and measure voltage on the ODU RF connector. The measure voltage should be same as IDU supply voltage (Depending on the cable length, the maximal decline is -2 V). If it is not same then check the device consumption. The IDU consumption together with ODU should be approximately 1 A.

Problems in Setting ODU Parameters

Before setting the ODU parameters (**set rad txf** and **set rad txp**) in the text mode, use “?” for viewing adjustable values. Maximal output power of ODU depends on the type of modulation.

Problems with Modem Synchronization

Check the external Automatic Gain Control (AGC) which is the automatic adjustment of IDU gain at receiving way (cable). The ideal value is between 4 to 16 dB. The more the value, the higher is the IF attenuation. The displayed gain can be a maximum of 17.5 dB, which means:

1. No signal is received
2. ODU is not powered
3. Broken cable

Problems with Received Signal (Rx) level at ODU

Check whether the ODU parameters are properly set (the Tx frequency and Rx frequency should be same on both the terminals, adequate output power and ODU is not muted) for both the IDUs. Next, check for correct installation and antenna alignment (voltmeter on BNC connector).

Problems with MSE

Check the received power at ODU. If it is OK, switch off the opposite ODU and scan the band (Radio / analyzer). By this, you will find the background noise in a given band. If the problem is not caused by noise, check the RF cable (connectors, shielding and so on).

Problems with Failing Link

Check the counters on RFI (Count / rfi/hsi), erase (button Clear) and check the counters on RFI again. If there are errors (the frames are not counted, the error frames are counted) check MSE (General / status – MSE) and Rx Level at ODU (General / status – Rx Level). If you still face problem, follow the instructions as mentioned earlier.

Problems with Ethernet Connection

Check the setup (Ports / parameters) of LAN ports. The setup has to be the same as setup on the opposite terminal (switch, PC, router and so on). Try to analyze the problem with the help of frame counters (Count / LAN basic) and detailed counters (Count / LAN detailed).

Problems with IP Management

IP parameters get saved in the memory only after device reboot. Change in the IP address can be a router problem (before change of arp table). You can display the actual adjusted parameters including the counters by the command “sh IP stat” (count / IP), actual routers by the command “sh IP route” (IP / route).

Use program “ping ip_address_of_your_device” from Personal Computer and trace counters via Personal Computer serial console (“sh ip stat”). Use “ping ip_address_your_PC” from device and trace counters; Use “ping ip_address_starting_gate”, eventually “ping ip_address_device_with_the_same_subnet” and trace printout and counters. With incorrect visualization of opposite device status, check the IP address setup of remote rfi (“sh ip conf”) (IP / address).

Firmware Update Problems

- Do not downgrade firmware onto the device
- Always clear the web browser cache

Chapter 6 - Technical Parameters

General

Item	*Parameter*	*Value*
Frequency	Operating Frequency Range	6 to 38 GHz
	Frequency Plans	According to CEPT/ITU-R recommendations
	T/R Spacing	According to CEPT/ITU-R recommendations
Modulation	Modulation Schemes	QPSK, 16QAM, 32QAM, 64QAM, 128QAM, 256QAM
	ACM	Three step adaptive modulation (user-defined)
	CEPT/ETSI Bandwidths	7/14(13.75)/28(27.5)/56 MHz
	ANSI/FCC Bandwidths	10/20/30/40/50 MHz
Data Transmission	Capacity Allocation	Packet transport (priority based packet system)
	Path Configuration	1+0
	Forward Error Correction	FEC, Predistortion, Equalization, Internal BER
	Compression Function	Online Ethernet header compression

Frequency Bands

Transmit Range[1]		*T/R Spacing*	*Bandwidth*
Minimum (MHz)	*Maximum (MHz)*	*(MHz)*	*(MHz)*
6 GHz			
5915.55	5989.675	252.04	74.125
6167.59	6241.715	252.04	74.125
5974.85	6048.975	252.04	74.125
6226.89	6301.015	252.04	74.125
6034.15	6108.275	252.04	74.125
6286.19	6360.315	252.04	74.125
6093.45	6167.575	252.04	74.125
6345.49	6419.615	252.04	74.125
5850	5946	300	96
6150	6246	300	96
5918	6014	300	96
6218	6314	300	96
5986	6082	300	96
6286	6382	300	96
6054	6150	300	96
6354	6450	300	96
6540	6600	160	60
6700	6760	160	60
6580	6640	160	60

6740	6800	160	60
6620	6680	160	60
6780	6840	160	60
6660	6710	160	50
6820	6870	160	50
6540	6590	170	50
6710	6760	170	50
6580	6630	170	50
6750	6800	170	50
6620	6670	170	50
6790	6840	170	50
6660	6700	170	40
6830	6870	170	40
6425	6509	340	84
6765	6849	340	84
6481	6564	340	83
6821	6904	340	83
6536	6619	340	83
6876	6959	340	83
6591	6674	340	83
6931	7014	340	83
6646	6729	340	83
6986	7069	340	83
6701	6785	340	84
7041	7125	340	84
6425	6499	350	74
6775	6849	350	74
6481	6554	350	73
6831	6904	350	73
6536	6609	350	73
6886	6959	350	73
6591	6664	350	73
6941	7014	350	73
6646	6719	350	73
6996	7069	350	73
6701	6775	350	74
7051	7125	350	74
7 GHz			
7093	7149	196	56
7289	7345	196	56
7121	7177	196	56
7317	7373	196	56
7149	7205	196	56
7345	7401	196	56

7177	7233	196	56
7373	7429	196	56
7205	7261	196	56
7401	7457	196	56
7114	7177	161	63
7275	7338	161	63
7149	7212	161	63
7310	7373	161	63
7184	7247	161	63
7345	7408	161	63
7219	7282	161	63
7380	7443	161	63
7239	7302	161	63
7400	7463	161	63
7274	7337	161	63
7435	7498	161	63
7309	7372	161	63
7470	7533	161	63
7344	7407	161	63
7505	7568	161	63
7414	7477	161	63
7575	7638	161	63
7449	7512	161	63
7610	7673	161	63
7484	7547	161	63
7645	7708	161	63
7519	7582	161	63
7680	7743	161	63
7539	7602	161	63
7700	7763	161	63
7574	7637	161	63
7735	7798	161	63
7609	7672	161	63
7770	7833	161	63
7644	7707	161	63
7805	7868	161	63
7428	7484	154	56
7582	7638	154	56
7470	7526	154	56
7624	7680	154	56
7512	7568	154	56
7666	7722	154	56
7433.5	7496.5	160	63
7593.5	7656.5	160	63

7478.5	7541.5	160	63
7638.5	7701.5	160	63
7526	7589	160	63
7686	7749	160	63
7443	7499	168	56
7611	7667	168	56
7485	7541	168	56
7653	7709	168	56
7527	7583	168	56
7695	7751	168	56
7400	7484	245	84
7645	7729	245	84
7484	7568	245	84
7729	7813	245	84
7568	7652	245	84
7813	7897	245	84
8 GHz			
8279	8307	119 & 126*	28
8398	8426	119 & 126*	28
8293	8321	119 & 126*	28
8412	8440	119 & 126*	28
8307	8335	119 & 126*	28
8426	8454	119 & 126*	28
8321	8349	119 & 126*	28
8440	8468	119 & 126*	28
8335	8363	119 & 126*	28
8454	8482	119 & 126*	28
8349	8377	119 & 126*	28
8468	8496	119 & 126*	28
8043	8113	208	70
8251	8321	208	70
8099	8169	208	70
8307	8377	208	70
8155	8225	208	70
8363	8433	208	70
8211	8281	208	70
8419	8489	208	70
7905	8024	266	119
8171	8290	266	119
8017	8136	266	119
8283	8402	266	119
7731	7867	311.32	136
8042	8178	311.32	136
7835	7971	311.32	136

8146	8282	311.32	136
10 GHz			
10150	10300	350	150
10500	10650	350	150
11 GHz			
10700	10890	490 & 500*	190
11200	11390	490 & 500*	190
10855	11045	490 & 500*	190
11355	11545	490 & 500*	190
11010	11200	490 & 500*	190
11510	11700	490 & 500*	190
10675	10855	530	180
11205	11385	530	180
10795	10975	530	180
11325	11505	530	180
10915	11135	530	220
11445	11665	530	220
11035	11215	530	180
11565	11745	530	180
13 GHz			
12751	12814	266	63
13017	13080	266	63
12807	12870	266	63
13073	13136	266	63
12863	12926	266	63
13129	13192	266	63
12919	12982	266	63
13185	13248	266	63
15 GHz			
14627	14732	315	105
14942	15047	315	105
14725	14844	315	119
15040	15159	315	119
14823	14928	315	105
15138	15243	315	105
14501	14613	420	112
14921	15033	420	112
14606	14725	420	119
15026	15145	420	119
14718	14837	420	119
15138	15257	420	119
14816	14928	420	112
15236	15348	420	112
14403	14522	490	119

14893	15012	490	119
14515	14634	490	119
15005	15124	490	119
14627	14746	490	119
15117	15236	490	119
14739	14858	490	119
15229	15348	490	119
14500	14668	475	168
14975	15143	475	168
14660	14828	475	168
15135	15303	475	168
14715	14883	475	168
15190	15358	475	168
14500	14610	640	110
15140	15250	640	110
14605	14715	640	110
15245	15355	640	110
14400	14512	644	112
15044	15156	644	112
14498	14610	644	112
15142	15254	644	112
14596	14708	644	112
15240	15352	644	112
14500	14615	728	115
15228	15343	728	115
18 GHz			
17685	17985	1010 & 1008*	300
18695	18995	1010 & 1008*	300
17930	18230	1010 & 1008*	300
18940	19240	1010 & 1008*	300
18180	18480	1010 & 1008*	300
19190	19490	1010 & 1008*	300
18400	18700	1010 & 1008*	300
19410	19710	1010 & 1008*	300
17700	18000	1560	300
19260	19560	1560	300
17840	18140	1560	300
19400	19700	1560	300
17700	18140	1560	440
19260	19700	1560	440
23 GHz			
22000	22314	1008	314
23008	23322	1008	314
22286	22600	1008	314

23294	23608	1008	314
21200	21600	1200	400
22400	22800	1200	400
21600	22000	1200	400
22800	23200	1200	400
22000	22400	1200	400
23200	23600	1200	400
21200	21500	1232	300
22432	22732	1232	300
21472	21786	1232	314
22704	23018	1232	314
21779	22093	1232	314
23011	23325	1232	314
22086	22386	1232	300
23318	23618	1232	300
26 GHz			
25050	25250	800	200
24549	24871	1008	322
25557	25879	1008	322
24843	25151	1008	308
25851	26159	1008	308
25123	25445	1008	322
26131	26453	1008	322

[1] *These values indicate ODU tuning range and not center frequencies.*

** Represents dual T/R Spacing supported by the software.*

Receive Sensitivities and Emission Designator for 11GHz

Modulation name	*Modulation*	*Bandwidth (MHz)*	*Receive Sensitivities (dBm)*	*Capacity (Mbps)*	*Emission Designator*
ETSI Modulations					
QPSK_07e6_01	QPSK	7	-94.4	8.97	7M00D1D
QPSK_07e6_02	QPSK	7	-92.3	10.26	7M00D1D
QAM16_07e6_01	16QAM	7	-86.4	20.64	7M00D1D
QAM16_07e6_02	16QAM	7	-85.4	22.15	7M00D1D
QAM32_07e6_01	32QAM	7	-83.3	26.06	7M00D1D
QAM32_07e6_02	32QAM	7	-82.4	27.71	7M00D1D
QAM64_07e6_01	64QAM	7	-80.1	31.02	7M00D1D
QAM64_07e6_02	64QAM	7	-78.9	33.28	7M00D1D
QPSK_14e6_01	QPSK	14	-91.1	18.74	14M0D1D
QPSK_14e6_02	QPSK	14	-89.2	21.64	14M0D1D

QAM16_14e6_01	16QAM	14	-83.7	40.05	14M0D1D
QAM16_14e6_02	16QAM	14	-82.6	42.98	14M0D1D
QAM32_14e6_01	32QAM	14	-80.6	50.1	14M0D1D
QAM32_14e6_02	32QAM	14	-79.3	53.75	14M0D1D
QAM64_14e6_01	64QAM	14	-77.2	60.14	14M0D1D
QAM64_14e6_02	64QAM	14	-75.9	64.52	14M0D1D
QAM128_14e6_01	128QAM	14	-72.1	75.3	14M0D1D
QAM128_14e6_02	128QAM	14	-71.8	76.57	14M0D1D
QPSK_28e6_01	QPSK	28	-86.3	38.88	28M0D1D
QPSK_28e6_02	QPSK	28	-85.1	44.23	28M0D1D
QAM16_28e6_01	16QAM	28	-82.6	73.1	28M0D1D
QAM16_28e6_02	16QAM	28	-80	85.57	28M0D1D
QAM32_28e6_01	32QAM	28	-77.2	104.18	28M0D1D
QAM32_28e6_02	32QAM	28	-76.2	110.76	28M0D1D
QAM64_28e6_01	64QAM	28	-75.3	128.55	28M0D1D
QAM64_28e6_02	64QAM	28	-72.9	134.06	28M0D1D
QAM128_28e6_01	128QAM	28	-73	134.25	28M0D1D
QAM128_28e6_02	128QAM	28	-70.1	156.99	28M0D1D
QAM256_28e6_01	256QAM	28	-67.8	168.78	28M0D1D
QAM256_28e6_02	256QAM	28	-66.5	179.43	28M0D1D
QPSK_40e6_01	QPSK	40	-83.5	55.75	40M0D1D
QPSK_40e6_02	QPSK	40	-83.5	60.83	40M0D1D
QAM16_40e6_01	16QAM	40	-79.1	111.62	40M0D1D
QAM16_40e6_02	16QAM	40	-77.7	121.78	40M0D1D
QAM32_40e6_01	32QAM	40	-77.7	137.02	40M0D1D
QAM32_40e6_02	32QAM	40	-74.5	152.26	40M0D1D
QAM64_40e6_01	64QAM	40	-74.5	167.49	40M0D1D
QAM64_40e6_02	64QAM	40	-71.4	182.73	40M0D1D
QAM128_40e6_01	128QAM	40	-71.4	197.97	40M0D1D
QAM128_40e6_02	128QAM	40	-68.9	209.65	40M0D1D
QAM256_40e6_01	256QAM	40	-66.5	225.4	40M0D1D
QAM256_40e6_02	256QAM	40	-65.2	239.62	40M0D1D
QPSK_56e6_01	QPSK	56	-83.5	77.2	56M0D1D
QPSK_56e6_02	QPSK	56	-82.5	82.82	56M0D1D
QAM16_56e6_01	16QAM	56	-77.8	154.51	56M0D1D
QAM16_56e6_02	16QAM	56	-76.2	168.56	56M0D1D
QAM32_56e6_01	32QAM	56	-76.2	189.65	56M0D1D
QAM32_56e6_02	32QAM	56	-72.9	210.73	56M0D1D
QAM64_56e6_01	64QAM	56	-73	231.82	56M0D1D
QAM64_56e6_02	64QAM	56	-70	252.9	56M0D1D
QAM128_56e6_01	128QAM	56	-69.8	273.99	56M0D1D
QAM128_56e6_02	128QAM	56	-66	299.99	56M0D1D
QAM256_56e6_01	256QAM	56	-64.8	310.65	56M0D1D

ANSI Modulations					
QPSK_10e6_01	QPSK	10	-91.2	14.28	10M0D1D
QPSK_10e6_02	QPSK	10	-90.2	15.33	10M0D1D
QAM16_10e6_01	16QAM	10	-85	28.94	10M0D1D
QAM16_10e6_02	16QAM	10	-84	30.77	10M0D1D
QAM32_10e6_01	32QAM	10	-81.8	36.2	10M0D1D
QAM32_10e6_02	32QAM	10	-80.8	38.49	10M0D1D
QAM64_10e6_01	64QAM	10	-78.5	43.46	10M0D1D
QAM64_10e6_02	64QAM	10	-77.5	46.21	10M0D1D
QPSK_20e6_01	QPSK	20	-87.8	29.51	20M0D1D
QPSK_20e6_02	QPSK	20	-86.8	31.66	20M0D1D
QAM16_20e6_01	16QAM	20	-81.9	59.14	20M0D1D
QAM16_20e6_02	16QAM	20	-81	63.44	20M0D1D
QAM32_20e6_01	32QAM	20	-78.9	73.95	20M0D1D
QAM32_20e6_02	32QAM	20	-77.8	79.33	20M0D1D
QAM64_20e6_01	64QAM	20	-75.8	88.76	20M0D1D
QAM64_20e6_02	64QAM	20	-74.7	95.22	20M0D1D
QAM128_20e6_01	128QAM	20	-72.9	103.57	20M0D1D
QAM128_20e6_02	128QAM	20	-71.7	111.11	20M0D1D
QAM256_20e6_01	256QAM	20	-69.4	118.39	20M0D1D
QAM256_20e6_02	256QAM	20	-68.2	127	20M0D1D
QPSK_30e6_01	QPSK	30	-85.8	44.57	30M0D1D
QPSK_30e6_02	QPSK	30	-84.8	47.82	30M0D1D
QAM16_30e6_01	16QAM	30	-80	90.08	30M0D1D
QAM16_30e6_02	16QAM	30	-79	95.76	30M0D1D
QAM32_30e6_01	32QAM	30	-76.9	112.62	30M0D1D
QAM32_30e6_02	32QAM	30	-76	119.73	30M0D1D
QAM64_30e6_01	64QAM	30	-73.8	135.17	30M0D1D
QAM64_30e6_02	64QAM	30	-72.5	144.92	30M0D1D
QAM128_30e6_01	128QAM	30	-71	156.3	30M0D1D
QAM128_30e6_02	128QAM	30	-69.8	167.67	30M0D1D
QAM256_30e6_01	256QAM	30	-67.6	180.27	30M0D1D
QAM256_30e6_02	256QAM	30	-66.1	191.64	30M0D1D
QPSK_40e6_01	QPSK	40	-83.5	55.75	40M0D1D
QPSK_40e6_02	QPSK	40	-83.5	60.83	40M0D1D
QAM16_40e6_01	16QAM	40	-79.1	111.62	40M0D1D
QAM16_40e6_02	16QAM	40	-77.7	121.78	40M0D1D
QAM32_40e6_01	32QAM	40	-77.7	137.02	40M0D1D
QAM32_40e6_02	32QAM	40	-74.5	152.26	40M0D1D
QAM64_40e6_01	64QAM	40	-74.5	167.49	40M0D1D
QAM64_40e6_02	64QAM	40	-71.4	182.73	40M0D1D
QAM128_40e6_01	128QAM	40	-71.4	197.97	40M0D1D
QAM128_40e6_02	128QAM	40	-68.9	209.65	40M0D1D

QAM256_40e6_01	256QAM	40	-66.5	225.4	40M0D1D
QAM256_40e6_02	256QAM	40	-65.2	239.62	40M0D1D
QPSK_50e6_01	QPSK	50	-83.4	73.7	50M0D1D
QPSK_50e6_02	QPSK	50	-82.4	79.07	50M0D1D
QAM16_50e6_01	16QAM	50	-77.9	147.51	50M0D1D
QAM16_50e6_02	16QAM	50	-76.9	158.25	50M0D1D
QAM32_50e6_01	32QAM	50	-74.9	184.42	50M0D1D
QAM32_50e6_02	32QAM	50	-73.6	197.84	50M0D1D
QAM64_50e6_01	64QAM	50	-71.7	221.32	50M0D1D
QAM64_50e6_02	64QAM	50	-70.7	237.43	50M0D1D
QAM128_50e6_01	128QAM	50	-68.7	258.23	50M0D1D
QAM128_50e6_02	128QAM	50	-67.5	277.02	50M0D1D
QAM256_50e6_01	256QAM	50	-65.6	295.13	50M0D1D
QAM256_50e6_02	256QAM	50	-64.4	311.24	50M0D1D

ODU Specification

	6 [GHz]	***7 [GHz]***	***8 [GHz]***	***11 [GHz]***	***13 [GHz]***	***15 [GHz]***	***18 [GHz]***	***23 [GHz]***	***26 [GHz]***
TR Space [MHz] / Sub-bands [number]	160/4	154/3	119/6	490/3	266/4	315/3	1010/4	1008/2	800/1
	170/4	160/3	126/6	500/3		420/4	1008/4	1200/3	1008/3
	252.04/ 4	161/16	208/4	530/4		475/3	1560/3	1232/4	
	300/4	168/3	266/2			490/4			
	340/6	196/5	311.32/ 2			640/2			
	350/6	245/3				644/3			
						728/1			

ODU RF Specification

Item	***Parameter***	***Value***
Polarization	Linear per Antenna	Vertical or Horizontal
Mounting	Remote Mount	for bands 6, 7, 8 GHz
	Antenna direct mount	for bands 7-38 GHz
Transmitter	Frequency Stability	± 5 ppm
Receiver	Frequency Stability	± 5 ppm

IDU Specification

IDU Traffic Interfaces

Item	***Parameter***	***Value***
10/100/1000 Gigabit Ethernet Port	Number of Ports	1 (RJ45)
	Basic Function	User traffic interface/management
	VLAN	Up to 64 VLANs

and **10/100 Fast Ethernet Port**	QoS	802.1p, IPv4 Type of TOS/DiffServ, IPv6 Traffic Class

Network Management

Parameter	*Value*
Channel	In-band and out-of-band
SNMP	SNMP v1/v2c, Manageable through ProximVision ES (PVES)
Telnet	IP Based via dedicated NMS port
RS232 Port	RJ45 to RS232 Serial port (ASCII console)
HTTP	Web based GUI
USB	USB A - USB Memory Management Port USB B – Craft Port
Out-of-Band Interface	10/100 Fast Ethernet Port

Waveguide Interface Specifications

Frequency Band	*Circular Waveguide*	*Rectangular Waveguide*
6	N/A	N/A
7	WC112	WR112
8	WC112	WR112
10	N/A	WR90
11	WC75	WR75
13	WC75	WR75
15	WC62	WR62
18	WC51	WR42
23	WC42	WR42
26	WC42	WR42

!! Note !! The default type is Rectangular but coaxial option for 6GHz is available.

Miscellaneous

Item	*Parameter*	*Value*
IDU Mechanical	Dimension [w x h x d]	10.0 x 1.73 x 7.9 inches (Std 19” Half rack mount and 1U height)
	Weight	2.6lbs
ODU Mechanical	Dimension [w x h x d]	10.9 x 9.4 x 3.6 inches
	Weight	Less than or equal to 9.5 lbs
Input Voltage Level	IDU	-20 VDC up to -60 VDC
	ODU	-20 VDC up to -60 VDC

Power Consumption	IDU only	Less than 20 Watts
	ODU only	Less than 35 Watts
	IDU+ODU	Less than < 55 Watts
	Maximum ODU current	up to 1.8 A DC
Environmental Operational Conditions	IDU Temperature	ETS 300 019 Class 3.2 (-5 to +45°C)
	IDU Humidity	0 to 95%, Non condensing
	ODU Temperature	ETS 300 019-2-4 Class 4M5 (-45 to +65ºC)
	ODU Humidity	0 to 95%, Non condensing

Chapter 7 - Appendix

Appendix A – Command Set

Description of Command Line Interface

When you logon to the device through CLI, the following command prompt (telnet, hyper terminal) appears.

Name_NM\#

Name	-	name of device
N	-	N/E – current status of device
M	-	N/E – historically was/ was not error
\	-	"\" saved / "|" unsaved changes
#	-	">" classical / "#" enable mod

Brief Description of the Commands

The command "sh system" displays the general status of the device. Following are the possible status of the device:

- **ok** : The turned-on controls are OK – LED is on
- **warning** : The non-system turned-on controls are in error status – LED blinks
- **error** : The system turned-on controls (last 3 rows sh alarm all) are in error status – LED is turned-off

The device is equipped with control mechanisms such as:

- Detailed counters of Ethernet frames ("sh lan cou" …., "sh cou lan")
- Frames for rfi with crc control ("sh cou rfi")
- e3 frames with control of header ("sh cou hsi")
- Internal test of bitwise errors ("sh ber") with error history ("sh his ber")
- Administration of actual status with control (able to turn-off) of parameters and function ("sh his ber")
- History of error parameters ("sh alarm dump") and their setting ("sh alarm conf") affecting the generation of SNMP traps.

To obtain actual configuration values and view the status of controls (reports), use the following commands:

```
xxx\#sh alarm all
REPORT-SETTING:-|   |-STATUS
600 g703_p1_link : off err
601 g703_p1_ais : off ok
602 g703_p2_link : off err
603 g703_p2_ais : off ok
632 lana1_link : off err
636 lanb1_link : off ok
640 hsi_los : off err
641 hsi_fer : off ok
644 mse_low : off err
```

649 mod_los : on err
650 rfi_los : off err
651 rfi_fer : off ok
652 idu_temp : on ok
653 odu_temp : on err
654 odu_RxL : on err
655 odu_comm : on err
656 odu_alarm : on ok
657 license : on ok
660 idu_hwerr : on ok
661 idu_swerr : on ok

600 g703_p1_link : off ok	- in HSI 2xE1 modules there is no link by first channel
601 g703_p1_ais : off ok	- in HSI 2xE1 module there is AIS signal by first channel
602 g703_p2_link : off ok	- for 2nd channel, setting “set ala add/rem g703 ch2”
603 g703_p2_ais : off ok	
632 lana1_link : off err	- there is no link by Gbit eth, setting “set rep add/rem c channel”
636 lanb1_link : off ok	- similarly, setting “set ala add/rem lanb1”
640 hsi_los : off err	- by HSI e3 modules there is no frame sync “set ala add hsi”
641 hsi_fer : off ok	- frame error rate by HSI exceeded adjusted limit
649 mod_los : on ok	- modem sync loss – setting “set ala add/rem rfi”
650 rfi_los : on ok	- as is by HSI, setting “set ala add/rem rfi”
651 rfi_fer : on ok	- as is by HSI, setting “set ala add/rem rfi”
652 idu_temp : on ok	- IDU temperature is out of limit (-5-60°C) “set ala add sys”
653 odu_temp : on ok	- ODU temperature is out of scope(-25-55°C) “set ala add/rem rad”
654 odu_RxL : on ok	- received level on ODU is under adjusted valuation
655 odu comm : on ok	- communication error with ODU, setting set ala add rad rad
656 odu_alarm : on ok	- alarm set in ODU – details “sh alarm detailed”

660 idu_hwerr : on ok
661 idu_swerr : on ok

First column in the output after the “:” (colon) represents the settings, second column represents the general status of the system (LED status1) (off = turned-off, on = turned-on) and the third column indicates the actual error status of the given parameters (OK, err = error).

Control Parameter Setting:

xxx\#set hsi fer 5	- it sets limit for HSI frame error rate to 5 errors in E3 header per minute
xxx\#set e3 fer 5	- it sets limit for rfi frame error rate to 5 errors in CRC per minute
xxx\#set alarm rxalarm - 65	- it sets limit for “radioRxallev” to -65dBm
xxx\#set alarm add all	- it sets all controls that affect general status of device (it turns-on all alarms)
xxx\#set alarm add hsi	- it turns-on HSI alarms
xxx\#set alarm add rfi	- it turns-on modem and rfi alarms
xxx\#set alarm rem g703 all	- it turns-off alarms from g703 (e1) ports
xxx\#set alarm add nu 654	- it turns-on on specific alarm (for exam. 654)

Detailed description of the alarm bytes of the ODU and IDU :

xxx|#sh alarm detailed

idu_hwerr : 00000200	- error bits set
idu_hwmask: 000000ff	- error bit mask (setting “set alarm hwmask 0xXXX”)
hw alarms : none	- text output of alarms after masking (none = OK)
MODEM alarms : 0x19 none	- text output of alarms of modems (none = OK)
ODU alarms: 0x00 None	- text output of alarms of ODU (none = OK)

The history of errors can be viewed by command “sh alarm dump”. Status is controlled each second and a row is generated, if change OK->error (E) or conversely (N).

xxx|#sh alarm dump

```
  IDC_119.226.223.36_NN\#sh alarm dump
  N 644 119.226.223.36  mse_low Mon Dec  6 11:22:14 2010
  E 644 119.226.223.36  mse_low Mon Dec  6 11:22:15 2010
  E 654 119.226.223.36  odu_RxL(-90) Mon Dec  6 11:22:18 2010
  E 656 119.226.223.36  odu_alarm(0x20) Mon Dec  6 11:22:18 2010
  N 644 119.226.223.36  mse_low Mon Dec  6 11:22:25 2010
  N 654 119.226.223.36  odu_RxL(-36) Mon Dec  6 11:22:25 2010
  N 656 119.226.223.36  odu_alarm(0x0) Mon Dec  6 11:22:25 2010
  E 644 119.226.223.36  mse_low Mon Dec  6 11:22:27 2010
  N 644 119.226.223.36  mse_low Mon Dec  6 11:22:29 2010
  N 649 119.226.223.36  mod_los Mon Dec  6 11:22:30 2010
Ok
```

The messages contains the following parameters:

N/E (N) – OK/error
Number (632) – identification number of event (code of controlled quantity/error)
ip (192.168.3.51) – IP address of device
device type (GX800)
name of controlled quantity/port (lana1 link)
date and time (Wed Oct 1 07:28:28 2008)

Use the following commands to display counters:

```
xxx\#sh cou hsi
HSI(E3-muxa)
a_frm rx  : 0              - number of received frames e3
a_frm err : 0              - number of received frames e3 with erroneous header
a_frm sync: 0              - number of synchronizing rejoin at e3 frames
HSI(E3-muxb)
b_frm rx  : 0
b_frm err : 0
b_frm sync: 0

xxx\#sh cou rfi
RFI(PBmux)
frm rx  : 1.3435e+09       - number of received packets
frm err : 5                - number of packets with faulty CRC
frm sync: 1                - number of synchronizing rejoin on packet system
tle : 1331s                - time in seconds from last error occurrence or iterators zeroing
tbe : 0s                   - time between errors
efs : 1331s                - grand total of error free seconds
ers : 1s                   - number of error seconds (with at least one error)
speed : 134.7Mbps          - actual measured speed of data outgoing from packet system to rfi

xxx\#sh cou lan
LANA1
frm disc: 0                - number of  discarded LAN frames
frm filt: 0                - number of filtered LAN frames
frm err : 0                - number of frames discarded on filter
LANA2
 frm disc: 0
 frm filt: 0
 frm err : 0
WANA
frm disc: 0                - number of discarded WAN frames
frm filt: 0                - number of filtered WAN frames
frm rx  : 0                - number of received WAN frames
```

```
LANB1
frm tx  : 366              - number of sent LAN frames
frm rx  : 953              - number of received LAN frames
frm err : 0                - number of faulty LAN frames
LANB2
 frm tx  : 0
 frm rx  : 0
 frm err : 0
WANB1
frm tx  : 953              - number of sent WAN frames
frm rx  : 366              - number of received WAN frames
frm err : 0                - number of faulty WAN frames

xxx\#sh ber
status    : sync random    - synchronization status
conf speed:100Mbps         - adjusted speed
act. speed: 34.6Mbps       - actual measured speed
tx pattern: random         - adjusted succession
bit count : 1.36692e+10    - number of received bits
err count : 0              - number of received error bytes
sync count: 1              - number of synchronizations
ber : 0                    - bit error rate
tle : 385s                 - time between errors
tbe : 0s                   - time when the last error occurred
efs : 385s                 - time during which device works without error
ers : 3s                   - time during which device works with error (second control)
```

With Best tester, it is possible to set both the rfi direction (“set ber speed xxx” - attention, it has the lowest priority; for right function it is necessary to decrease Ethernet capacity), and HSI direction (“set hsi e1 chxx ber”, “set hsi e2 chxx ber”) and control the given data path. It is possible to combine the Ber tester with loop backs for verification of the right function of data paths (“set e 1 chx loop”, “set hsi loop”, ...)

For loop backs, it is needed to look for possible embedded Ethernet.

Counter and also ber tester is possible to delete (“cle cou” , “cle lancou”, “cle ber”).

The device status can be viewed with commands “sh st lan”, “sh st mux”, “sh st system”, “sh modem”, “sh radio stat”, “sh radio atpc”.

```
xxx\#sh st lan
LANA1                          - Gigabit user data port
link   : none                  - detection link
aneg   : on                    - setting of automatic speed/duplex detection
duplex : not resolved          - actual (identified) duplex (not resolved/half/full)
speed  : not resolved          - actual (identified ) speed (not resolved/1000m/100m/10m)
LANA2                          - port of internal switch interconnection
link   : ok
aneg   : off
duplex : full
speed  : 100m
LANB1                          - 100Mbit management port
link   : ok
aneg   : on
duplex : full
speed  : 100m
LANB2                          - port of internal switch interconnection
switch : off                   - (on/off) enabled/denied switch interconnection
```

```
link   : ok
aneg   : off
duplex : full
speed  : 100m

xxx\#sh st system
SYSTEM
status : ok                                          - global status of device (ok/warning/error)
design : user                                        - name firmware
temp.  : 49.2C                                       - IDU temperature
date  : Wed, 01.10. 2008 08:15:44 +0200 METDST       - date, time and timezone
uptime : 0d 19:25:45
fans   : auto-on 11370, 11160 rpm
RADIO
rxlevel: -52dBm                                      - received level of ODU
temp.  : 37.0C                                       - IDU temperature

xxx|#sh st mux
 RFI
  ifc type: modem                                    - type of interface (modem)
  mux type: PBPS                                     - type of multiplexer – packet based priority system
  mux sync: ok                                       - synchronization at PBPS frames (ok/loss)
 HSI
  ifc type: nc
ok
```

xxx\#sh modem

```
sh modem
MODEM-Config
Modulation set: qam128_28e6_01                       - adjusted modulation (“set mod at xxx”)
Bitrate       :  139,61Mbps                          - bit rate at modem interface
Auto Acquire  : on                                   - setting of automatic synchronization
Tx mute       : off                                  - setting of output only for supporting frequency
Spectral inv. : auto
Sp inv. status: no inversion
latency mode  : standard
Ext. agc mode : auto                                 - setting of attenuation steering on cable
Mse allevel   : -29                                  - value of lower MSE, when it triggers alarm
Ad.mod. config: off
Adaptive mod.0:
Adaptive mod.1: qam32_28e6_01 (-21.5dB,-75dBm)       - modulation for worse weather
Adaptive mod.2: qpsk_28e6_02 (-14dB,-81dBm)          - modulation for the worse conditions
```

MODEM-Status

```
Modem sync (1)      : 1                  - status of synchronization (1 = OK, 0 = loss, another number = code
                                           of error)
Symbol rate         : 24700272Hz         - symbol speed (times number of status = “over air” bitrate)
internal AGC gain   : -5.2dB             - internal forcing of signal from cable (OK = -8 to -1)
external AGC gain   : 17.0dB             - external forcing of signal from cable (OK = 10 to 25)
carrier offset      : -598Hz             - offset supporting
MSE                 : -35.4dB            - similar to S/N ration (smaller = better)

possible alarms of modem are:
"Sync byte detector not locked”          - sync byte not found
"Equalizer MSI estimator below threshold",  - unable to set equalizer
"Symbol timing not locked"

xxx|#sh rad stat
```

```
 RADIO-Status
  Alarms(00) : 00                 - hexadecimal dump of ODU alarms (00 = OK)
  Temp       : 50.0C              - temperature of ODU (-25 up to 55 C ok)
  RX_PWR(dBm): -46                - received level of signal (higher then -70 is OK)
  Subband    : A
  MW band    : 11.00 GHz
  Band level : L
  SDH/PDH    : T
  Side-r     : L
  T/R value  : 490.00MHz          - distance Rx and Tx frequency
  Tx f band  : 10700-10890MHz     - valid setting of  Tx frequency
Ok

xxx\#sh rad atpc
atpc     : off                  - status of automatic proceeding of output power (on/off - turned-on/turned-off)
cur. txp.: 5dBm                 - current sent power
max txp. : 5dBm                 - maximal (adjusted - “set rad txp xxx”) transmitting power
cur. rxl.: -55dBm               - current received level of signal
min rxl. : -60dBm               - set (“set rad atpc rxl xxx”) maximal level of signal to which it will regulate
                                  (+2dBm hysteresis)
```

The key command for local device is “sh local” and analogical command for opposite device is “sh remote”.

```
xxx\#sh local
ocal status : ok
LOCAL RADIO
Temperature  : 45C              - ODU temperature
Tx frequency : 18490.000MHz     - transmit frequency
Current Rxl. : -51dBm           - received power
ATPC Rx level: -60dBm           - adjusted minimal level of signal for ATPC
Current Txp. : 5dBm             - current transmit power
Alarm (00)   : 00               - hexadecimal dump of ODU alarms (00 = ok)
LOCAL IDU
Temperature      : 40C          - IDU temperature
MSE              : -35.1dB      - distance of dots in v I/Q diagram from ideal location (smaller = better)
Modem sync(1)    : 1            - status of synchronization (1 = OK, 0 = loss, another number = code of error)
Alarm (1d)       : 1d           - hexadecimal dump ODU alarms (1d = OK)
Error seconds    : 0            - number of error seconds on rfi PBPS
HSI interface    : E3           - type of inserted modulus
SETTING:-|   |-STATUS
... list of report follows as in dump “sh alarm“
```

To switch between the Transmit /Receive (T/R) spacing for ODU units, use the following command:

xxx\#set radio tr high/low

For administering the device, use the following commands:

```
xxx\#delayed 30 sh rad stat     - it executes command “sh rad stat” after 30 second of waiting
sleeping 30 seconds
running command "sh rad st"
ok

xxx\#sh his delayed
Wed, 01.10.2008 11:37:57 - sh rad st    - date of record and command
RADIO-Status                            - dump of command
Alarms(00) : 00
```

Temp : 43.0C
RX_PWR(dBm): -55
T/R value : -1010.000
Tx f band : 1918419687
RSSI (dBm) : -54.8
ok - status of command sh rad st
ok - status of command sh hsi delayed

xxx\#run fd - records factory default configuration (does not change settings)
xxx\#run w0 - records saved configuration of device after reset
xxx\#run w1 - records saved configuration of device from w1(-3) position
xxx\#run auto - automatic update of configuration (run w0) after 6 minutes (enable timeout) since last adjusting command (turning-off “run noauto”, or “exit”).
xxx\#write w0 - Saves configuration with IP settings
xxx\#write w1 - Save configuration without IP settings

Appendix B – Using “Help” in Text Terminal

xxx\>?
- ? : print help...
- clear : clear counters (?)
- delayed : [x] [cmd] run cmd after x seconds, result in "show hist del"
- enable : enable setting
- ping : [xx.xx.xx.xx] ping to ip
- quit : quit & logout
- show : system status & config & counters (?)
- telnet : [xx.xx.xx.xx] telnet to ip

ok

xxx\>enable
ok

xxx\#?
- ? : print help...
- clear : clear counters (?)
- delayed : [x] [cmd] run cmd after x seconds, result in "show hist del"
- enable : enable setting
- exit : exit from enable mode
- kill : [xxx] kill user with xxx pid
- ping : [xx.xx.xx.xx] ping to ip
- quit : quit & logout
- reset : resetting device (?)
- run : [w0-3/fd/auto/noauto] run config, enable autorun
- set : settings (?)
- show : system status & config & counters (?)
- telnet : [xx.xx.xx.xx] telnet to ip
- update : manage files, usb/ftp update (?)
- write : [w0-3] write configuration

ok

xxx\#clear ?
- atu : clear atu table
- ber : clear ber counters
- count : clear mux counters
- history : clear history logs (?)
- lancount : clear lan counters

ok
xxx|#clear history ?
- count : clear rfi counter err log
- delayed : clear delayed cmd log
- alarm : clear alarm log
- plog : clear periodical log

ok

Appendix C - IDU Functionality

The following figure illustrates the functionality of an IDU.

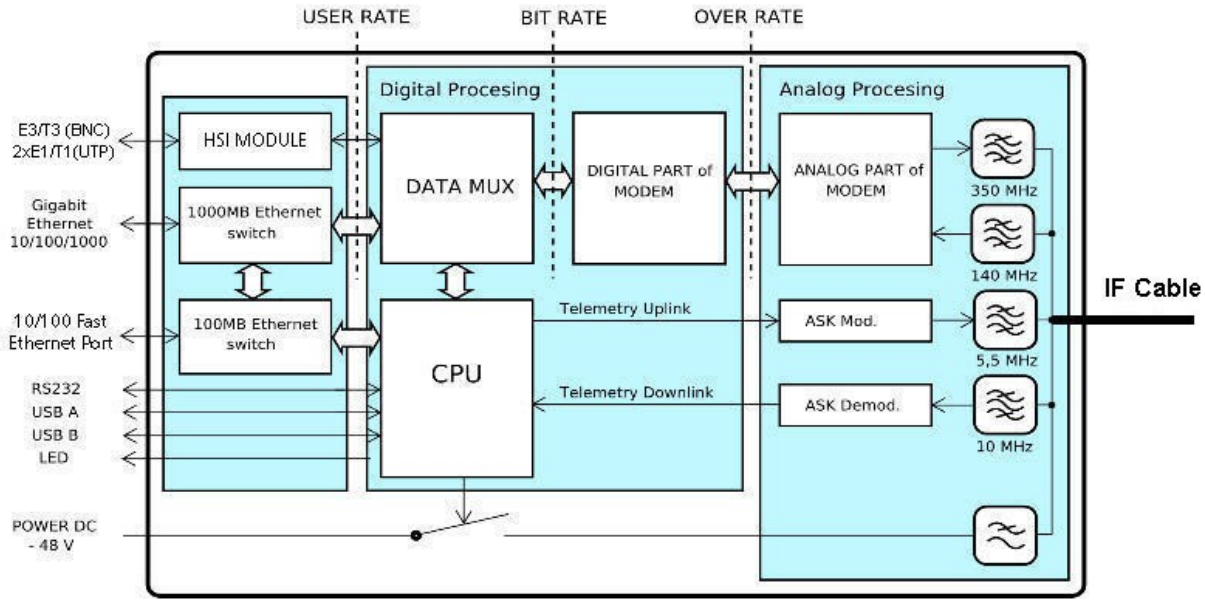


Figure 50: Block Diagram of the IDU

The circuits of the Ethernet interface and the HSI module together with Digital Multiplexer (DATA MUX), Digital Modem (DSP block), Central Processing Unit (CPU) and the Analog signal processing block are the essential functional blocks of the IDU.

Data is first processed by the Ethernet physical layer, followed by the HSI interface. The processed data is then directed to the Data Multiplexer for further processing. Digital modem then adds synchronization marks, Forward Error Correction (FEC) to the data stream and creates a digitally modulated signal, which is directed to the Analog signal block for further processing. All these parts are interconnected inside the device with high-speed bus and are controlled by the CPU. This block is also accessible via management interfaces and allows the user to configure all the settings both locally and remotely through the IP interface on the IDU.

Digital Multiplexer (block DATA MUX), from a user's perspective is divided into two parts:

- **RFI:** Processes the data coming into the modem from HSI and Ethernet
- **HSI:** Process the data coming from the HSI module

RFI is a digital multiplexer (based on Packet Based Priority System (PBPS)) which creates a single data stream for the modem block containing all the permitted user input data. The data source for digital multiplexer are the signals from HSI interface, Ethernet data and data from the internal BER tester. System PBPS first transmits the data with the high priority and than with the low priority - from Ethernet block and from internal BER tester. Thus, prioritizing the data transmission helps to dynamically reduce data transmission rate, depending on the available overall transmission capacity.

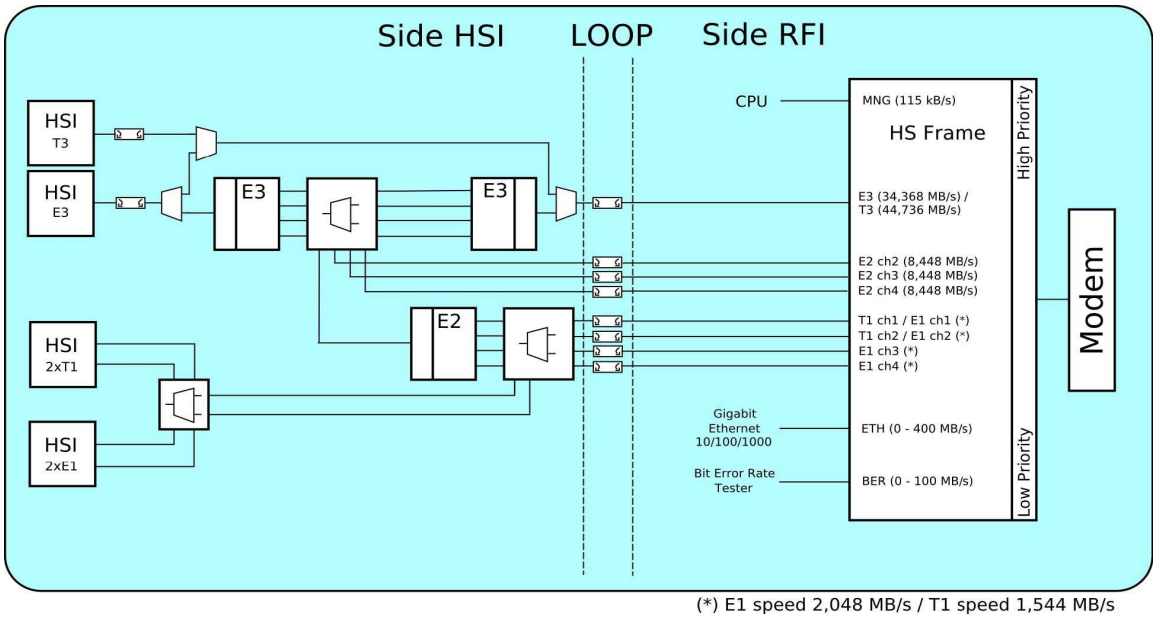


Figure 51: Block Diagram of Data MUX

The priorities for data transmission are assigned in the following order:

1. Service monitoring channel signal for management - 115 kbps (the highest priority)
2. Signal E3/T3 from the Internal Bus – 34.368 / 44.736 Mbps
3. Signals E2 from the Internal Bus (channels 2 to 4) – 3 x 8.448 Mbps
4. Signals E1/T1 from the Internal Bus (channels 1 to 4 / 2) – 4 x 2,048 Mbps / 2 x 1,544 Mbps
5. Signal from Ethernet block – 0 up to 400 Mbps (400 for 56MHz)
6. Signal from BER tester – 1 up to 100 Mbps (the lowest priority)

DSP block is the core of the IDU and provides its own digital modulation and demodulation. The whole block is configured and monitored by the CPU. All settings related to the types of modulation and their selected bandwidth are loaded into the DSP block and this block ensures the correct algorithm for data processing.

Appendix D – Abbreviation List

AGC	Automatic Gain Control
AIS	Alarm Indication Signal
ANEG	Auto Negotiation
ATPC	Automatic Power Control
ATU	Table of MAC addresses
BER	Bit Error Rate
BNC	Bayonet Neill-Concelman
CPU	Central Processing Unit
CRC	Cyclic Redundancy Check
DC	Direct Current
FEC	Forward Error Correction
FER	Frame Error Rate
HSI	High Speed interface
IDU	Indoor Unit
IF	Intermediate Frequency
LAN	Local Area Network
MSE	Mean Square Error
NAT	Network Address Translation
NMS	Network Management System
ODU	Outdoor Unit
PBPS	Packet Based Priority System
PC	Personal Computer
RFI	Radio Frequency Interface
RSL	Received Signal Level
RSSI	Received Signal Strength Indication
SNMP	Simple network management protocol
VLAN	Virtual Local Area Network

IMPORTANT NOTE:

FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 530cm between the radiator & your body.