6. Turn on the UPS by pressing the power button on the UPS front panel.

7. Turn on the playout server by pressing the power button on the playout server front panel.

8. Turn on the modulator AC power switch located on the modulator rear panel.  All three front panel LED's will flash while the modulator goes through its boot-up process.

9. Turn on the HPA circuit breaker located in cabinet breaker panel 2.

10. Turn on the HPA AC power switch located on the HPA rear panel.  The front panel LCD and rear panel PWR OK LED's will turn on.

### 5.3.2 Configuring the Transmitter

The transmitter has been factory configured with the customer specified television standard, channel bandwidth and centre frequency.

The user will be required to:

- Configure the modulator network parameters for remote network access.

- Configure the modulator transport stream input parameters.

- Configure the transmission (modulation) parameters and network mode (MFN or SFN)

### 5.3.2.1 Configuring the Network Parameters

The modulator must be configured correctly, before it can be placed on a network and operated remotely through either of the rear panel Ethernet connectors.

To configure modulator for remote operation, the user must:

1. Connect a PC to either of the modulator rear panel Ethernet connectors.

2. Open a Web browser.

3. Enter the default IP address of the modulator in the Web browser address bar.

4. When the login page appears, enter "admin" in the password field.  **Note:** The username field must be left blank.

5. Once logged in, navigate to System Parameters -> Network Parameters and re-configure the modulator's network parameters as desired – see Figure 5-1.  **Note:** The Management port refers to Ethernet connector A, while the Second Etherport refers to Ethernet connector B.

6. Once the Network Parameters have been re-configured, navigate to System Parameters -> System Reset and reset the modulator – see Figure 5-2.  **Note:** The modulator must be reset for Network Parameter changes to take effect.

7. Once the modulator completes it reboot process, connect your network device to the modulator's rear panel Ethernet connector.

**Note: The default IP address for the modulator is 172.20.33.69**

**Note: The default password for the Web GUI is "admin"**



Figure 5-1  Network Parameters



Figure 5-2  System Reset

Alternatively, the modulator front panel LCD and cursor/EXECUTE keys can be used to configure the modulator's network parameters.

1.  Navigate to the Status Display window "f" and press the "Execute" button. This will take the user to a System Parameters sub-menu where the network parameters can be re-configured as desired.

2.  Once the Network Parameters have been re-configured, navigate to System Parameters -> System Reset and reset the modulator.

3.  Once the modulator completes it reboot process, connect your network device to the modulator's rear panel Ethernet connector.

### 5.3.2.2 Configuring the Input Parameters

The modulator must be configured correctly, before it can lock to the input transport stream.

1. Navigate to Config -> Input to configure the DVB-ASI or GbE (IP) input settings – see Figure 5-3.

2. When a transport stream is connected to ASI input, Selected Input can be configured for automatic selection, or the user can select the DVB-ASI input connector manually. No other input parameters need to be configured.

3. When a GbE transport stream is connected to either of the Ethernet connectors, IP Input Interface, Input Stream Dst IP and Input Stream Dst Port must be configured correctly.



**Figure 5-3  Input Configuration**

### 5.3.2.3 Configuring the Modulation Parameters

1. Navigate to Config -> Modulator Mode to ensure Normal operation is selected – see Figure 5-4. Normal mode must be selected for OFDM carrier generation.

2. Navigate to Config -> Transmission to configure the network mode (MFN or SFN) and/or configure the DVB-H modulation parameters – see Figure 5-5.
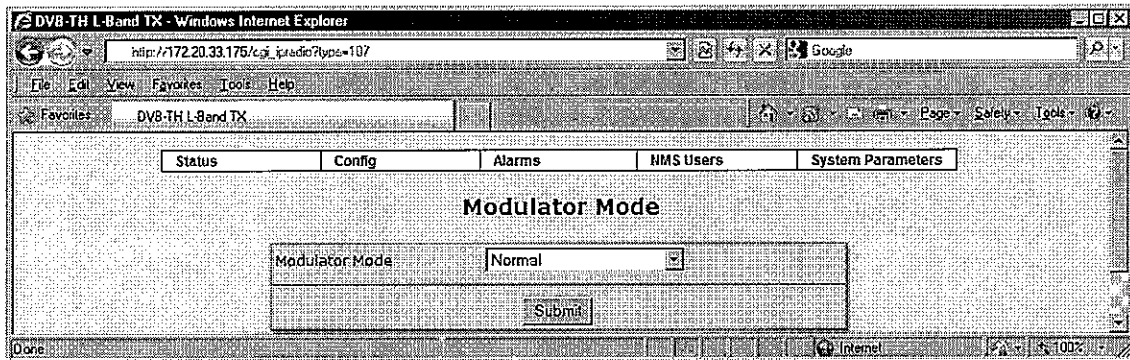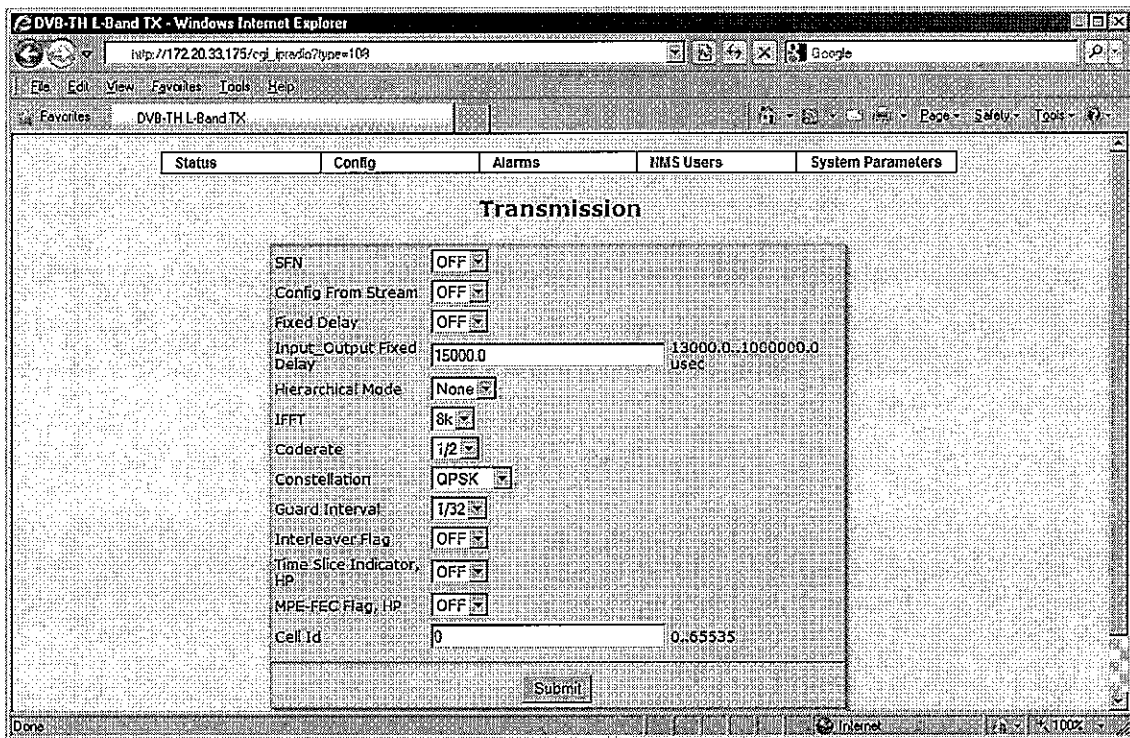
**Figure 5-4  Modulator Mode**



**Figure 5-5  Transmission (Modulation) Parameters**

### 5.3.3  Turning On the RF Output

1. Check the Alarm Status screen for active alarms.  The only alarm present should be GPS Quality Low.  The GPS Quality Low alarm will take up to 5 minutes to clear as satellites are acquired.

2. During the initial on-site turn on, it is recommended to set the transmitter output level to 46 dBm (minimum value) before the transmitter is placed in Broadcast mode.  This will ensure that the effects of a transmission line or antenna fault are minimized when the RF is turned on.  Navigate to Config -> HPA Control and set the output power level to 46 dBm – see Figure 5-6.

3. For SFN operation, check the Alarm Status screen to ensure that the GPS Quality Low alarm has cleared.  Once the alarm has cleared, the transmitter can be placed in Broadcast mode.  **Note:** For MFN operation, the GPS is not required to be locked.

4. From the HPA Control page, set the Transmitter Operating Mode to Broadcast.

5. The modulator front panel Status Display window "i", HPA front panel LCD, or Web GUI Global Status page can be used to monitor the transmitter forward and reflected power levels.  Alternatively, a power meter can be connected to the HPA sample port to monitor the forward power level.

6. If the forward and reflected power levels are acceptable, increase the RF Output Power Level by 3 db and continue to monitor the forward and reflected power levels.

7. Continue to increase the RF Output Power Level by 3 dB, until the desired output level is reached (max of 56 dBm).
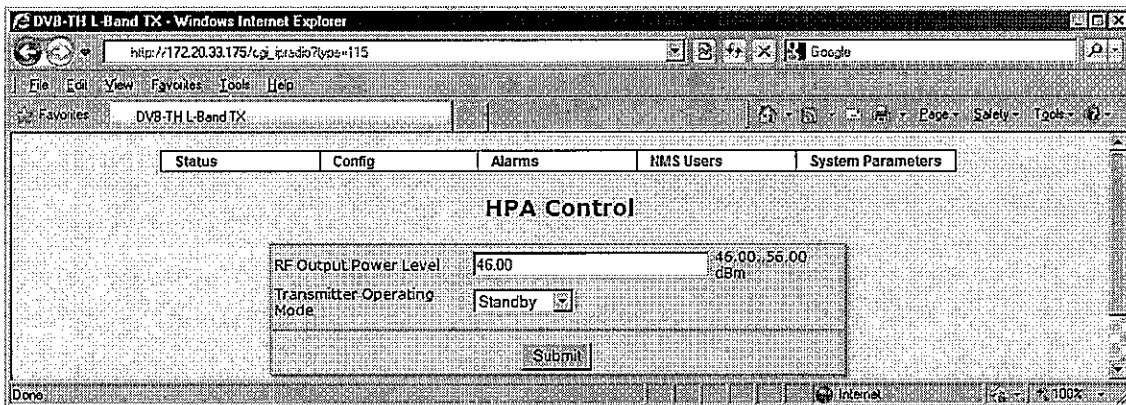


**Figure 5-6  HPA Control**

### 5.3.4  Turning Off the RF Output

Before turning off the AC power switch, the user should set the Transmitter Operating Mode to Standby.  This will ensure that the next time the transmitter is powered on, it will be powered on in Standby mode.

## 5.4    Control and Communication

The Transmitter can be controlled and monitored locally (on-site), or remotely from a Network Management System (NMS).

### 5.4.1  Control and Communication Interfaces

There are two interfaces port provided for control and communication:

- Ethernet Port A or B (RJ-45) – used for local control with a laptop PC and remote access through a LAN.  Web GUI, SNMP and CLI (Telnet and HyperTerminal) protocols are supported.
- USB Port (Type B) – used for local control, initial setup, status information and troubleshooting with a laptop PC.  A Command Line Interface (CLI) telnet session is the supported protocol.

For a detailed description of the Web-GUI interface refer to Section 6.

For a detailed description of the CLI interface refer to Section 7.

### 5.4.2  Local Access

The transmitter can be controlled and monitored locally (on site) through Ethernet Port A or B and/or the USB port with a PC.  The modulator front panel LCD and cursor/execute keys can also be used for local access.

The Ethernet ports provide access to the Web GUI and CLI (through Telnet).  The USB interface provides access to the CLI, which allows the operator to perform initial setup/troubleshooting when network connectivity is not available or desired.

### 5.4.3  Remote Access

The Network Management System (NMS) operator can control and monitor the transmitter remotely through Ethernet Port A or B and LAN using the Web GUI and/or SNMP interfaces.

## 5.5    Modes of Operation

There are two main parameter groups which determine the operating mode, the Transmitter Operating Mode parameter group and the Modulator Operating Mode parameter group.

### 5.5.1  Transmitter Operating Modes

The chief transmitter operating modes are Broadcast and Standby.

If the transmitter experiences an AC power interruption under normal, no fault conditions, the transmitter's AC power-up algorithm will restore the mode of operation that was active prior to the AC power interruption, once power is restored.

### 5.5.1.1 Broadcast Mode

The transmitter normally operates in broadcast mode, allowing it to transmit a broadcast signal and run all protection loops and ALC. It receives a transport stream signal, or generates an internal test signal and transmits an OFDM signal for terrestrial broadcast. In this mode, all transmitter functions are automatically maintained by the modulator controller.

To operate in broadcast mode, the following conditions must be met:

- The transmitter must be receiving an input signal and be locked to the input stream (if the modulator is in test mode, the input signal presence is ignored).
- The ALC loop must be running.
- For Single Frequency Network (SFN) operation, the system must have a GPS signal lock with no alarms (if the modulator is in test mode, the GPS signal presence is ignored).
- There must be no modulator alarms.
- There must be no HPA alarms.

### 5.5.1.2 Standby Mode

In this mode the transmitter output is muted by turning the HPA RF switch off and muting the modulator output.

The operating conditions in Standby Mode are:

- AC power is supplied to the modulator and HPA
- The HPA RF switch is off
- The modulator output is muted

### *5.5.2 Modulator Operating Modes*

The five modulator modes are: Normal, CW, Test 1 (Carriers Removed), Record and Playback.

In Normal mode, the modulator generates a complete DVB-H waveform. CW and Test 1 are special test modes not used in regular operation. The CW mode generates a narrow-band frequency tone and the Test 1 mode suppresses a set of OFDM carriers in the center of the band (useful for checking for interference, factory configurable). Record and Playback are described in Section 6.4.1.

### 5.6  Indicators and Controls

The transmitter main subassemblies have individual indicators and controls used in normal operation. This includes:

- DVB-H Modulator
- HPA

### 5.6.1 Modulator

### 5.6.1.1 Front Panel

The two line by forty characters LCD display, in conjunction with four cursor keys and an EXECUTE button allow easy operation of the modulator. Three LED are provided as status indicators. For a detailed description of front panel operation, please refer to Section 8.
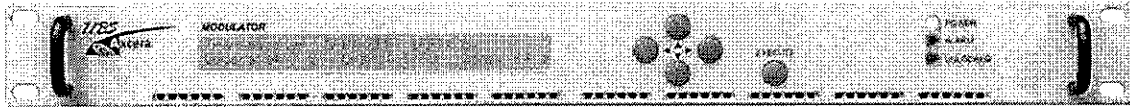


**Figure 5-7 Modulator Front Panel**

| LED | Description |
|-----|-------------|
| POWER (Green) | This Green LED indicates that the modulator AC power supply has been turned on. |
| ALARM (Red) | This Red LED indicates that there is an active transmitter alarm. |
| UNLOCKED (Red) | This Red LED indicates that the modulator has failed to synchronize to the incoming transport stream or if the incoming transport stream is absent. |
| *NOTE: All LEDs flash green during the boot-up process.* | |

**Table 5-1 Modulator Front Panel Status LEDs**

| Pushbutton | Function |
|------------|----------|
| EXECUTE | Used to enter the configuration menu system (GENERIC or SPECIFIC) from a status display window, to enter a sub-menu and confirm changes made to configurable parameters. |
| ▲ (up) | Used to scroll through the different status display windows, exit the current menu and enter a higher-level menu, increase alpha-numerical parameters or abort confirmation of a change. |
| ▼ (down) | Used to scroll through the different status display windows, exit the current menu and enter a sub-menu, decrease alpha-numerical parameters or abort confirmation of a change. |
| ◄ (left) ► (right) | Used to scroll horizontally through the Config menus, the parameter listings and the parameter characters, in the case of editable parameters. They are also used to increase and decrease % parameters. |

**Table 5-2 Modulator Front Panel Pushbutton Functions**

### 5.6.2 HPA

### 5.6.2.1 Front Panel

The HPA front panel LCD indicates the status of the HPA Forward Power, Reflected Power, Temperature and Current as well as several other parameters.
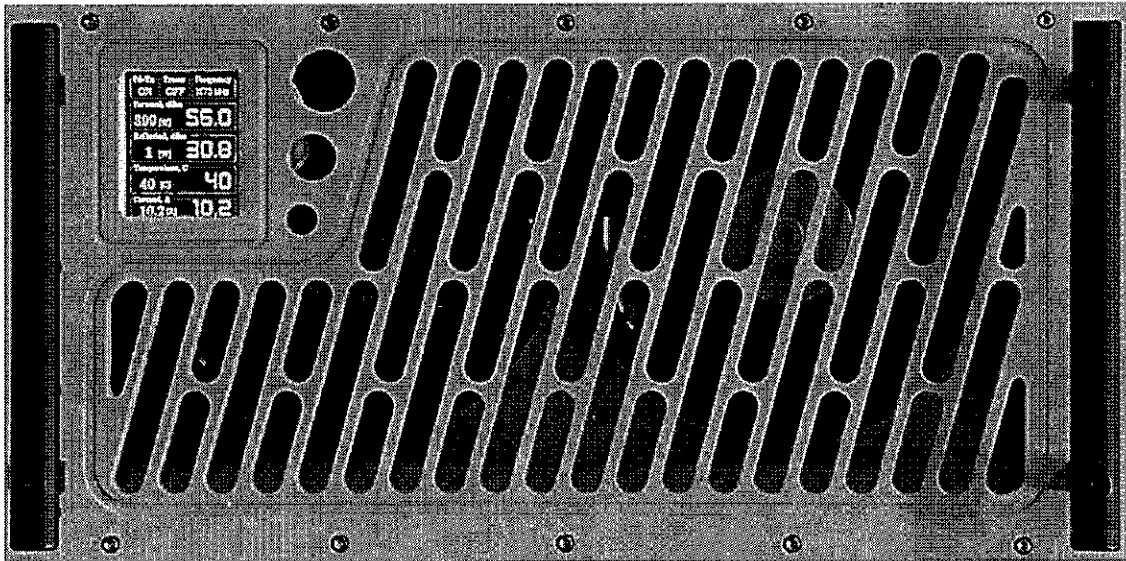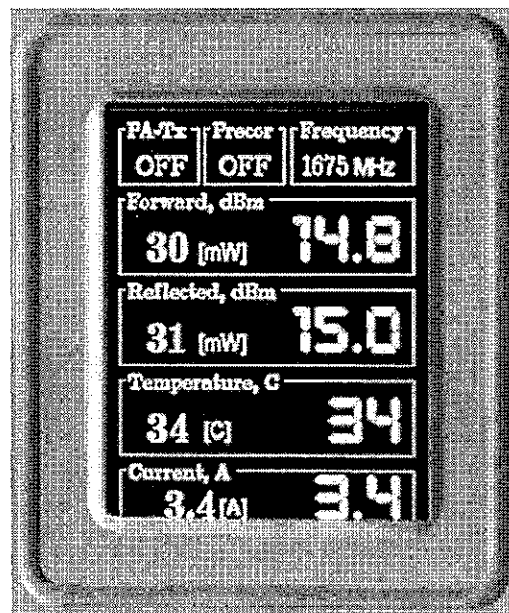


**Figure 5-8  HPA Front Panel**
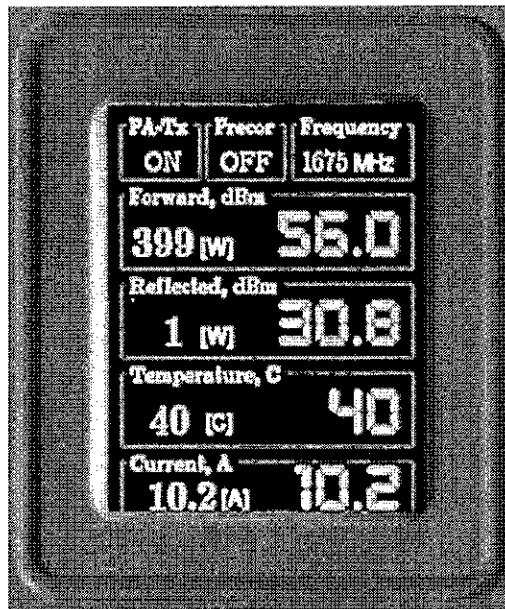


**Figure 5-9  HPA Front Panel LCD (Standby Mode)**

**Figure 5-10  HPA Front Panel LCD (Broadcast Mode)**

| Parameter | Description |
|---|---|
| Forward, dBm (W) | Displays the HPA forward (output) power measured by the internal HPA combiner/coupler RF detector. |
| Reflected, dBm (W) | Displays the HPA reflected power measured by the internal HPA combiner/coupler RF detector. |
| Temperature, C | Displays the highest temperature measured by one of the HPA temperature sensors. |
| Current, A | Displays the highest current measured on one of the power modules. |
| PA-Tx | Indicates the HPA transmission status (ON or OFF) |
| Precor | Not used for this application (always OFF). |
| Frequency | Indicates the transmitter frequency, which is set by the modulator. |

**Table 5-3  HPA Front Panel LCD Status**

## 5.6.2.2 Rear Panel

The HPA rear panel includes two AC status LED's.
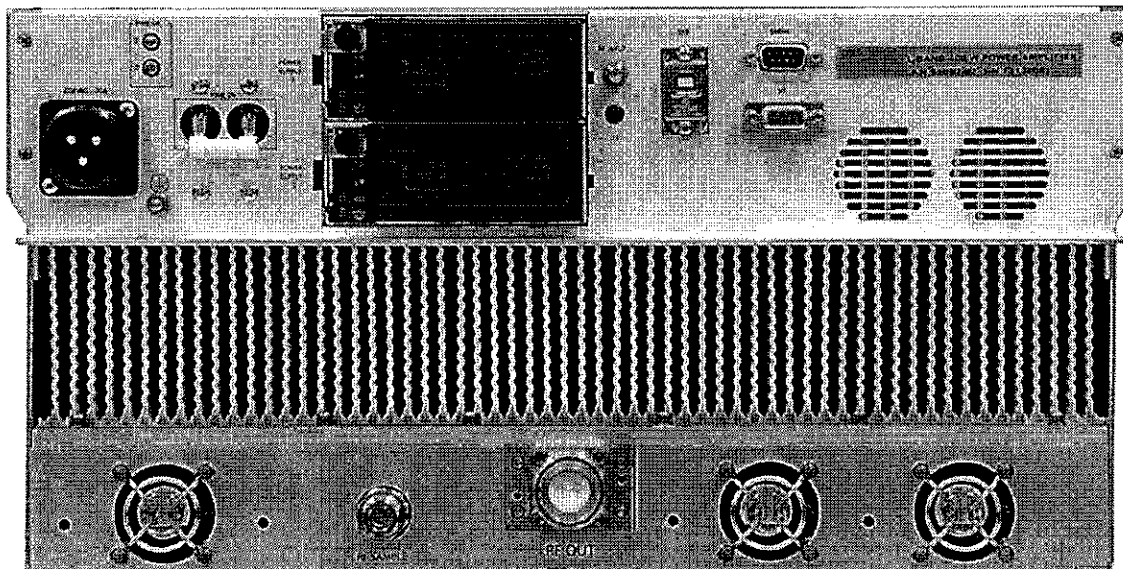


**Figure 5-11  HPA Rear Panel**

| LED | Color | Description |
|---|---|---|
| PWR OK 1 | OFF | Power supply 1 AC input is not present. |
| | Green | Power supply 1 AC/DC input is present. |
| PWR OK 2 | OFF | Power supply 2 AC input is not present. |
| | Green | Power supply 2 AC/DC input is present. |

**Table 5-4  HPA Rear Panel LEDs**

# 6   Web GUI Interface

## 6.1   Introduction

The transmitter parameters can be reviewed or changed using the Web GUI Interface.  The Web GUI interface is an intuitive interface allowing the user to access the current transmitter status and set up the operational parameters of the transmitter.  The Web GUI interface uses a simple hierarchical menu structure which provides access to the transmitter parameters.
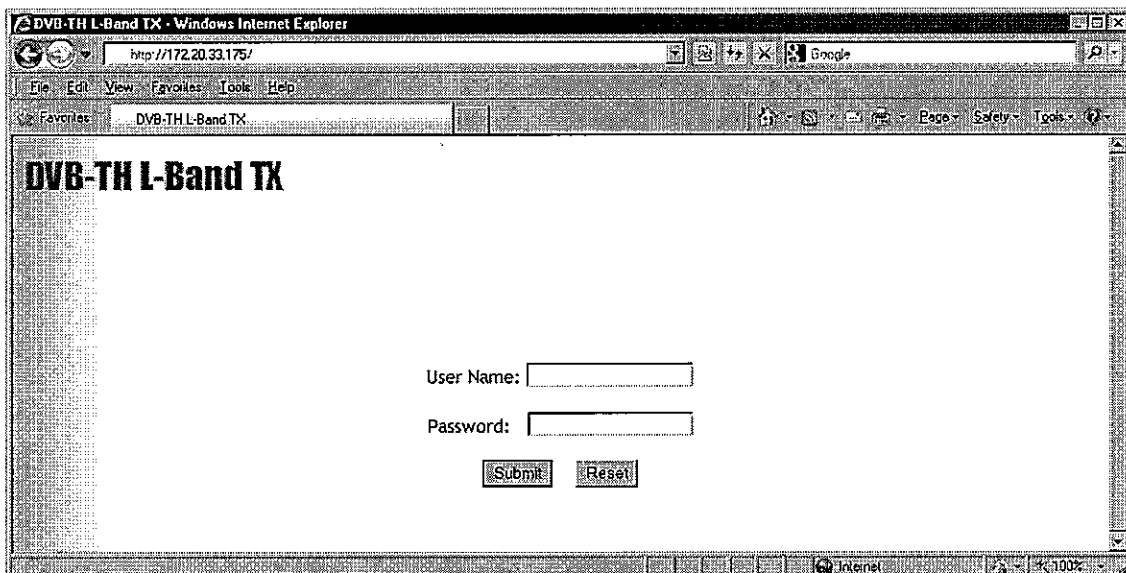
The modulator needs to be assigned an IP address in order to access the Web GUI.  The transmitter is shipped from the factory with a default IP address of 172.20.33.69, but the user will need to modify the IP address of each unit according to the local network. The IP address can be accessed and modified from the console interface (CLI) or front panel interface.

## 6.2   Access and Navigation

### 6.2.1   Login

Connect either locally or remotely via the modulator Ethernet port:

- Open a web browser window (e.g., Internet Explorer, Firefox, etc.) and enter the modulator IP address.  For example: http://172.20.33.69/

- The first menu page is the login page.

- The User Name field must be kept blank, while the default password for normal access is "admin".



**Figure 6-1  Login Screen**

Once the user successfully logs in, the Global status page is displayed.  This page provides global status information for the transmitter system.

### 6.2.2 Global Status Page



| Status | Config | Alarms | HMS Users | System Parameters |

## Global Status

**Versions and Serial Numbers**    Tue Jul 23 17:57:10 2013

| Serial Number: | 27130019 | Site Name: | UBS |
| Linux 2.4.20_mvl31-ml300 Version: | 3037 | Modulator Application Version: | 2375 |
| Modulator FPGA Version: | 5890 | Modulator CPLD Version: | 40 |
| GPS Receiver Software Version: | 4.0 | Up Converter Software Version: | 6.12 |

**HPA Statuses**

| Transmitter Operating Mode: | Broadcast | Cabinet Ambient Temperature: | -72 °C |
| Forward RF Level: | 55.91 dBm | Input RF Level: | -0.52 dBm |
| Reflected RF Level: | 44.06 dBm | | |

**Modulator Type**

| Modulator Type: | | | DVB-T/H |

**Transmission**

| Modulator Mode: | Normal | Playback File: | None |
| SFN: | OFF | Fixed Delay: | OFF |
| Hierarchical Mode: | None | IFFT: | 8k |
| Coderate: | 7/8 | Constellation: | 64 QAM |
| Guard Interval: | 1/32 | Cell Id: | 0 |
| Cell ID Enable: | ON | Interleaver Flag: | OFF |
| Time Slice Indicator, HP: | OFF | MPE-FEC Flag, HP: | OFF |
| HP Ideal Bitrate(kbit/s): | 19793 | | |

**Input**

| Selected Input: | Auto | Current High Prority Input: | A |
| Input Status: | Locked | Average Input Bitrate(kbit/s): | 4494 |
| Reference Signal: | GPS | 10 MHz Reference Status: | Locked |
| 1PPS Reference Status: | present (3 clk tolerance) | | |

**Output**

| Bandwidth: | 5 MHz | Spectrum Inversion: | OFF |
| Window Enable: | ON | Mute ON/OFF: | OFF |
| Mute Status: | unmuted | MIP Power Function Status: | Not present |
| MIP Tx Power: | 0.0 dBm | MIP Frequency Offset: | 0 Hz |
| RF Output Frequency: | 1675000000 Hz | Adjusted RF Output Frequency: | 1675000000 Hz |
| RF Power Level: | 0.0 dBm | RF Channel Grid: | User Defined |
| RF Freq Channel: | CH21 474 MHz | Base Frequency: | 100000000 Hz |
| Base Channel: | 1 | User Frequency Channel: | CH0 N/A |
| External Amplifier Gain: | 15.0 dB | Board Temperature: | 36.50 °C |

**External Board**

| Voltage 1: | 0.000 Volt | Voltage 2: | 0.000 Volt |
| Voltage 3: | 0.000 Volt | Voltage 4: | 0.000 Volt |
| Voltage 5: | 4.095 Volt | Voltage 6: | 4.095 Volt |
| Voltage 7: | 4.095 Volt | Voltage 8: | 4.095 Volt |

**Non-Linear Precorrector**

| NLP State: | ON | NLP Curve Name: | 2013-06-20 2 |
| NLP Gain: | 0.0 | NLP Peak Clipping: | -5.0 |

**Linear Precorrector**

| LP State: | OFF | LP Profile Name: | LP_Default_Flat |

**Network**

| Management IP: | 172.20.33.231 | Management Netmask: | 255.255.0.0 |
| Default Gateway: | 172.20.1.1 | Second Etherport IP: | 0.0.0.0 |
| Second Etherport Netmask: | 255.255.0.0 | | |

**Ethernet Interface Status**

| Ethernet 1 Link: | Up | Ethernet 1 Speed and Duplex: | 100M Full-duplex |
| Ethernet 2 Link: | Down | Ethernet 2 Speed and Duplex: | Unresolved |

**Alarms**

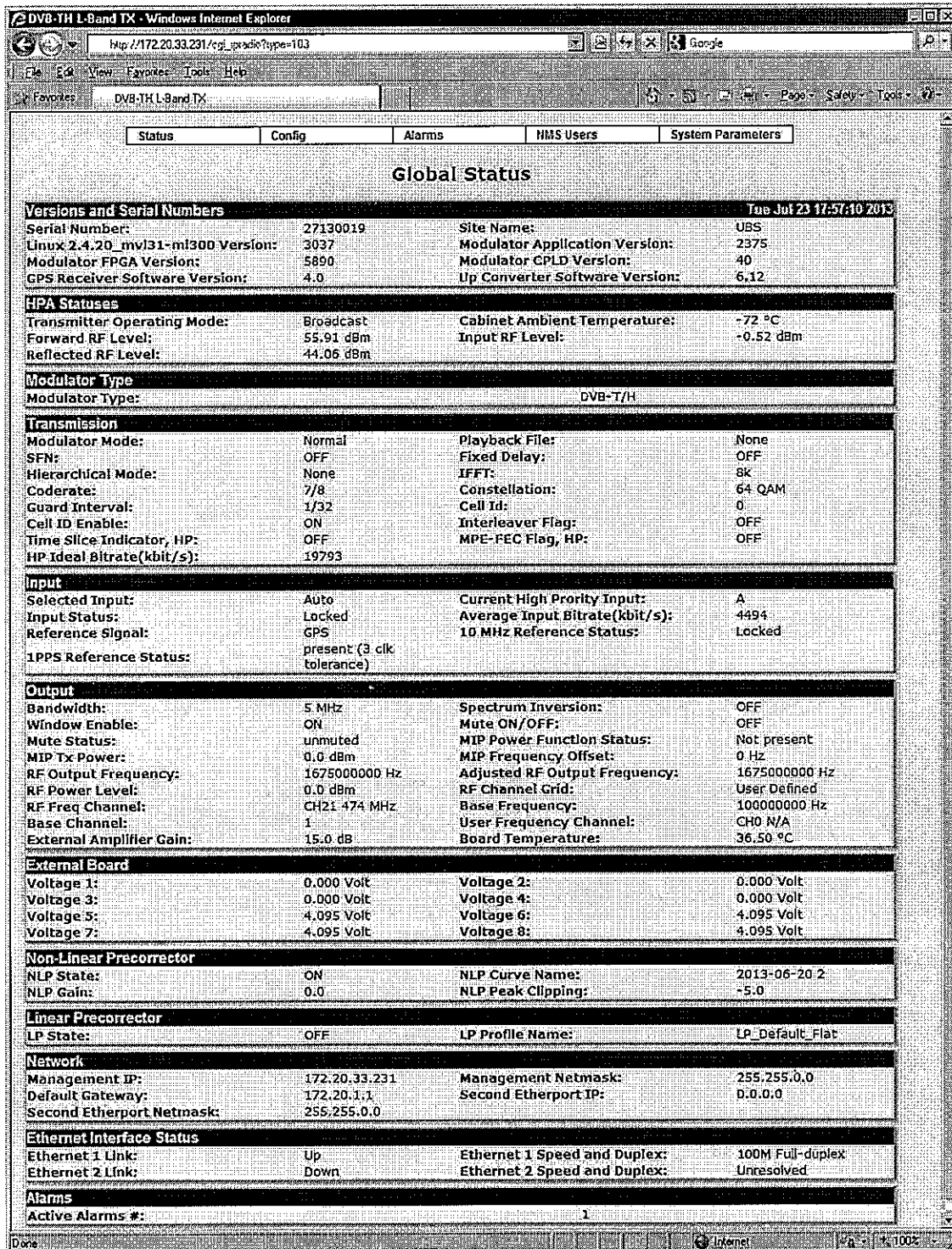| Active Alarms #: | | | 1 |

### Figure 6-2  Transmitter Global Status Page (MFN Mode)

### 6.2.3  GUI Navigation and Structure

The Global Status page seen in Figure 6-2 demonstrates the hierarchical structure of the Web GUI interface.  Along the top of the screen are a row of five icons with pull down menus.  The five menu categories accessible via the Web GUI interface are:

1) Status – Displays the current operating status of the transmitter

2) Config – Provides access to change the transmitter operating parameters

3) Alarms – Provides alarm status and settings as well as alarm log information

4) NMS Users – Set user(s) log in authorization, passwords and other information

5) System Parameters – Set access control, network and SNMP parameters as well as system reset and software upgrades

The menu tree for the Web GUI is shown below:

| Status | Config | Alarms | NMS Users | System Parameters |
|--------|--------|--------|-----------|-------------------|
| ↓ | ↓ | ↓ | ↓ | ↓ |
| Global Status | Modulator Mode | Alarm Properties | User Properties | Identification |
| GPS Status | Transmission | External Voltage Alarm Setting | | Access Control |
| HPA | Input | Log Management | | Network Parameters |
| | Output | Alarm Log | | SNMP Parameters |
| | RF Channels | | | System Time |
| | User RF Channels | | | Heartbeat Time |
| | Non-linear Pre-corrector | | | System Reset |
| | Linear Pre-corrector | | | Download Config Files(s) |
| | HPA Control | | | Upgrade and Files Upload |
| | GPS | | | List Uploaded Files |
| | Site | | | |

**Table 6-1  Web GUI Menu Structure**

### 6.2.4 Changing Parameters

Before changes to system parameters are accepted, the user must first click the submit button. The example below has the user clearing the Alarm Log in the Log Management screen.
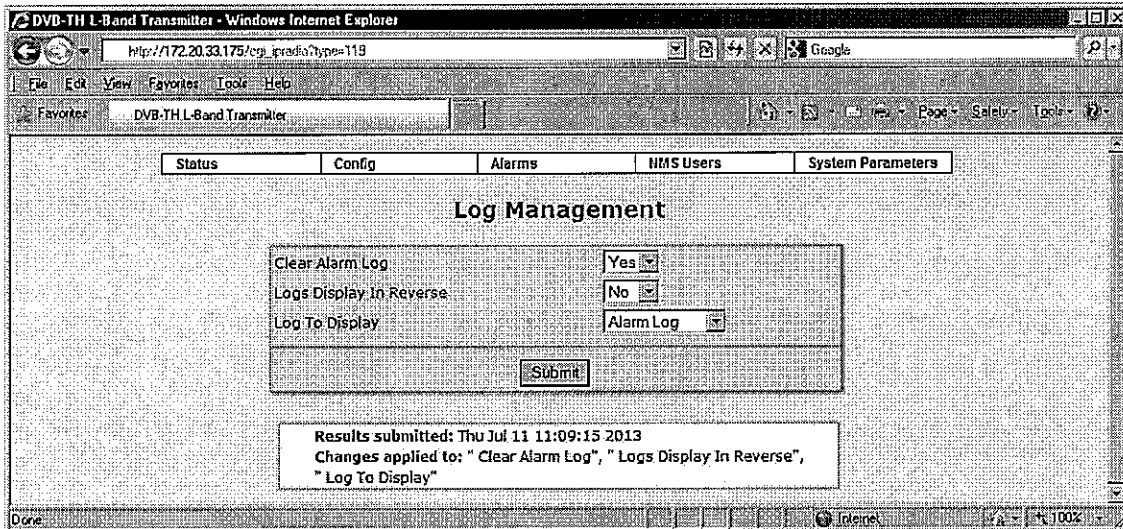


**Figure 6-3  Example of Submitting a Parameter Change**

Once the user has selected "Yes" for the Clear Alarm Log pull down box, the user will then need to click Submit. At that time a small green box will appear at the bottom of screen confirming the change.

## 6.3  Status Menu

The Status menu contains the following pull-down items (see Figure 6-4 below).

- Global Status
- GPS Status
- HPA
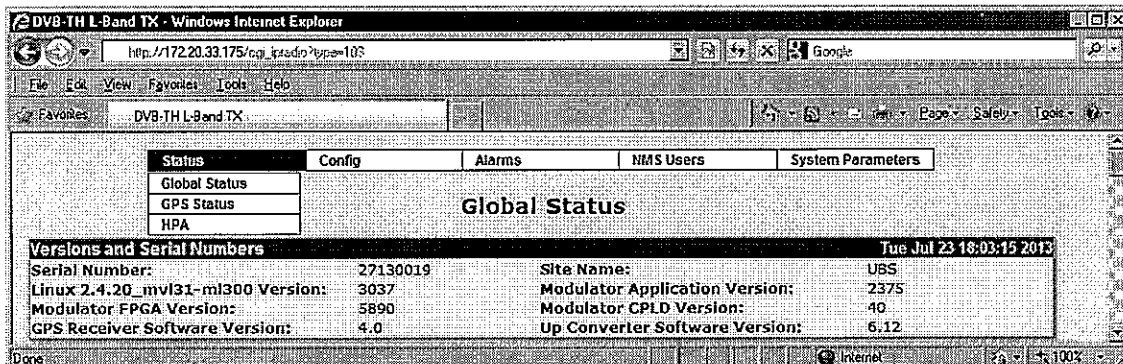


**Figure 6-4  Status Menu**

### 6.3.1  Global Status

The Global status page appears upon login and provides general information about parameter settings and the transmitter's alarm status.  The list of parameters will change dynamically as the transmission mode (MFN or SFN) and/or transport stream input (ASI or IP) is changed.  See Figure 6-2, Figure 6-5 and Figure 6-6 for details.

The drop down menus, located at the top of the status page, provide links to other pages that control various parameters and alarm functions.

- **Versions and Serial Numbers**: Displays the software and firmware version number for each of the main software components of the modulator.

- **HPA Statuses**: Displays the Transmitter Operating Mode (**Broadcast, Standby or Manual**) Input, Forward and Reflected RF power levels for the HPA as well as the Cabinet Ambient Temperature.

- **Modulator Type**: Displays the modulator waveform selected (**DVB-T/H**).

- **Transmission**: Displays the Modulator Mode (**Normal or CW**), the SFN status (**ON or OFF**), the OFDM parameter settings and the Ideal Bit Rate.  The statuses of the MIP offset functions are only displayed when SFN mode is enabled.

- **SFN Parameters**: Displays the Transmitter ID, the Local Delay Offset set by the user, the MIP Maximum delay and MIP Time offset as included in the MIP and the resulting Adjusted SFN Delay.  This window is only available when SFN mode is enabled.

- **Input**: Displays the Selected Input (**Auto, A, B or IP**), Input Status (**Locked or Unlocked**) and the status of the 10 MHz and 1PPS Reference inputs.

- **IP Input**: Displays the IP Input status, Input Stream Destination IP Address and Port, Buffer Depth, Packet Size, FEC Mode, Input Bit Rate and Packet information. This window is only available when an IP input has been selected.

- **Output**: Displays the Bandwidth, RF Output Frequency, RF Output Power Level, Spectrum Inversion (**ON or OFF**), parameters related to the pre-defined and User Channel Grids (not uses for this application) as well as MIP parameters.
  The Mute setting (**ON or OFF**) and Mute status (**Muted or Unmuted**) are also displayed.  The output might be muted as a result of an active alarm, even though the Mute setting is set to OFF.

- **External Board**: Displays the voltage on each of the I/O port pins.

- **Non-Linear Pre-corrector**: Displays the status of the Non-linear Pre-corrector.

- **Linear Pre-corrector**: Displays the status of the Linear Pre-corrector.

- **Network**: Displays the modulator IP Addresses, Default Gateway and the Management Netmask.

- **Ethernet Interface Status**: Displays the link status and speed.

- **Alarms**: Displays the number of active alarms
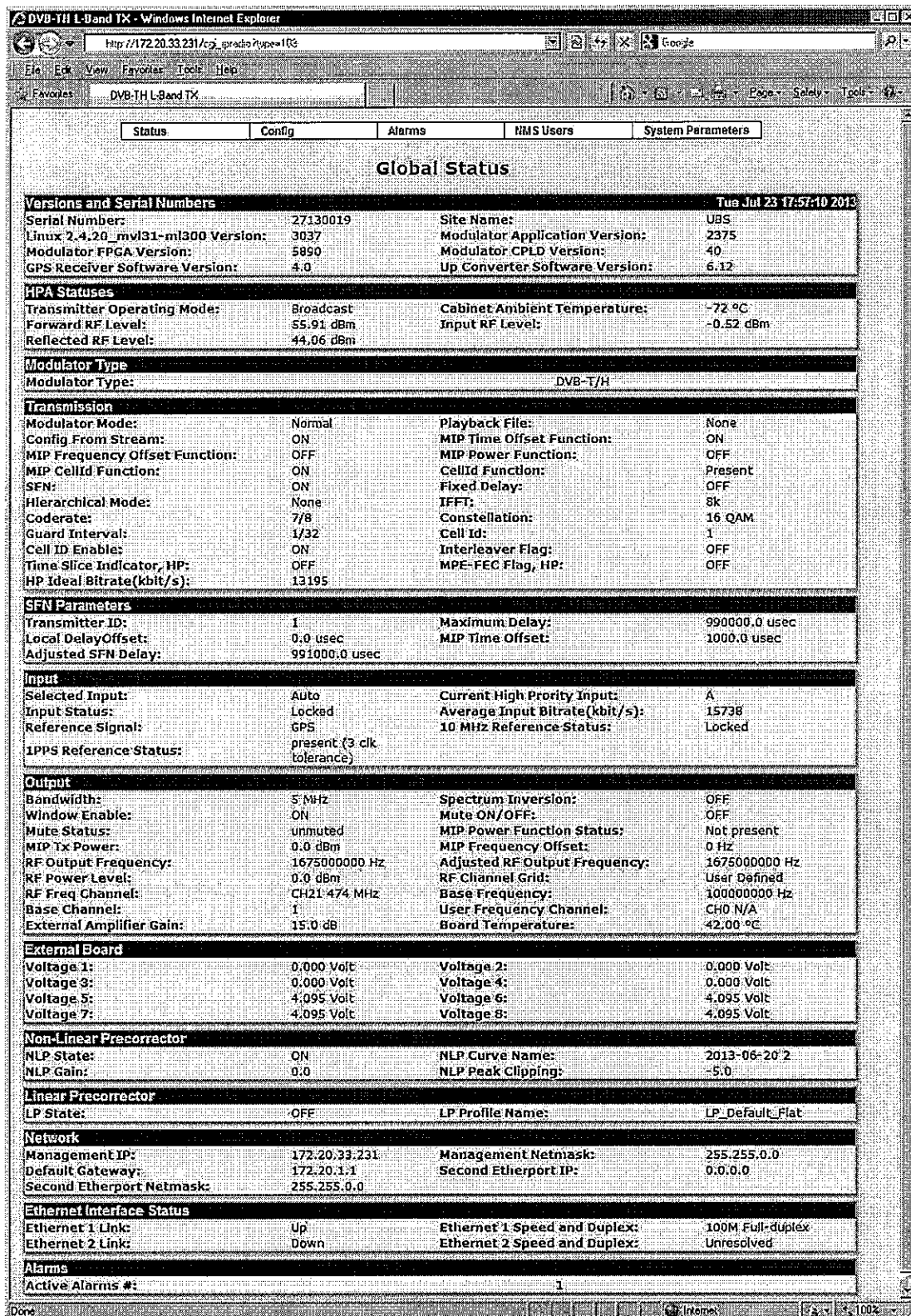
**Figure 6-5  Transmitter Global Status Page (SFN Mode, ASI Input)**
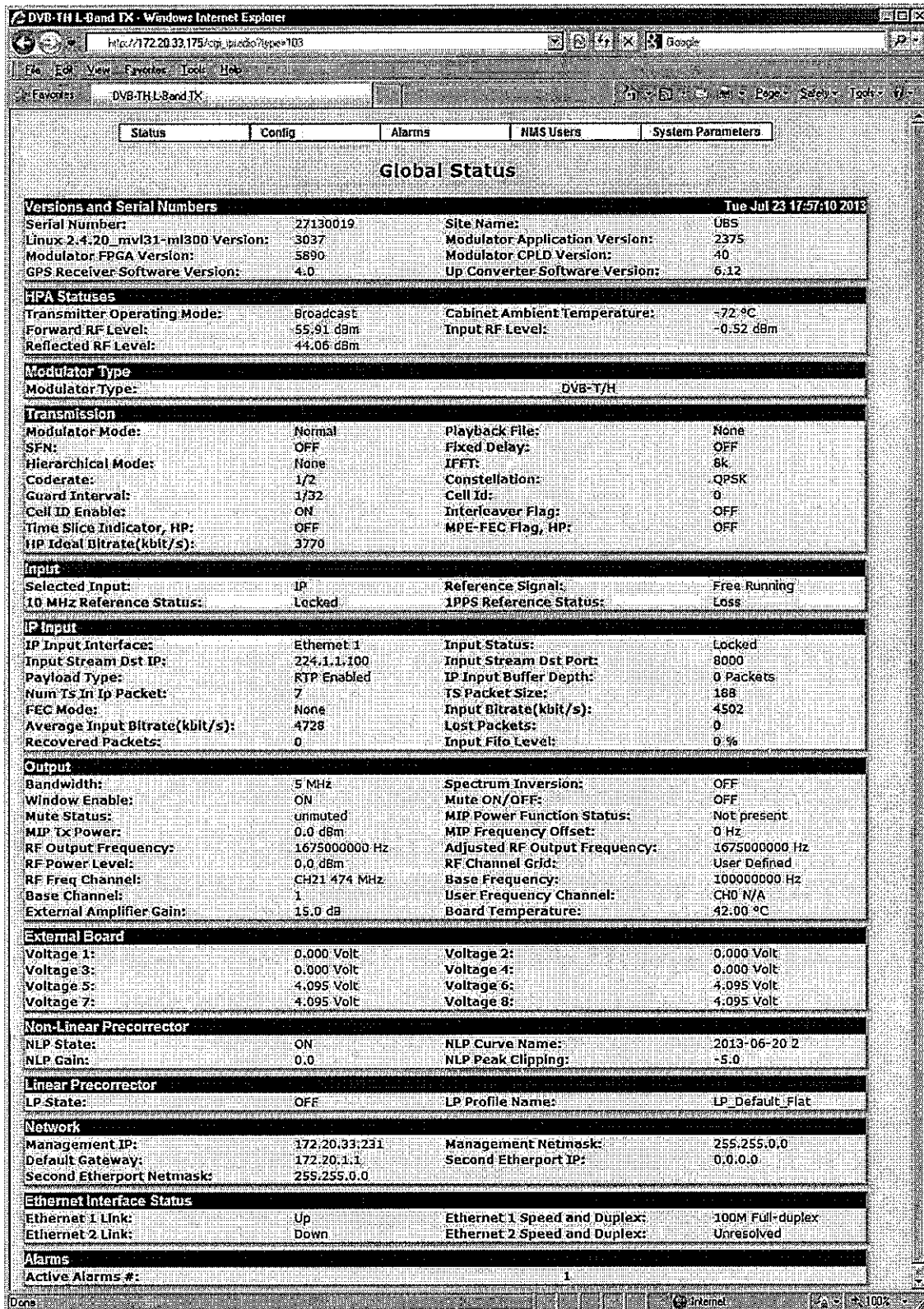
**Figure 6-6  Transmitter Global Status Page (MFN Mode, IP Input)**

### 6.3.2 GPS Status

The GPS Status page provides access to GPS receiver information including the lock status and the number of visible satellites, as well as the exact location and time.

- **GPS Common:** Indicates the GPS PLL Status (**Lock or Unlock**), Position Altitude, Position Latitude, Position Longitude, 3D Fix, Number of Visible and Tracked Satellites, and Sigma Accuracy. GPS Common will also indicate if the System Clock is updated from the GPS and it will display the System Timezone.

- **Satellites:** Indicates the satellite number and corresponding carrier to noise ratio.
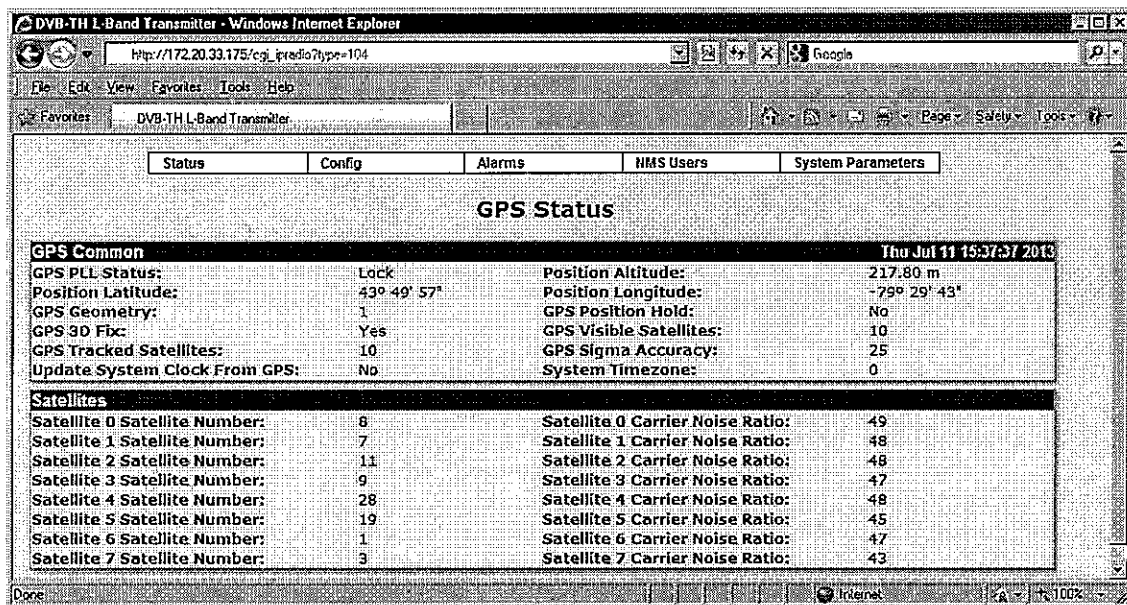


**Figure 6-7  GPS Status**

After initialization, the GPS starts tracking the satellites to determine its position; the accuracy of the GPS output signals depends on the GPS satellite reception. The GPS PLL Status will indicate "Lock" when the quality of the received GPS signals are higher than the minimum reception level and the minimum number of tracked satellites is reached. GPS 3D Fix will occur when a minimum of 4 satellites are tracked. The GPS will then display Position Latitude, Longitude and Altitude.

The output of the GPS (1 PPS and 10 MHz pulses) is fed to the Distribution Amplifiers, which in turn feed the pulses to the modulator and up-converter.

The Controller communicates continuously with the GPS to deter-mine if the GPS is still operating correctly and still receiving the satellite signals, etc., or if it has any alarm (malfunction) to report.

A PLL (Phase Locked Loop) Status Unlocked event can be the result of an antenna under-current (antenna open) or antenna over-current (short), a poor GPS 3D Fix (minimum requirement is 4 satellites). In general, conditions that result in a poor GPS signal quality.

### 6.3.3 HPA

The HPA page provides access to HPA information including the HPA TX On status (On of Off), Input, Forward and Reflected power levels as well as sub-module current values and heat sink temperature values.

- **HPA Statuses:** Displays the HPA Controller Firmware and CPLD versions as well as the Input, Forward and Reflected RF (power) levels.

- **HPA Settings:** Displays the HPA Tx On status (**ON or OFF**), RF Output Power Level (target), Precorrector Enable (**OFF**), Freeze ALC (**ON or OFF**) and RF Input Frequency.

- **Power Supply Voltage Levels:** Displays the DC voltage for HPA Power Supply 1 and HPA Power Supply 2.

- **HPA Current Levels:** Displays the current consumption for the Pre-Driver, Driver and Power Modules.

- **HPA Temperature Sensors and Fans:** Displays the temperature readings for the Pre-Driver and Power Module heat sink temperature sensors as well as the fan speed for the front panel fans.
  - Temperature Sensor 1 – Power Module heat sink
  - Temperature Sensor 2 – Power Module heat sink
  - Temperature Sensor 3 – Pre-Driver heat sink
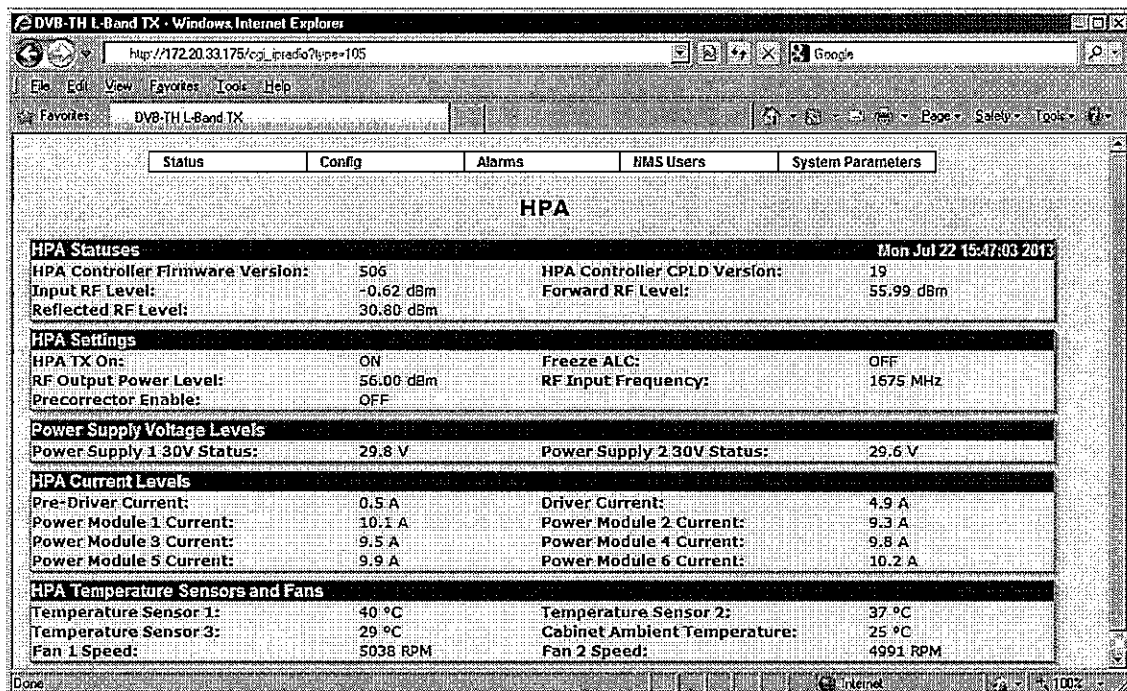


**Figure 6-8  HPA**

### 6.4   Config Menu

The Config menu contains the following pull-down items (see *Figure 6-9* below).

- Modulator Mode
- Transmission
- Input
- Output
- RF Channels
- User RF Channels
- Non-Linear Precorrector
- Linear Precorrector
- HPA Control
- GPS
- Site
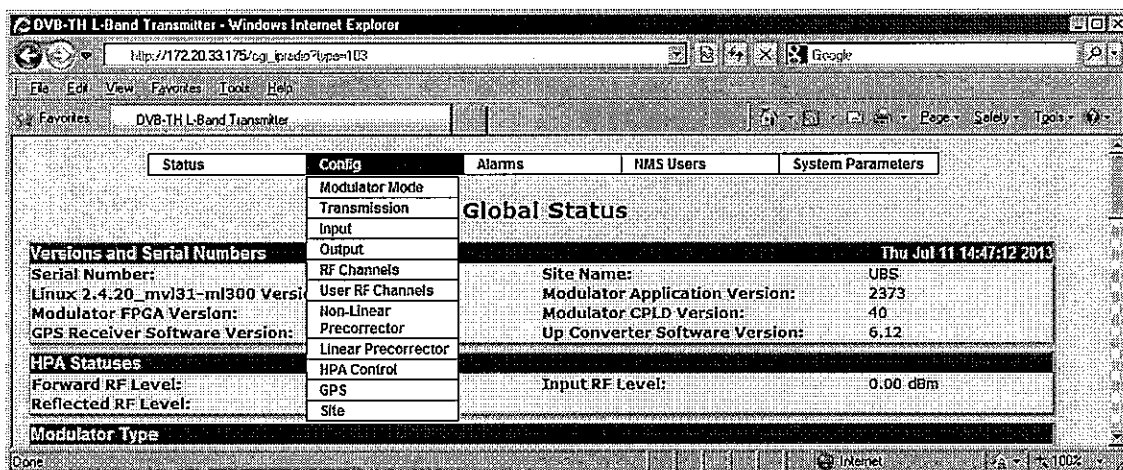


**Figure 6-9  Config Menu**

The Configuration menu provides access to change the transmitter operating parameters. The operating parameters and their range of values or settings are also accessible through the CLI interface and modulator front panel interface.

### 6.4.1 Modulator Mode

This page allows the users to select the Modulator Mode and the Test Mode.
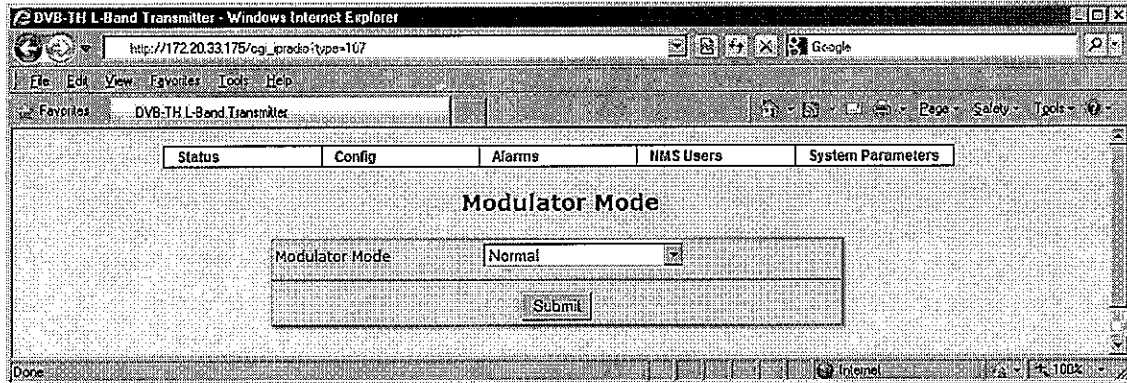


**Figure 6-10 Modulator Mode Configuration**

The available parameters are:

| Item | Option |
|------|--------|
| Modulator Mode | Normal, CW, Test1 (Carriers Removal), Record , Playback |

**Table 6-2 Modulator Mode Parameters**

CW and Test 1 are special test modes not used in regular operation. The CW mode generates a narrow-band frequency tone. This is useful for phase noise measurements or to view background noise. The Test 1 mode suppresses a subset of the carriers from the center of the DVB-H signal. This is useful for simulating a notch fading event or to view the background noise present in the band. In the "Test 1" mode, usually 500 carriers are removed. The number of removed carriers can be factory configured from between 100 to 800 via the advanced access interface.

The Record mode allows the user to record a input data stream (limit of 16 megabytes) for later playback. The modulator must first be set to SFN mode, a valid SFN input stream must be present and no input stream alarms can be reported.

After recording, the modulator will automatically switch back to Normal mode. The user can check the Global Status page to see that the modulator is back in Normal mode and that the stream has been recorded. The user can check also the "List Uploaded Files" screen under "System Parameters" to see the file name displayed.

In the Playback mode the recorded input stream is used to generate a modulator output. This is useful for detailed system testing especially when an input signal is not available or for benchmark testing using a known test signal.

### 6.4.2 Transmission

The Transmission page allows the user to select the network type (MFN or SFN), set the modulation parameters and configure a number of SFN parameters.

The Transmission page will change dynamically, depending on the Modulator Mode selected (MFN, SFN or SFN with Config From Stream On). The user has the option to configure the modulation parameters from the incoming stream (MIP) or locally.

In SFN mode, a network of modulator operating at the same frequency are all synchronized using special timing packets (MIP) embedded in the input transport stream as well as GPS timing information. If the SFN mode is disabled, the system will operate in MFN mode where all modulators in a network work independently of one another.



**Figure 6-11 Transmission Configuration (MFN)**

**Figure 6-12  Transmission Configuration (SFN – No Config from Stream)**



**Figure 6-13  Transmission Configuration (SFN – Config from Stream)**

The available parameters for MFN and SFN mode are:

| Item | Option |
|---|---|
| SFN | OFF, ON |
| Config From Stream | ON, OFF<br><br>If "Config From Stream" is ON, the modulation parameters are set from the input SFN data stream and the other modulation parameters of this web-page are ignored. If it is set to OFF, the modulation parameters can be configured locally.<br><br>Only relevant when SFN is enabled. |
| Fixed Delay | OFF, ON<br><br>If "Fixed Delay" is ON, the output stream will be synchronized to the input stream.<br><br>Only relevant when an ASI input is present. |
| Input_Output Fixed Delay | Range: 13000 μsec .. 1 second<br><br>Only relevant when an ASI input is present. |
| Hierarchical Mode | None, aEq1, aEq2, aEq4 |
| IFFT | 2k, 8k, 4k |
| Coderate | 1/2, 2/3, 3/4, 5/6, 7/8 |
| Constellation | QPSK, 16 QAM, 64 QAM |
| Guard Interval | 1/32, 1/16, 1/8, 1/4 |
| Interleaver Flag | OFF, ON<br><br>Only relevant for a 2k and 4k IFFT. |
| Time Slice Indicator, HP | OFF, ON |
| MPE-FEC Flag, HP | OFF, ON |
| Cell ID | Range: 0 .. 65535 |
| Transmitter ID | Range: 0 .. 100<br><br>Only relevant when SFN is enabled. |
| Local Delay Offset | Range: -500000.0 .. +500000.0 μsec<br><br>Only relevant when SFN is enabled. |

**Table 6-3  Transmission Parameters (MFN and SFN Mode)**

The available parameters for SFN mode with Config From Stream On are:

| Item | Option |
|------|--------|
| SFN | OFF, ON |
| Config From Stream | ON, OFF |
| Fixed Delay | OFF, ON |
| Input_Output Fixed Delay | Range: 13000 µsec .. 1 second |
| MIP Time Offset Function | OFF, ON |
| MIP Frequency Offset Function | OFF, ON |
| MIP Power Function | OFF, ON |
| MIP Cell ID Function | OFF, ON |
| Cell ID | Range: 0 .. 65535 |
| Transmitter ID | Range: 0 .. 100 |
| Local Delay Offset | Range: -500000.0 .. +500000.0 µsec |

**Table 6-4  Transmission Parameters (SFN Mode with Config From Stream On)**

All of the above parameters are described in the DVB-TH standard.  The above list includes a number of optionalMIP parameters for remote adjustment of the transmitter signal:

- MIP Time Offset Function (tx_time_offset_function)

  The tx_time_offset_function is used to apply a deliberate offset in time of the transmitted DVB-TH signal, relative to the reference transmission time (STS+maximum_delay) modulo $10^7$

- MIP Frequency Offset Function (tx_frequency_offset_function)

  The tx_frequency_offset_function is used to apply a deliberate frequency offset of the centre frequency of the emitted DVB-TH signal relative to the centre frequency of the RF channel.

- MIP Power Function (tx_power_function)

  The tx_power_function can be used to remotely configure the transmitter ERP.

- MIP CellId Function (cell_id_function)

  The cell_id_function can be used to configure the cell identifier of the transmitter.

### 6.4.3 Input

The Input page allows the user to select ASI port A, ASI port B, Auto selection between ASI ports or an IP input.

To configure the modulator with an IP (GbE TS) input, the user must set the Selected Input to IP Input and configure the IP Input Interface, Input Stream Dst IP and Input Stream Dst Port accordingly – see Figure 6-15.



**Figure 6-14  ASI Input Configuration**



**Figure 6-15  IP Input Configuration**

The available parameters are:

| Item | Selection |
|---|---|
| Selected Input | A, B, Auto, IP<br><br>Choice of ASI port A, ASI port B, Auto selection between ASI ports or an IP input. |
| IP Input Interface | Ethernet 1, Ethernet 2<br><br>If Selected Input is set to IP this will determine which Ethernet port is selected for the input stream. |
| Input Stream Dst IP | Standard IP address: 0.0.0.0..255.255.255.255<br><br>Relevant only if Selected Input is set to IP and Fixed Delay is OFF. |
| Input Stream Dst Port | Range: 1025 .. 65535<br><br>Relevant only if Selected Input is set to IP and Fixed Delay is OFF. |
| FEC Mode | None, Column Only, Column + Row<br><br>Relevant only if Selected Input is set to IP and Fixed Delay is OFF. This sets the Forward error Correction (FEC) mode for the IP input as per the Pro MPEG CoP#3 standard for FEC protection of MPEG-2 transport streams over an IP network. |
| IP Input Buffer Depth | Range: 0 .. 500 Packets<br><br>Relevant only if Selected Input is set to IP and Fixed Delay is OFF. |

**Table 6-5  Input Parameters**

### 6.4.4 Output

The Output page allows the user to Mute the modulator output, set the Spectrum Inversion and modify the RF Output Frequency and the modulator RF Power Level.

The menu options vary depending if the system is configured for SFN with "Config From Stream" enabled or MFN operation (see section 6.4.2). When the system is in MFN mode the user can select the transmission bandwidth. If "Config From Stream" is enabled when SFN mode is enabled, the bandwidth option is not available. The next two figures show the Output configuration screen for both MFN and SFN operation.



**Figure 6-16 Output Configuration (MFN Mode)**

**Figure 6-17  Output Configuration (SFN Mode – Config From Stream On)**

The available parameters are:

| Item | Selection |
|------|-----------|
| Mute ON/OFF | OFF, ON |
| Bandwidth | 5 MHz<br><br>Bandwidth selection is only available in MFN mode |
| Spectrum Inversion | OFF, ON |
| Window Enable | OFF, ON |
| External Amplifier Gain | Range: 0.0.. 6553.5 dB<br><br>Is used for the MIP power function. |
| RF Output Frequency | Range: 167000000 .. 167500000 Hz |
| RF Power Level | Range: -10.0 .. 0.0 dBm |
| RF Channel Grid | DVBT UHF 8M 474-858 MHz, User Defined |
| Base Frequency | Range: 167000000 .. 167500000 Hz |
| Base Channel | Range: 1 .. 200 |

**Table 6-6  Output Parameters**

### 6.4.5  RF Channels

**Note: RF Channels is not used for this application and should not be modified by the user.**
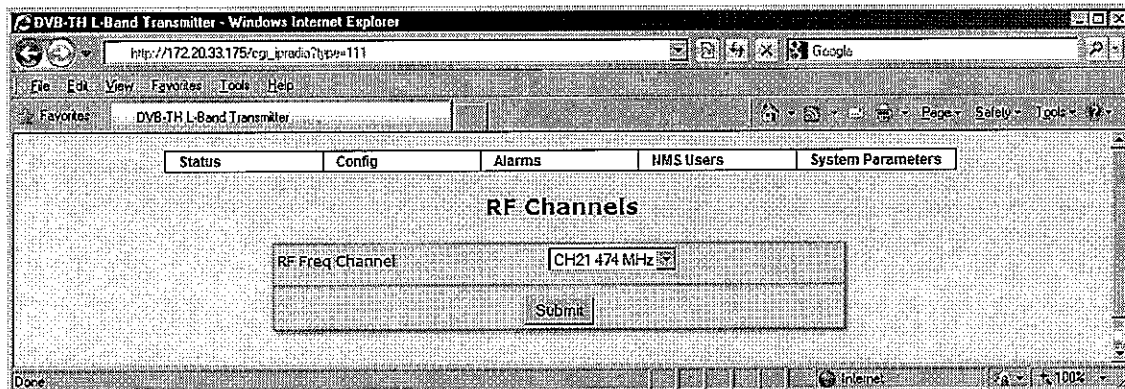


**Figure 6-18  RF Channels Configuration**

### 6.4.6  User RF Channels

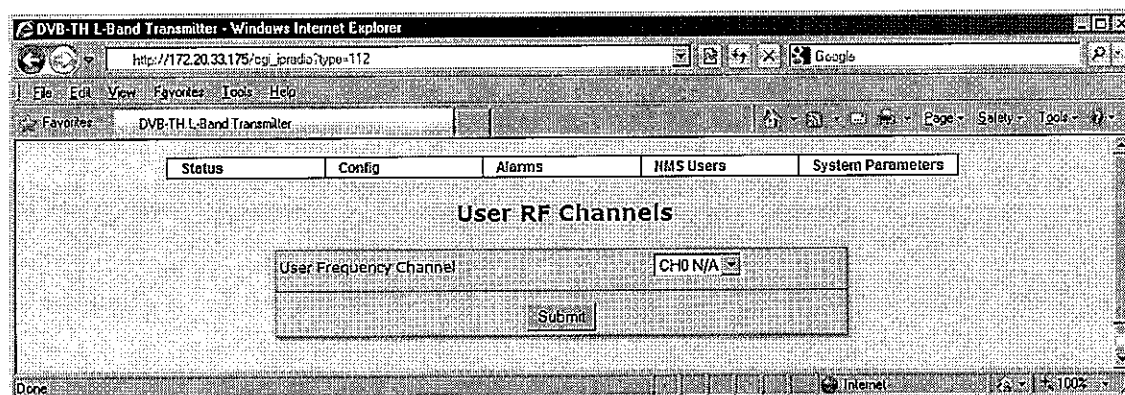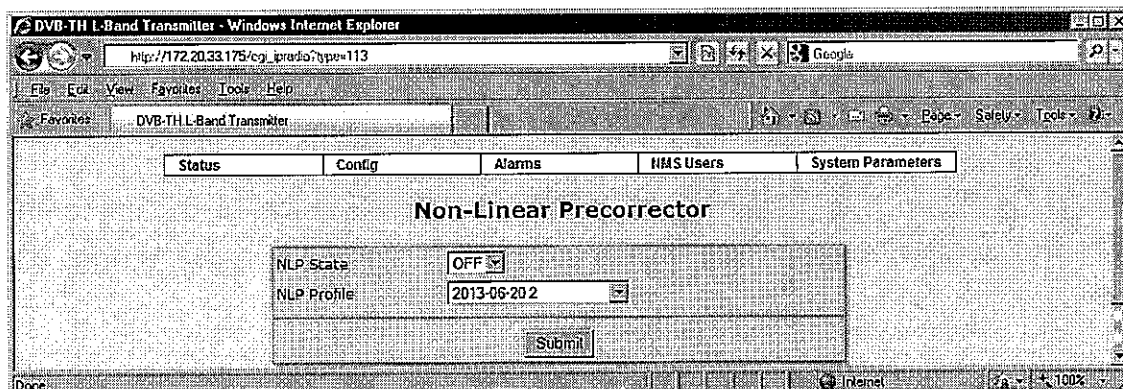**Note: User RF Channels is not used for this application and should not be modified by the user.**



**Figure 6-19  User RF Channels Configuration**

### 6.4.7 Non-Linear Pre-corrector

This page allows the user to select the NLP (Non-Linear pre-corrector) Profile state and profile.



**Figure 6-20  Non-Linear Pre-corrector Configuration**

| Item | Selection |
|------|-----------|
| NLP State | OFF, ON |
| NLP Profile | A selection of different NLP profile files |

**Table 6-7  Non-Linear Pre-corrector Parameters**

### 6.4.8 Linear Pre-corrector

This screen pages the user to select the LP (Linear pre-corrector) State and profile.
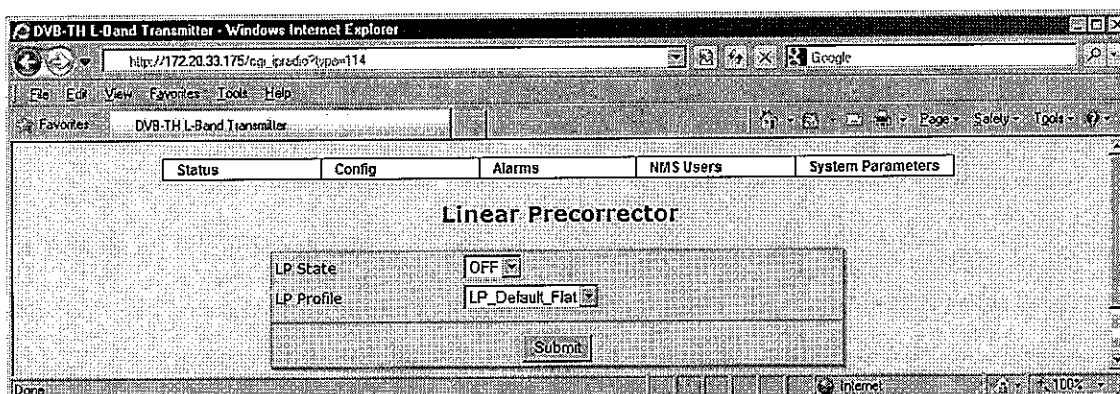


**Figure 6-21  Linear Pre-corrector Configuration**

| Item | Selection |
|------|-----------|
| LP State | OFF, ON |
| LP Profile | A selection of different LP profile files |

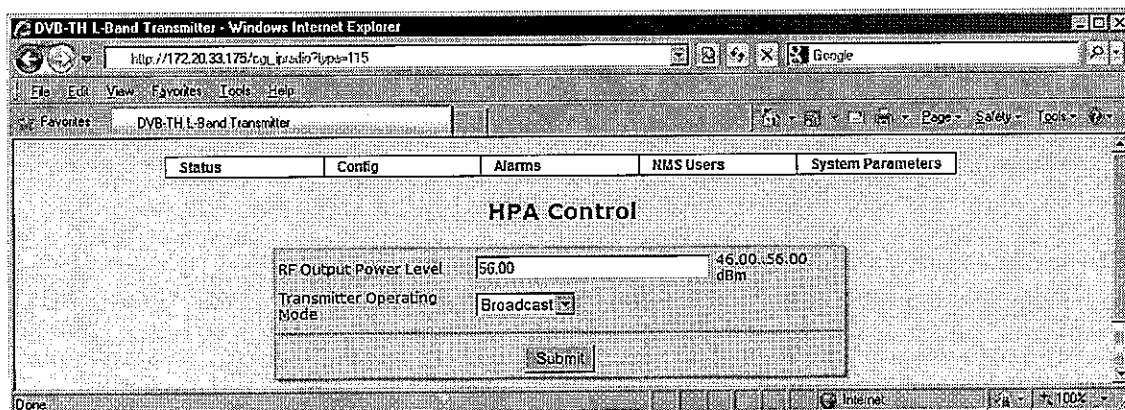**Table 6-8  Linear Pre-corrector Parameters**

### 6.4.9  HPA Control

The HPA Control page contains a drop down menu that allows the user to set the transmitter to one of the following modes:

- Standby
- Broadcast
- Manual

Broadcast mode represents normal operation.  Standby mode disables the transmitter output.  In Manual mode the HPA behaves as a simple amplifier and the modulator control of the HPA output is limited to setting the input drive level to the HPA.

The RF Output Power Level allows the user to set the output power level to a value between 46 dBm and 56 dBm.



**Figure 6-22  HPA Control Configuration**

The available parameters are:

| Item | Selection |
| --- | --- |
| RF Output Power Level | Range: 46.00 .. 56.00 dBm |
| Transmitter Operating Mode | Standby, Broadcast, Manual |

**Table 6-9  Non-Linear Pre-corrector Parameters**

### 6.4.10  GPS

The most important parameter for the GPS menu is the Max GPS Holdover Time parameter. Following a loss of signal lock to the GPS satellite network, the Max GPS Holdover time is the maximum length of time the system will continue to operate in a free-running mode before an alarm is issued leading to a possible transmitter shutdown condition.  It is imperative for a SFN network for all transmitters to be synchronized to GPS at all times.
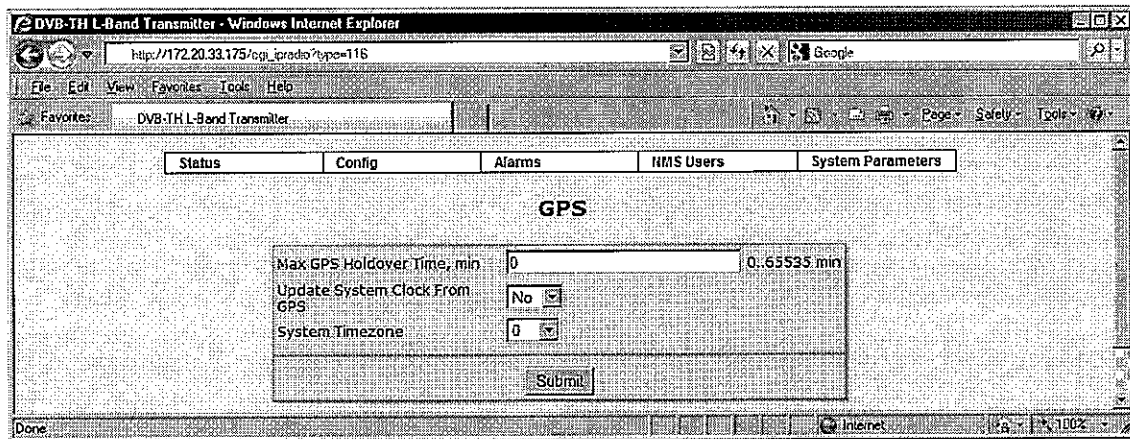


**Figure 6-23  GPS Configuration**

The available parameters are:

| Item | Option |
|---|---|
| Max GPS Holdover Time, min | Range: 0 .. 65535 min |
| Update System Clock From GPS | No, Yes |
| System Timezone | -11 to 11 hours |

**Table 6-10  GPS Parameters**

### 6.4.11  Site

The Site page allows the user to add information identifying the site, including the name of the site, address, contact information, etc.  Each item is limited to 35 alphanumeric parameters.



**Figure 6-24  Site Information**

The available parameters are:

| Item | Option |
|------|--------|
| System Description | up to 35 alphanumeric characters |
| Contact Information | up to 35 alphanumeric characters |
| System Location | up to 35 alphanumeric characters |
| Site Address Line 1 | up to 35 alphanumeric characters |
| Site Address Line 2 | up to 35 alphanumeric characters |
| Site Address Line 3 | up to 35 alphanumeric characters |
| Site Address Line 4 | up to 35 alphanumeric characters |
| Site Notes | up to 35 alphanumeric characters |

**Table 6-11  Site Parameters**