Operation Manual
IPTV

Annex to TSW800TP Operation Manual

Version: 4
Revision: 7
September/2010

Copyright

- This manual was created by **Wise Telecommunications Industry**. No part or contents of this manual may be re-created without written authorization of **Wise Telecommunications Industry**.

- **Wise Telecommunications Industry** reserves the right to alter any of its products and manuals contents, without any prior notification, according to its own discretion.

- **Wise Telecommunications Industry** products are under constant development, some characteristics and functionality may not be included in the manuals during time of print; they may be added as future annexes

- Any contribution or criticism that may influence the favorable development of this product or manual will be welcomed by **Wise Telecommunications Industry**.

- If the content of this manual is not in accordance with the product functionality or operations please contact **Wise Telecommunications Industry** directly:

Phone: 55-61-3486-9100
E-mail: wise@wi.com.br

Wise Telecommunications Industry
Setor de Indústria Bernardo Sayão
SIBS quadra 01 conjunto D lote 12
Núcleo Bandeirante – Brasília – DF – Brazil
CEP 71736-104
Please visit our homepage: **http://www.wi.com.br**

Contents

1 Operation

The TSW800TP IPTV module has been developed to provide all of the required information for the installation, maintenance and troubleshooting of IPTV (*Internet Protocol TV*) and VoD(*Video on Demand*) services on xDSL lines.

It verifies if the video stream is being sent by a IPTV or VoD server and performs several measurements to assesses the connection quality. Flow rates (audio, video and data) are measured separately, as well as the total packets of each flow. Several types of errors, which ease the maintenance, are also measured, including, packet loss, packet delay / jitter, and measurement of the expected performance.

The most important parameters are compared with predefined Quality of Service thresholds levels (QoS).

TSW800TP allows physical testing via Ethernet or direct on xDSL lines. The capability of the TSW800TP includes the following measurements:

- **Errors**

    - Continuity Errors
    - Error Indicator
    - Synchronization Errors
    - RTP packet Loss
    - Out of sequence RTP packets
    - RTP packet Discontinuity

- **Jitter Measurements**

    - PCR Jitter
    - Network Jitter
    - Histogram of packet Jitter and PCR of the last 5 minutes.

- **Stream Statistics (ST)**

    - Total of Video packets
    - Total of Audio packets
    - Total of Data packets
    - Total of Unknown packets

- **Stream Rates**

    - Video stream rate
    - Audio stream rate
    - Data stream rate
    - Unknown stream rate

- **Channels number (PIDS of PAT)**
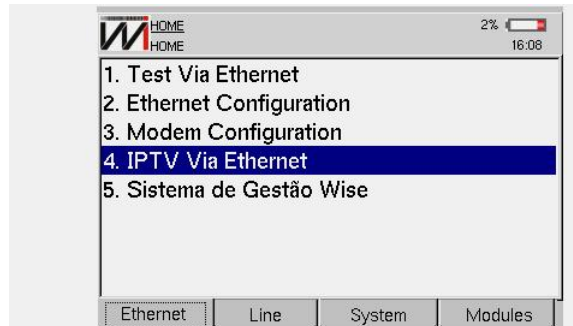
    - Each channel Band Usage Percentage

- **IGMP Measurements**

    - IGMP latency (time between ordering the channel and when stream arrives)

---

2 IPTV Test Configuration

2.1 IPTV Tabs

Initial screen with main tabs ETHERNET, LINE, SYSTEM and MODULES.

2.2 IPTV Test via Ethernet

From the HOME screen Select **Ethernet** by pressing the F1 key. Before entering the IPTV module, press the numeric #2 key or move the cursor using the up and down keys to **Ethernet Configuration** and press **START/STOP** (**Start/Stop** keys may be used as an ENTER key as well) to configure how to obtain IP addresses (manual or automatic). If the TSW800TP MAC address is required to be the same of the STB MAC address, the configuration can be done in this screen also.

More information about the **Ethernet Configuration** item may be viewed at the TSW800TP basic manual. To enter IPTV module, go back to initial screen, by pressing F1, and press numeric key 4 or move the cursor to the IPTV item and press **START/STOP**.

2.3 IPTV Test via xDSL

Select **Line** tab and configure the line as described on TSW800TP basic manual. To enter IPTV module, go to initial screen, by pressing F1 and press numeric key 4 or move the cursor to IPTV item and press **START/STOP**.

2.4 IPTV configuration screen

Test, via Ethernet or via xDSL, have the same configuration screen:
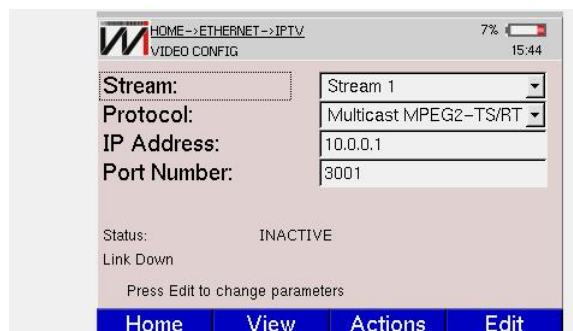
- **F1 - Home** : Go back to initial screen;

- **F2 -View**: Shows ten screen options to be visualized. See section 3;

- **F3 - Actions**: Shows Start/Stop and results saving options. See section 3;

- **F4 - Edit**: Allows to edit the parameter where the cursor is;

- **Stream**: Up to three streams (video flows) can be started.
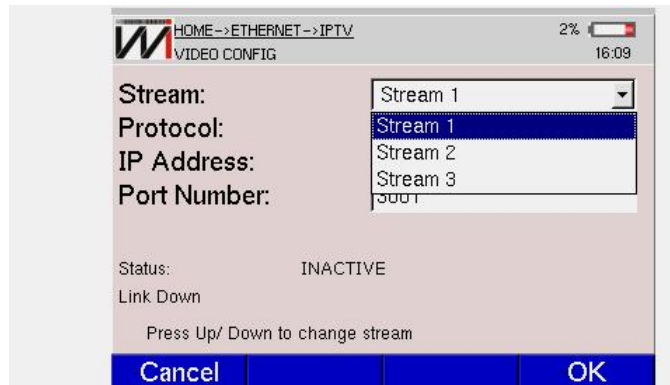
- **Protocol**:
  This parameter defines the transport protocol type. Although video codification protocol is MPEG-4, the transport mechanism used is MPEG-2 Transport Stream. TS packets may be encapsulated into UDP/IP or RTP/UDP/IP. IPTV uses IGMP protocol (Internet Group Management Protocol) to get into a multicast group, different from VoD, that uses RTSP (Real Time Streaming Protocol) to get into a unicast group.
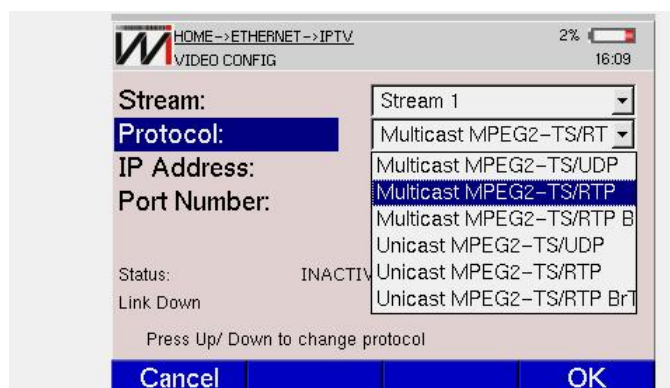
Multicast MPEG2-TS/UDP: MPEG-2 TS packets are encapsulated into UDP/IP.

Multicast MPEG2-TS/RTP: MPEG-2 TS packets are encapsulated inside RTP packets, which are encapsulated into UDP/IP.

Multicast MPEG2-TS/RTP BrT: MPEG-2 TS packets are encapsulated inside RTP packets, which are encapsulated into UDP/IP (little-endian).

Unicast MPEG2-TS/UDP: MPEG-2 TS packets are encapsulated into UDP/IP.

Unicast MPEG2-TS/RTP: MPEG-2 TS packets are encapsulated inside RTP packets, which are encapsulated into UDP/IP.

Unicast MPEG2-TS/RTP Brt: MPEG-2 TS packets are encapsulated inside RTP packets, which are encapsulated into UDP/IP (little-endian).

- **IP Address**:
  This parameter defines the desired IPTV channel IP address. It is necessary to know the specific IP address to send a IGMP packet asking to get into the multicast group that is receiving the channel. Only after the request is accepted, will the video stream starts. This field appears only if multicast protocol is selected.

- **URL (RTSP)**:
  This parameter defines the URL of the VoD server. It is necessary to know this URL to send a RTSP packet asking to get into the unicast group. The video stream starts after this request is accepted. This field appears only if an option with unicast is selected.
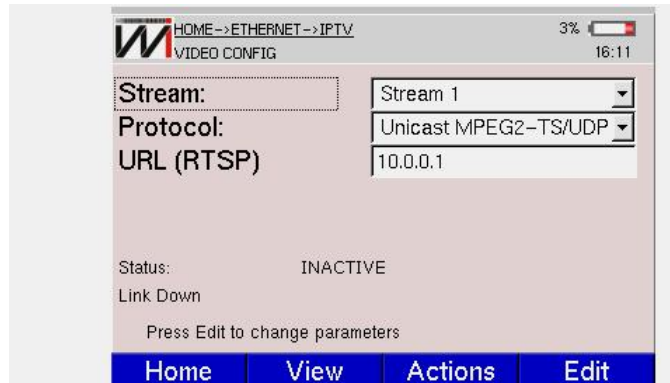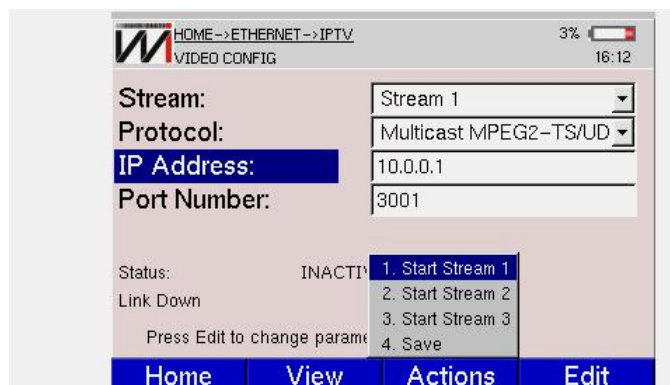

- **Port Number**:
  This parameter defines the port number which IPTV communication will use. Only appears if a multicast protocol is chosen.

3 IPTV Test Application

Press the F3 key (Actions), select Start Stream 1, then press START/STOP to start the first IPTV test. It is possible to activate all three streams simultaneously.

If the protocol chosen is a multicast, an IGMP packet will be sent. Choosing a unicast protocol (VoD), a RTSP packet will be sent and the video flow should start in a while. Through F2 key (View), a pop-up menu gives access to many others screens. The description of each option is given below.
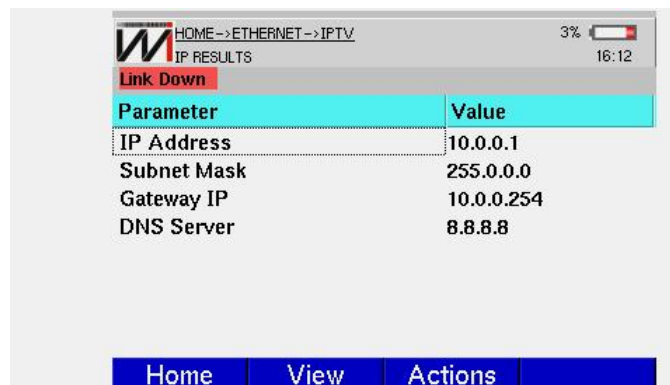
- **Video Config**
  Press #1 Key or select 1.Video Config and press START/STOP key to close pop-up menu and show the initial configuration screen.
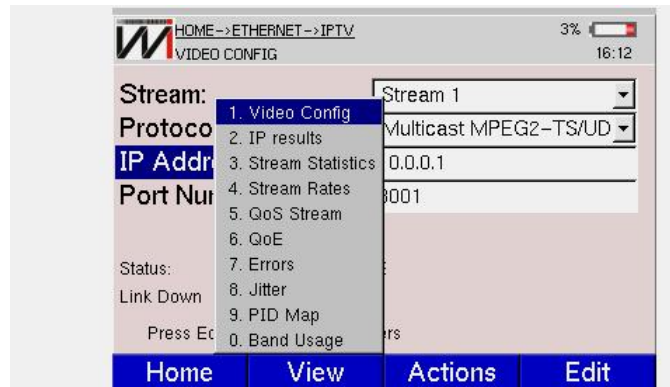
- **IP results**
  This screen shows received IP, Gateway IP, DNS server IP and the Subnet mask.

- **Stream Statistics**
  This screen shows TS packets total count (MPEG-2 transport packet, with 184 data bytes and 4 header bytes). Each TS packet has a PID that is analyzed to see if the packet should be counted as video, audio, data or unknown packets. Total bytes are also informed. F4 key (Stream) defines which stream will have its counters shown.

- **Stream Rates**
  This screen shows Kbps rates for different types of packets: video, audio, data and unknown.

- **QoS Stream**
  This screen shows the QoS parameters, its current and maximum values and the assessment of the quality of service, comparing with the predefined boundaries.

  – **PCR Jitter (Program Clock Reference)**
    Measures the evaluated jitter, analyzing the reference clock, recorded into same packets. Jitter is the oscillation of time interval between packets received, comparing the time recorded when it was generated. This interval should be equal to the difference between the recorded times, but the decoder and the network may delay some packets. If there is an excessive oscillation, the decoder may have problems. The maximum jitter to approve quality of service is 10ms.

  – **Latency**
    Measures the time between the transmission of a request to receive a program (stream) and the moment when the packet flow starts. The maximum latency to approve quality of service is 250ms.

  – **Continuity Error (Cont. Err.)**
    Measures the packets' sequence loss. The MPEG-2 TS packet has a sequence counter that allows the receiver to know a packet did not arrive by the required time. QoS screen: This counter looks at percentage, it counts the total continuities errors divided by the total MPEG2 TS packages. The maximum percentage to approve the service quality is 0.1

  – **Error Indicator (Err. Ind.)**
    Indicates there was a problem during the generation. This indication is done by the encoder when it detects corrupted source content. It is not related to the performance of the distribution network. Only the value zero approves quality of service here.

- **QoE (Quality of Experience)**
  The new term used to assess the media quality percept by the final user. To measure QoE at IPTV, the MDI (Media Delivery Index) is used. This index is composed of DF (Delay Factor) Jitter and MLR (Media Loss Rate). MDI is ruled by RFC 4445.

  – **DF Jitter**
    Its a measure that indicates the amount of video, in milliseconds, needed to be stored, considering the instantaneous video rate, to avoid jitter effect at the final user video. This parameter gives a hint of the minimum size of the buffer required at the next node.

  – **MLR**
    Represents the amount of media packages that are lost per second. Losses due to buffer overflow which occurs when there is network jam or when there are bad network

devices, resulting in many time gaps with positive and similar MLR. Transient effects, caused maybe due to electrical variation noise, result in less affected time gaps, i. e., the positive MLR values will be sparse and random.

- **Errors**
  This screen shows several types of errors and the respective counted amount.

- **Continuity Errors**
  Registers the amount of sequence packets loss.

- **TS Lost**
  Registers the amount of TS (Transport Stream) unity losses. Losing one IP frame may result in the loss of seven TS packets due to the 188 byte TS packetsize.

- **Error Indicator**
  Registers the amount of packets arrived with the bit Error Indicator activated.

- **Sync. Errors**
  Registers the amount of times that it was not possible to identify a MPEG-2 TS packet on the application layer.

- **RTP Lost**
  Registers the amount of lost RTP frames when the protocol is MPEG-2 Broadcast (RTP).
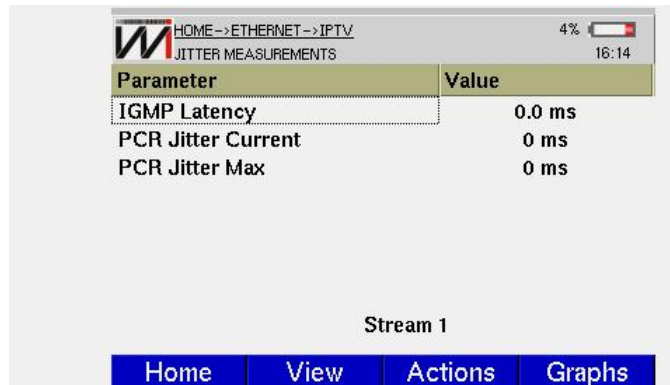
- **RTP OOS**
  Registers the amount of RTP frames out of sequence when the protocol is MPEG-2 Broadcast (RTP).

- **RTP Discontinuity**
  Registers the amount of RTP frames sequence breaks when the protocol is MPEG-2 Broadcast (RTP).

- **Jitter**
  This screen shows PCR jitter and Network jitter counting, maximum and instantaneous values. Network Jitter is caused by network traffic. PCR jitter may be caused by the encoder, by the network or by reception problems. When the protocol is MPEG-2 Broadcast (UDP), only the PCR jitter will be shown. IGMP Latency is also shown in this screen and measures the time between a request to receive a program (stream) and packet flow starts.
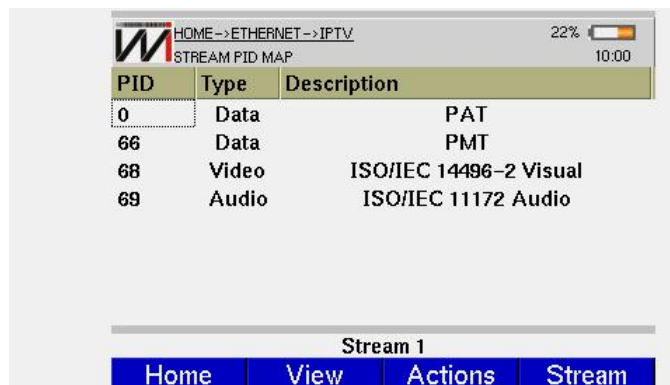
- **PID Map**
  This screen shows each PID (Packet Identifier) received its type and description. This parameter identifies to whom the packet belong. If PID is 0, the packet is PAT (Program Association Table), which is a table with each PMT (Program Map Table) PID. There is a PMT to each channel (program). This PMT is a table containing PIDs of video, audio and data packets of that channel.
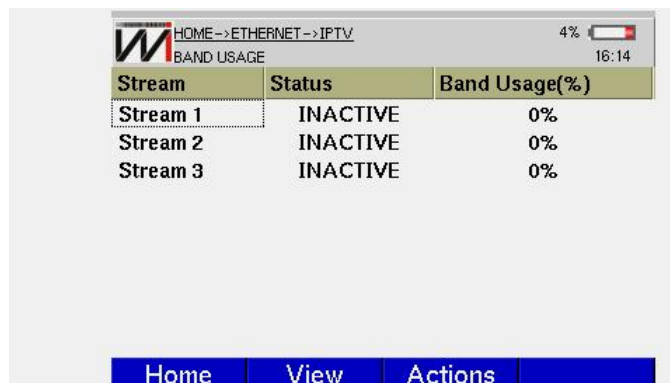
- **Band Usage**
  This screen shows each stream band usage status and percentage. The band usage percentage is the channel rate divided by the sum of all actives channels rates.

4   IPTV Test Conclusion

To finish the IPTV Test the streams should be stopped. Press F3 key (Action) and the number of the stream. Stop Stream by pressing START/STOP. If there are more streams running, it will be necessary to stop one at a time. Selecting the Save option, the test results may be saved into a file, as shown. With the following capabilities the TSW800TP is the right tool for properly deploying and managing IPTV services over xDSL lines.