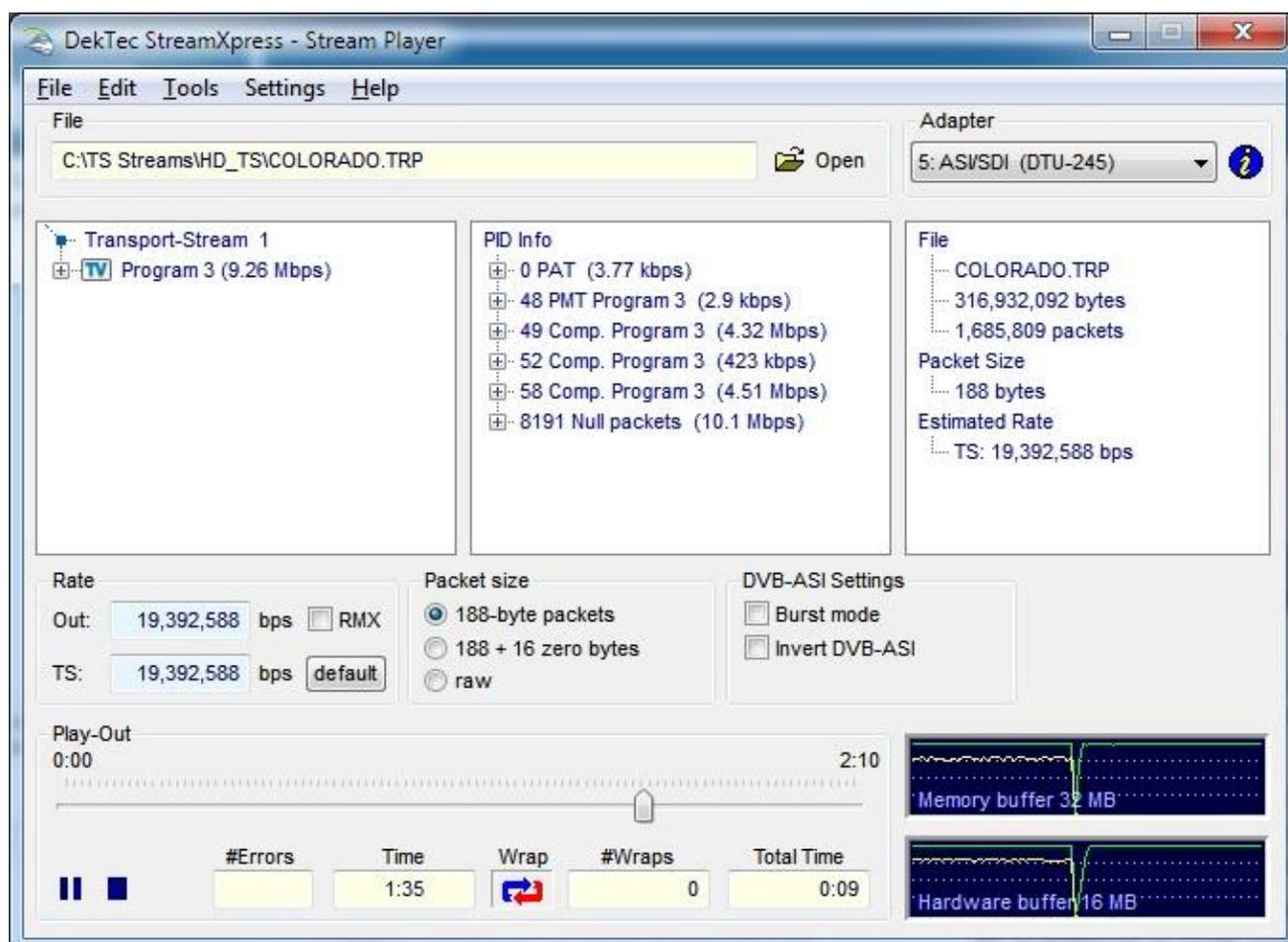


# DTC-300-SP

| StreamXpress® Software



## USER MANUAL

April 2017



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## 1. Introduction

### 1.1 General description

The DTC-300-SP StreamXpress is an easy-to-use Windows™ software package designed to provide real-time playback of MPEG-2 compliant transport streams and SDI recorded files. StreamXpress is intended to be loaded by the end-user on any qualifying PC or laptop and work in conjunction with most DekTec output devices. StreamXpress is design to read a proper formatted transport stream or SDI file from the local PC hard drive and connect it to a DekTec output device for realtime streaming. StreamXpress supports a large range of streaming interfaces including ASI, ToSIP, RF modulated outputs and SDI. StreamXpress provides basic transport stream information including: transport stream contents, PID, and file information. It provides start, stop, pause, seamless looping and much more capabilities. These features, when coupled with the variety of available DekTec output devices, give the user a powerful and portable high value playback solution. The DTC-300-SP is a licensed software product from DekTec B.V.

The DTC-300-SP StreamXpress software can be controlled remotely by the DTC-302-RC StreamXpress remote control option. See the DTC-302-RC API document for further details.

### 1.2 Software architecture

The DTC-300-SP StreamXpress is standalone software that can be freely downloaded from the DekTec website. It can be installed on any suitable laptop or computer running a supported version of Microsoft Windows™. StreamXpress is compatible with Microsoft Windows™ XP/2K3/Vista/2K8/7/8. StreamXpress needs to detect a suitable licensed DekTec device to be able to operate. The DekTec device can be a USB attached device like the DTU-215 or a PCI/PCIe card like the DTA-2144. For a complete list of devices refer to the DekTec hardware compatibility section. In order to operate StreamXpress needs to be properly licensed. The license key is held in the hardware device. (See installing a StreamXpress license section). Only one StreamXpress license is required per DekTec hardware device. When multiple output ports are available on a single hardware device, multiple independent versions of StreamXpress can be running at the same time. The number of StreamXpress instances is only limited by the DekTec hardware bandwidth limitation and PC resources (CPU, RAM, Disk Drive speed, etc...).

### 1.3 PC Hardware requirements

Depending on the application and DekTec hardware, the requirements for running StreamXpress vary.

Operating System:

Microsoft Windows™ XP/2K3/Vista/2K8/7/8

Processor and RAM:

PIII\* 300 MHz with 256MB for ASI playout

Core 2\* with 2GB of RAM for DVB-T2 playout

\*Or equivalent AMD processor

Disk Drive:

Combined Rates > 50Mb/s use drive separate from Operating System

- Combined Rates ≤ 100Mb/s use single 7200 RPM SATA
- Combined Rates > 100Mb/s use 10000 RPM SATA
- Combined Rates > 200Mb/s use SSD drive (Solid State Disk)

**NOTE:** Drive specifications are recommendations. Different architectures will yield different results in some systems.

## 1.4 DekTec hardware compatible products

The DTC-300-SP is compatible with the following DekTec hardware:

Signal Type	Supported Adapters
DVB-ASI	DTA-100, DTA-105, DTA-112, DTA-115, DTA-140, DTA-2136, DTE-3100, DTU-205
ASI/SDI	DTA-145, DTA-160, DTA-545, DTA-2137, DTA-2142, DTA-2144, DTA-2145, DTA-2152, DTA-2154, DTA-2160, DTA-2162, DTA-2174, DTU-205, DTU-245
DVB-SPI	DTA-102, DTA-2142
Modulators	DTA-107, DTA-107S2, DTA-110, DTA-111, DTA-112, DTA-115, DTA-116, DTA-117, DTU-215, DTA-2107, DTA-2111, DTA-2115
TSoIP	DTA-160, DTA-2160, DTA-2162
I/Q Samples	DTA-115, DTA-116, DTA-117, DTU-215, DTA-2107, DTA-2111, DTA-2115

## 1.5 Applications

Typical applications of StreamXpress include:

### ASI Streaming

Using a USB or PCI/PCIe DekTec device supporting ASI output, StreamXpress can stream 1 MPEG-2 TS per ASI output port. For DekTec products that have software selectable bidirectional ASI ports, use DtlInfo for changing input ports into output ports.

### IP Streaming

Using a PCI/PCIe DekTec device supporting an Ethernet connection, StreamXpress can stream multiple MPEG-2 TS over the DekTec Ethernet port. Note that StreamXpress does not have a limit on how many streams can be streamed over the Ethernet port, it is only limited by the PC resources. StreamXpress can also stream over a standard NIC card. You need a dongle license for this option to be available.

### Modulated TS streaming

Using a USB or PCI/PCIe DekTec device supporting RF outputs, StreamXpress can stream 1 MPEG-2 TS per RF output port. StreamXpress allows changing RF modulation settings and supports the

following modulations formats using the appropriate card: 8VSB, QAM A/B/C, DVB-T, DVB-T2, ISDB-S, ISDB-T, DTMB, CMMB, DVB-S, DVB-S2(X) and DAB+.

### SDI streaming

Using a USB or PCI/PCIe DekTec device supporting SDI outputs, StreamXpress can stream 1 pre-recorded SDI stream per SDI output port. For products that have software selectable bidirectional ASI/SDI ports, use DtInfo for changing input ports into output ports.

**NOTE:** The SDI file format used by StreamXpress is proprietary to DekTec. It needs to be recorded using DtGrabber+.

## 1.6 Limitations

The structure of the software and hardware brings with it a number of limitations. The main limitations are listed below.

SDI	The SDI streams needs to be compliant to the DekTec SDI file format and needs to be recorded by DekTec software and/or hardware.
Conditional access	No real time encryption supported. If a file is encrypted, StreamXpress will stream the file encrypted.
Multiplexing	Program remultiplexing is not supported. Only the total rate can be increased from the original total transport rate to meet the channel output requirements.
VBR	Only CBR Transport Streams are supported.

## 1.7 List of abbreviations

8PSK	8 Levels Phase Shifting
ACE	Active Constellation Extension
ADTB-T	Advanced Digital Television Broadcast-Terrestrial
ATSC	Advanced Television System Committee
ASI	Asynchronous Serial Interface
CATV	Cable Television
CBR	Constant Bit Rate
CDS	Cable Delivery System Descriptor
CMMB	China Mobile Multimedia Broadcasting
COFDM	Coded Orthogonal Frequency Division Multiplexing
DAB	Digital Audio Broadcasting
DMB	Digital Multimedia Broadcasting

DQPSK	Differential Quadrature Phase Shift Keying
DSNG	Digital Satellite News Gathering
DTMB-T/H	Digital Terrestrial Multimedia Broadcast-Terrestrial/Handheld
DTS	Decoding Time Stamp
DVB	Digital Video Broadcasting
DVB-C	DVB standard for modulation appropriate for in Cable networks
DVB-H	DVB standard for modulation appropriate for Terrestrial Handheld networks
DVB-T	DVB standard for modulation appropriate for Terrestrial networks
DVB-T2	DVB standard for second generation modulation appropriate for Terrestrial networks
EPG	Electronic Program Guide
FEC	Forward Error Correction
FEF	Future Extension Frame
FFT	Fast Fourier Transfer
GOP	Group Of Picture
HEM	High-Efficiency Mode
IIP	ISDB-T Information Packet
IP	Internet Protocol
IQ	In phase and Quadrature phase modulation components
ISDB-T	Integrated Services Digital Broadcasting- Terrestrial
ISSY	Input Stream SYNchronizer
LCD	Liquid Crystal Display
LDPC	Low-Density Parity-Check
MAC	Media Access Controller
MBd	Megabaud. Number of symbols per second.
Mbps	Megabit per second
MFN	Multiple Frequency Network
MISO	Multiple Input Single Output mode
MPTS	Multi-Program Transport Stream
NA	Not Applicable
NIT	Network Information Table
OFDM	Orthogonal Frequency Division Multiplexing
PAPR	Peak to Average Power Ratio
PCR	Program Clock Reference
PID	Packet ID

PLP	Physical Layer Pipe
ppm	Parts per million
PRBS	Pseudo Random Binary Sequence
PTS	Presentation Time Stamp
QAM	Quadrature Amplitude Modulation
QPSK	Quadrature Phase Shift Keying
RF	Radio Frequency
RO	Read Only
R/W	Read / Write
SDI	Serial Digital Interface
SFN	Single Frequency Network
SMPTE	Society of Motion Picture and Television Engineers
SNMP	Simple Network Management Protocol
RTP	Real-time Transport Protocol
T2-MI	DVB standard that define the communication protocol used between the T2 Gateway and the DVB-T2 modulator.
TDSD	Terrestrial Delivery System Descriptor
TDT	Time and Date Table
TMCC	Transmission and Multiplexing Configuration Control
TOT	Time Offset Table
TPS	Transmission Parameters Signaling
TR	Tone Reservation
TS	Transport Stream
TSoIP	Transport Stream over IP
TTL	Time To Live
UDP	User Datagram Protocol
UHF	Ultra High Frequency band, officially ranging from 300MHz to 3GHz, but in the context of cable television from 300MHz to 1GHz.
URL	Uniform Resource Locator
VBR	Variable Bit Rate
VHF	Very High Frequency band, ranging from 30 to 300MHz

## 2. Installation

### 2.1 Installing the DTC-300-SP software

The DTC-300 StreamXpress software can be installed on any suitable Microsoft Windows PC. When installing the StreamXpress software, the install package will install the StreamXpress application and the driver for USB and PCI cards

Download the latest version of StreamXpress from DekTec's website at <http://www.dektec.com/Downloads/Applications.asp> or copy StreamXpress.zip to the local hard drive from the DekTec USB stick .

Unzip the software into a temporary directory

**NOTE:** You have to be logged in as an administrator to install the software.

Close any other software that may already be using DekTec hardware.

Run 'StreamXpress Setup.exe'.

**Note that if you are running Win7 you need to right click on the executable and select 'run as administrator'. Failure to do so may result in a bad installation even if you have administrator rights.**

Follow the instruction on the screen until you have to select Complete or Custom.

**Complete** will install the StreamXpress software and the drivers for DekTec USB and PCI/PCIe devices. It will overwrite any existing drivers on the PC.

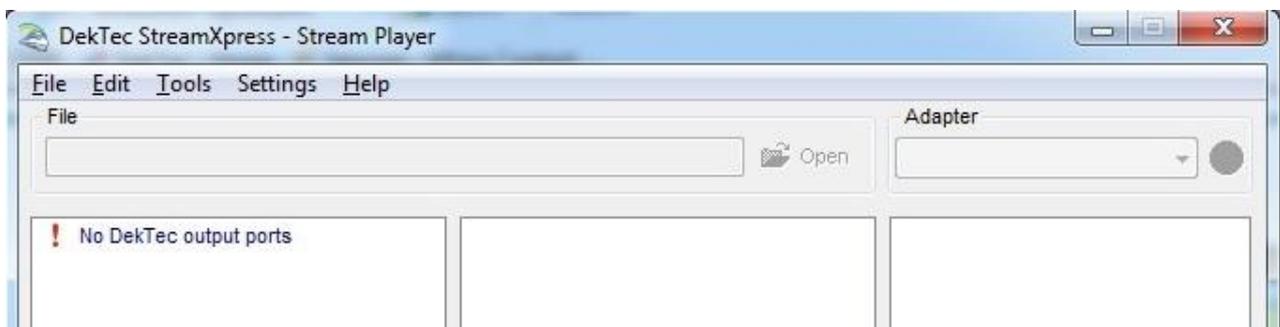
**Custom** setup allows the user to choose which elements will be installed and the location of the installation.

By default use the **Complete** installation.

When the installation is complete, you are ready to start using the DTC-300-SP StreamXpress software.

### 2.2 Licensing of the software

In order to operate the DTC-300-SP StreamXpress software, the PC must be connected to a DekTec device that holds a valid DTC-300-SP license. If no DekTec hardware product is detected, the StreamXpress interface will show this:



If no license is detected on a valid DekTec product, the StreamXpress interface will show this:



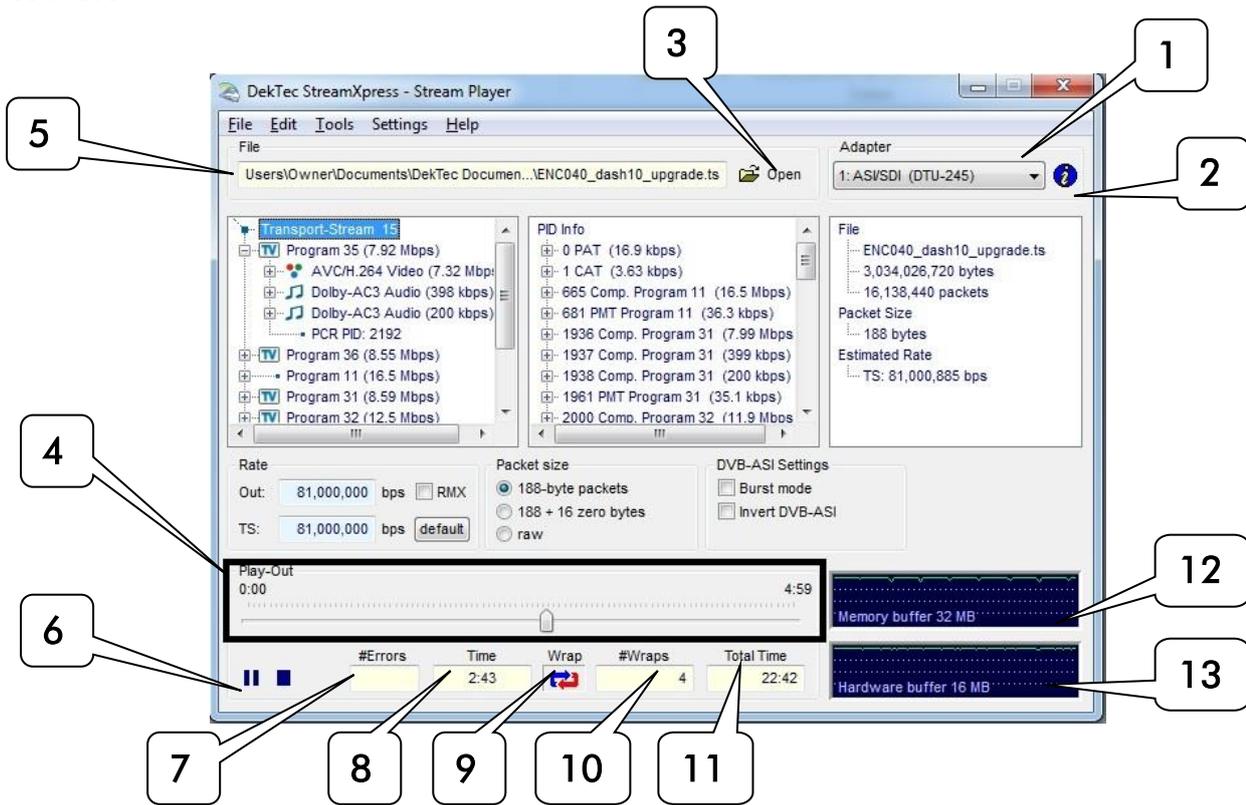
Use DtInfo to add a license or contact DekTec to purchase a valid StreamXpress license.

### 3 Overview of the interface

Depending on the type of hardware that StreamXpress connects to it'll offer more or less settings. We can divide the settings in 2 categories: general settings and mode/interface specific settings.

#### 3.1 General settings

These settings and displays are common with all DekTec devices connected to the StreamXpress software.



Variable	Type	Description	Diag.
Adapter	Drop down	Select the Adapter and port to payout	1
info	Button	Lookup interface and Port number info. Also provides the serial number of the selected adapter	2
Open	Button	Select a file to open to payout.	3
Playout Status	Display	This area indicates the length of the file calculated based on PCR and bitrate* when using a transport Stream. It also shows a cursor indicating where in the file the payout process is.	4
File	Display	Displays the filename and full path of the opened file	5
	Button	Control button to Start a payout and Stop the payout or Pause the payout when already playing.**	6

Variable	Type	Description	Diag.
# Errors	Display	This is an internal error counter that gets incremented when the device is dropping packets. This can happen if the buffer gets overflowed or underflowed due to streaming of a badly formatted file or due to PC resource limitations	7
Time	Display	This time represent the playing time since the beginning of the file	8
Wrap	Button	When pressed, the file will be looping over and over. If not selected the file will only play once and the player will stop	9
#Wraps	Display	Counter that keeps the number of loops since the playback started	10
Total Time	Display	This time represent the complete playing time from the last time the stop button was pressed	11
Memory buffer	Display	This displays the size of the software memory buffer used for the playout and a graph showing the fullness of the buffer. If the buffer line goes down to zero, the buffer is empty and the playout will stop.	12
Hardware buffer	Display	This displays the size of the hardware device memory buffer used for the playout and a graph showing the fullness of the buffer. If the buffer line goes down to zero, the buffer is empty and the playout will stop	13

\* If the PCR is incorrect in the file, the length of the playback will be wrong

\*\* The playout is never stopped. When the stop button is used, the hardware will stream out null packets at the playout rate. This can be seen as the output buffer doesn't go to zero.

### 3.2 General menu

This section describes the general menus at the top of the StreamXpress interface. Following this table, a more detailed section offers some additional information on the menus

Menu	Sub Menu	Description	Details
File	Open	To open a TS file, an SDI file, an IQ file, an ETI file or an XML configuration file	#1
File	Save Settings	To save a configuration file that will include all of the settings. The format is XML. The XML file can be modified with an external XML editor	#2
File	Capture Stream	To capture the output stream to a file. Note that you do not require an adaptor with an input to capture the streaming file	#3
File	Exit	To close StreamXpress	
Edit	Sub Loop	Allow creating a sub loop that will be smaller than the complete file length	#4
Tools	Error Injection	Allows injecting calibrated TS errors.	#5
Tools	Loop and TDT/TOT Adaptation	Allows changing the loop functions when using a TS playout. Also allow to change the setting for TDT/TOT when looping the stream.	#6

Menu	Sub Menu	Description	Details
<b>Tools</b>	Test Signal generator	Allow to use Pseudo Random Polynomial playout 0151 PRBS or use a pseudo random file. This is used for error rate measurement	#7
<b>Settings</b>	RF Output Control	When using a modulator device, this menu allows to change the RF output level	#8
<b>Settings</b>	Use NIT...	Allow to use the NIT to derive playout parameters	#9
<b>Help</b>	About	Provides version and build number for StreamXpress	

This section provides additional details regarding the general menus.

### **#1 File/Open:**

#### **Opening an MPEG-2 TS:**

The default file extension is .TS and .TRP for MPEG-2 Transport Streams. If the file extension is not .TS or .TRP, it may not show up in the list of available files. In that case just select the \*.\* filter and you'll be able to see the file. As long as the file is an MPEG-2 TS, StreamXpress will be able to open the file no matter what its extension is. If the file is not a valid MPEG-2 TS, it will open the file and indicate it is not a valid transport stream. StreamXpress can accept 188 and 204 byte packets MPEG-2 TS.

**NOTE:** StreamXpress plays standard MPEG-2 TS that can come from any source.

#### **Opening an .XML configuration file:**

Use the File/Open function to load an .XML configuration file. See #2 Save Settings for more information.

#### **Opening a .dtsdi file:**

StreamXpress can play out SDI files from the hard disk using an adaptor that supports SDI playback. See the section of this manual about playing SDI files.

#### **Opening an IQ file:**

StreamXpress can be used to play files with IQ samples. See the section about IQ modulation options for more information.

#### **Opening an ETI file:**

ETI files contain a multiplexed stream for DAB/DAB+/DMB. StreamXpress only supports the ETI(NI) file format.

### **#2 File/Save Settings:**

When playing out a file with StreamXpress, the user can change many of the settings including bitrate, RF channels, RF power levels etc... In some case when StreamXpress is used for regular

testing (like QC applications) it does make sense to save all the playout settings into a file for future recall.

The Save Settings will save into an .XML file the current settings including the filename and path. To reload the settings use the open button and select the proper .XML file.

**NOTE:** The user can edit and create .XML configuration files using a standard .XML editor. See appendix A for an example of a StreamXpress XML Config file

### **#3 File/Capture Stream:**

StreamXpress allows modifying the original recorded file when playing back out. For example, the user can modify the total rate, change 188 byte packet into 204 byte packets or loop the file several times to increase its total playout time. StreamXpress has an internal recorder that allows writing the modified playout file to the hard disk. The Capture Stream menu allows selecting a filename and location to record the output file. When the Capture Stream file is selected, the file will be recorded to the hard disk when playing out the stream.

**NOTE:** As soon as the stop button is pressed, the recorded file will be closed and won't be overwritten even if the start button is pressed again.

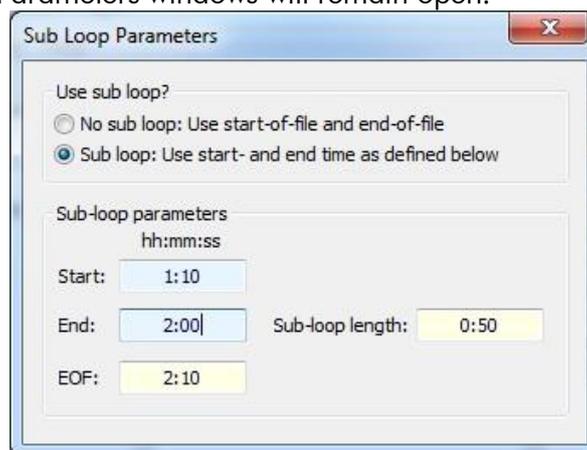
**NOTE:** This feature is available even if your DekTec device is a playout device only.

**NOTE:** This feature is only available for MPEG-2 TS files.

### **#4 Edit/Sub Loop:**

Sometimes recorded files can be long and only part of the stream can be of interest for testing purposes. StreamXpress allows playing a part of the stream. This is setup using the Sub Loop function. When using the Sub Loop, select the start time (from the start of the file) and the end time or the duration of the sub loop.

**NOTE :** When sub loop is selected a \*\*\*\*Sub Loop Selected\*\*\*\* message will appears in the playout window and the Sub loop Parameters windows will remain open.



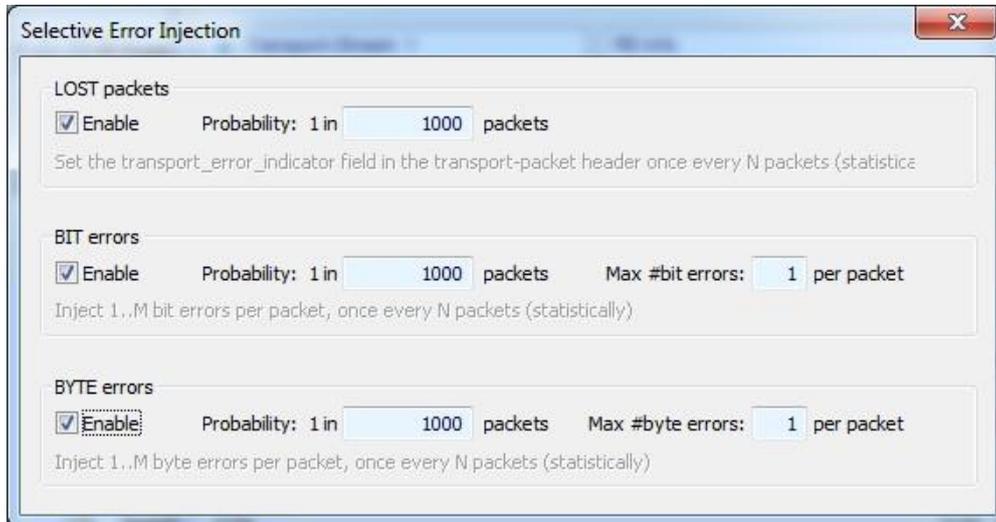
### **#5 Tools/Error Injection:**

StreamXpress will play a recorded file from the hard disk. Assuming the file on the hard disk is perfect, StreamXpress will play without any TS errors. Sometimes it's interesting to add calibrated errors to the playout to simulate bad transmission or to test a receiving device's capability to recover from errors. The Tools/Error Injection menu allows to inject calibrated errors into the output TS.

**NOTE:** This menu is only available when playing an MPEG-2 TS.

There are 3 types of errors that can be injected:

- Lost Packets
- BIT errors
- Byte Errors



**Lost Packets:** When selecting this type of error insertion, StreamXpress will set the `transport_error_indicator` field in the TS packet header once every N packets. The frequency of the error insertion can be changed using the probability window.

**Bit Errors:** When selecting this type of error insertion, StreamXpress will modify (from 1 to 0 or from 0 to 1) 1 to M bits per modified packet. The frequency of the error insertion can be changed using the probability window. The bit error distribution is random.

**BYTE Errors:** When selecting this type of error insertion, StreamXpress will modify 1 to M bytes per modified packet. The frequency of the error insertion can be changed using the probability window. The byte error distribution is random.

**NOTE:** The probability of error insertion can vary by few packets. For exact bit error measurement use the Test-Signal generator function.

**NOTE:** When injecting errors, the Selective Error Injection window will remain open until all error injection options are turned off.

#### **#6 Tools/ Loop and TDT/TOT Adaptation:**

StreamXpress offers the capability to loop a recorded transport stream for continuous playback. An operation encoder is designed to run continuously and when looping a pre-recorded TS there will be some discontinuity that can affect the receiver and decoder downstream. StreamXpress offers some looping options that can help minimize the effect of the discontinuity at the looping point. It allows adapting the Continuity Counter, PCR and DTS/PTS, TDT/TOT after the

first loop. These adaption functions are only available when playing transport-stream files.



**Loop adaption for the Continuity Counter:**

When selecting Continuity Counter StreamXpress will modify, in real time, after the 1<sup>st</sup> loop, the Continuity Counter of each PID in the stream to ensure that there is no discontinuity in the count that may result in decoder error or reset. As a result after the 1<sup>st</sup> loop, the continuity count of the original file will not be maintained when that option is enabled.

**Loop adaption for the PCR and DTS/PTS:**

When selecting PCR, DTS/PTS StreamXpress will modify, in real time, after the 1<sup>st</sup> loop, the PCR and DTS/PTS of each program/component in the stream to ensure that there is no discontinuity in the PCR that may result in decoder error or reset. As a result after the 1<sup>st</sup> loop, the PCR and PTS/DTS of the original file will not be maintained when this option is enabled.

**NOTE:** This option should be not used when testing time sensitive element like interactive data triggered by PCR value or add insertion trigger with SCTE35 flags. As the PCR and PTS/DTS are re-stamped, the trigger will be lost in these applications after the first loop.

**Loop adaption for the TDT/TOT:**

When selecting TDT/TOT StreamXpress will modify, in real time, after the 1<sup>st</sup> loop, the TDT and TOT according to the setting below. It will re-stamp each packet with a TOT/TDT packet updating the timetable so it appears to be continuous in time. There are 3 options for updating the TDT/TOT.

Do Not change the TDT/TOT time in first loop: In this case StreamXpress will use the TDT/TOT from the original stream as reference and when looping will increment the TDT/TOT accordingly.

Use current date/time: In this case StreamXpress will discard the TDT/TOT from the stream and replace it with the current time and date of the PC.

Change date/time to: In this case StreamXpress will use the specified date/time and replace the TDT/TOT. Upon looping, the date and time will be updated accordingly.

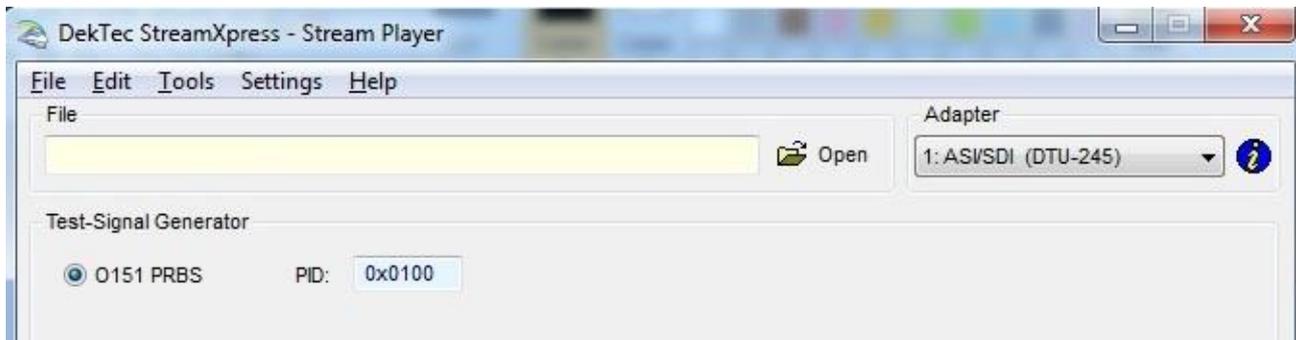
Note on Stream Looping: StreamXpress can improve the looping performance by “tricking” the receiver that it is receiving a real time continuous stream. However, StreamXpress cannot make a 100% seamless looping and elements such as buffer integrity, GOP boundary etc... will not be respected at looping point. In order to minimize the visual effect of the looping, it is advised to use a single program TS file with black video and audio silence at the start and the end of the clip.

### **#7 Tools/Test-Signal Generator:**

StreamXpress offers the capability to playout a PRBS test signal for accurate bit rate measurements. A PRBS (Pseudo Random Binary Sequence) is a binary PN (Pseudo-Noise) signal. The sequence of binary 1’s and 0’s exhibits certain randomness and autocorrelation properties.

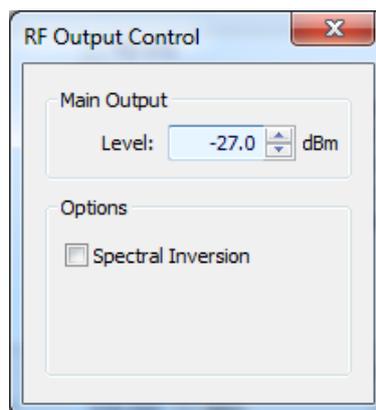
Bit-sequences like PRBS are used for testing transmission lines and transmission equipment because of their randomness properties. StreamXpress implements ITU-T standard O.151 ( See Appendix B. for more information on how the PRBS sequence is generated)

StreamXpress is capable of encapsulating the O.151 PRBS data into an MPEG-2 TS where the user specifies the PID where the PRBS data will be carried. The user can also specify the total bitrate of the transport stream. The total PRBS sequence is 64Mbits so the duration of the sequence will depend on the bitrate played out.



### **#8 Settings/RF Output Control:**

StreamXpress offers the capability to change the RF output level when using an RF modulator with a variable RF output. The user can choose to adjust the RF output level and also to invert the spectrum.



### **#9 Settings/Use NIT for Deriving Parameters:**

StreamXpress offers the capability to read the NIT if present in the stream and derive the Streaming parameters. This is relevant for streams with a DVB “Cable Delivery System Descriptor (CDSD)” or “Terrestrial Delivery System Descriptor (TDSD)”.

If “Deriving parameters from NIT” is set:

- For DVB-C: the RF frequency, symbol rate and QAM constellation are set to the values found in the CDSD
- For DVB-T: the RF frequency and DVB-T parameters are set to the values found in the TDSD

### 3.3 Display Transport Stream information

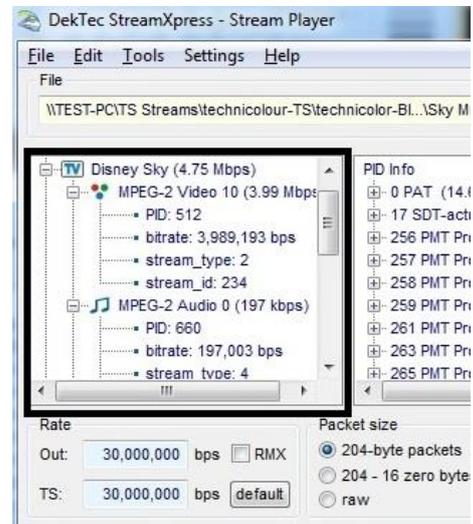
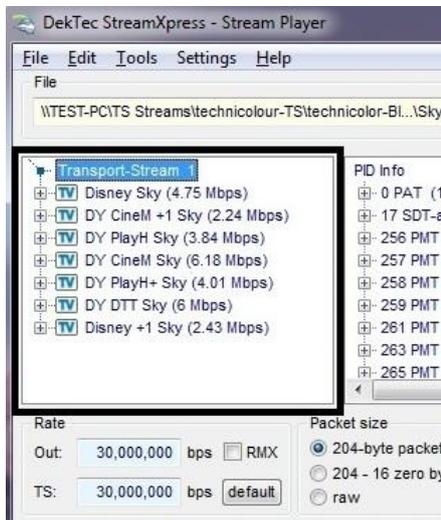
Upon opening an MPEG-2 TS StreamXpress will read the data from the opened TS file and display some valuable information for the user. There are 3 main areas of display:

- Transport Stream Info
- PID Info
- File Info

#### 3.3.1 Transport Stream info

The first window from the left represents the Transport Stream Info. It will display the following information if it's available in the stream:

- Transport Stream ID.
- Each program detected into the stream.
- Program name and total bitrate for the program.
- Under each program: PID#, Stream\_type, Stream\_ID and bitrate of each component.

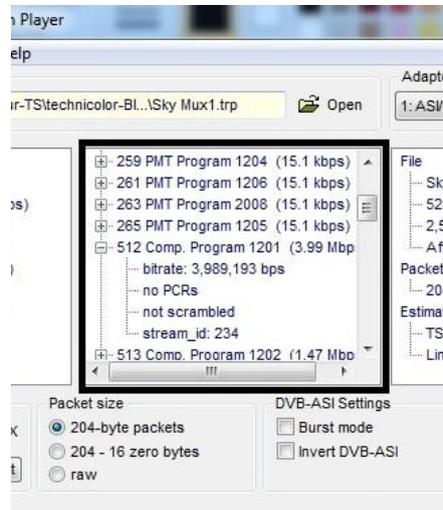


#### 3.3.2 PID info

The second window from the left represents the PID Info. It will display the following information if it's available in the stream:

- Each PID and its association with a program number.
- Bitrate of the PID.
- PCR presence.

- Whether or not the stream is scrambled.
- Stream\_ID.



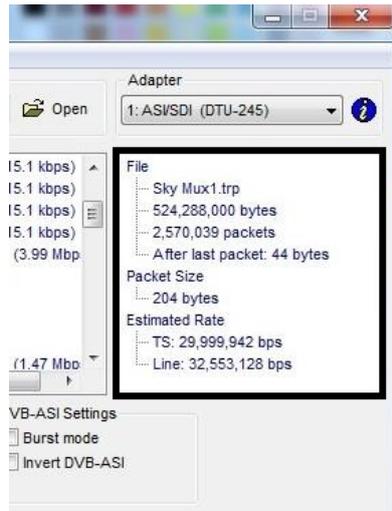
### 3.3.3 File info

The third window from the left represents the File Info. It will display from the file:

- File name.
- File size in bytes.
- Number of full packets in the file.
- Packet Size.
- Estimated Rate for the TS and for the Line.
- How many bytes are trailing and not part of a full MPEG TS packet.

**NOTE:** The line rate includes Reed-Solomon 16 bytes extra information, if present.

**NOTE:** Some players can have issues with trailing bytes that are not part of any TS packet. StreamXpress will discard these trailing bytes during playback.



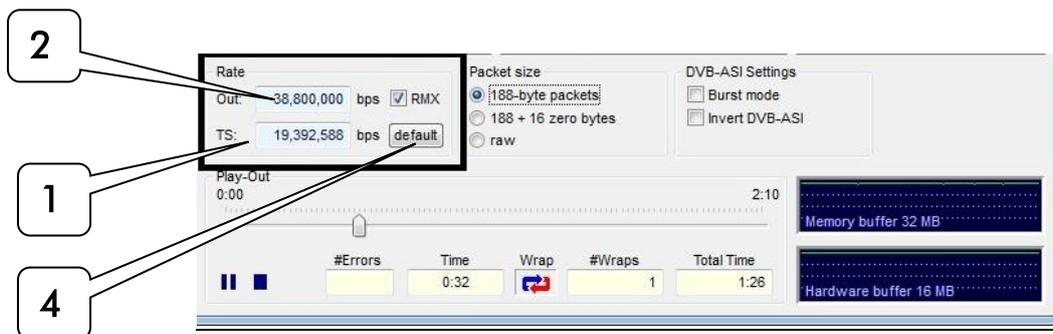
### 3.4 Playing a Transport Stream through an ASI interface

StreamXpress supports the playout of CBR transport streams over different interfaces. One of the most common interfaces is ASI. The following are StreamXpress display/setting specific to playing a transport stream over ASI.

#### 3.4.1 ASI rate control

StreamXpress offers some powerful capabilities with regards to setting the output rate of the playback.

Variable	Type	Description	Details	Diag.
TS Rate	Display/Field	Display the TS rate of the file derived from PCR in the file	#1	1
Out Rate	Field	Allow to the set the output rate for the playback	#2	2
RMX	Button	Select to remux the TS to match the output rate of the channel	#3	3
Default	Button	Use this to restore the default output rate (based on PCRs) in the TS rate window		4



**#1 TS Rate:**

The native TS rate is derived by reading the PCR values in the first 12MB of the file, counting the number of bytes between PCR values and correlating with the PCR values.

**NOTE:** If the file has bad PCR values or there are no PCRs detected, the TS rate will be wrong. The same will happen if the stream is VBR. In this case the user can type in its own value for the TS rate. If the TS rate is different than the calculated bitrate, the TS rate will turn red. If the StreamXpress plays a file at the non-native rate, it may result in bad timing of the A/V which may result in picture breaking up and pixelating.

**#2 Out Rate:**

The output rate will follow the native TS rate by default but represent the actual playout rate. The output rate can be set independent of the native rate. Note that without remultiplexing (RMX button) the stream won't be able to be decoded properly if played at a different rate than the native rate as the PCR values will not be correct.

**#3 RMX:**

StreamXpress offers the capability to remultiplex the open TS by adding in real time Null Packets (stuffing) and recalculating PCR and PTS/DTS on the fly.

This is desirable when trying to play to a modulator that requires a fixed input bitrate.

**NOTE:** StreamXpress can only add Null Packets and cannot play properly at a rate lower than the native rate (even if the original stream contains null packets).

**NOTE:** If the output rate is set lower than the native TS rate, the Out display will turn orange.

**3.4.2 Packet size**

StreamXpress support the playback of multiple TS formats. It supports 188 byte packets, 204 byte packets (188 + 16 zero bytes) and raw playback.

If the original file contains 188 byte packets, the user can choose to playout 188 byte packets (Native) or 204 byte packets (188+ 16 zero byte) or can play a file in raw format.

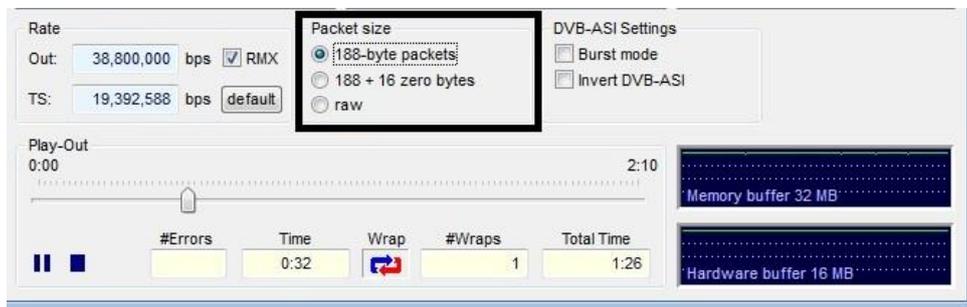
**NOTE:** StreamXpress cannot calculate valid Reed-Solomon bytes so therefore the 16 additional bytes with be zero bytes.

If the original file contains 204 byte packets, The user can choose to playout 204 byte packets (Native) or 188 byte packets (188- 16 zero byte) or can play a file in raw format.

**NOTE:** StreamXpress will play valid Reed-Solomon if present in the original file.

**NOTE:** The TS rate will be different than the line rate as the 16 extra bytes are not used to calculate the playout rate. The actual output rate will include the 16 Reed-Solomon bytes per packet if playing 204 bytes packets.

If the file is not formatted with either 188 or 204 byte TS packets, StreamXpress can play Raw. Raw means that StreamXpress doesn't care about packet size: anything can be transmitted. This works for ASI or SPI, but not for modulators because these devices expect a packet structure. This is the only way to playout ETI files over an ASI interface.



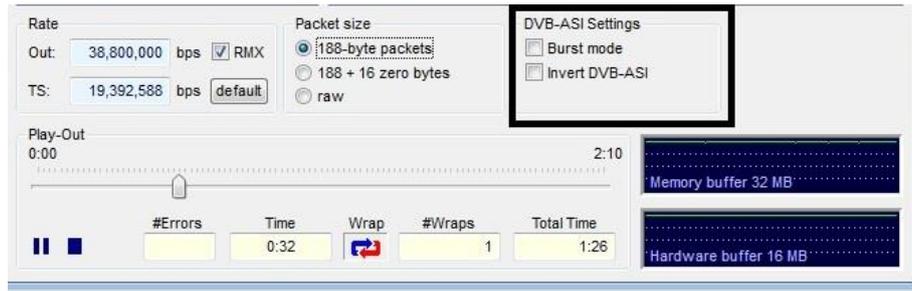
### 3.4.3 DVB-ASI settings

StreamXpress with playback over ASI using byte mode meaning that each byte is spread across the 270Mbits/s ASI interface. This mode is the safest mode as it spreads the data evenly without any burst. Data bursts can create near instantaneous data rate hikes that may be difficult for ASI receiver to handle.

StreamXpress allows to playback ASI in burst mode. In this case the interface will be sending complete 188 bytes packets at a time. Click on the Burst mode tick box to select this mode.

ASI is very similar to SDI as it is a 270Mbits/s serial signal. One of the major difference between ASI and SDI is that ASI is polarized, meaning that it has to be in a certain polarization for the data to be received. Some older Distribution Amplifier (DA) will invert the polarization of the ASI data when receiving and regenerating an ASI signal, causing the receiver not to be able to handle that inverted ASI.

The StreamXpress software allows to playback inverted ASI which can be used to test a device capability to handle inverted ASI or to feed an inverting DA (Creating a proper ASI on the output side). Click on invert DVB-ASI tick box to select this mode.



### 3.5 Playing a Transport Stream through an RF interface

StreamXpress supports the playout of CBR transport streams over different interfaces. DekTec supports multiple RF modulator adaptors that can generate RF signals. The following are StreamXpress settings specific to playing a transport stream over RF interfaces. Each type of modulation will offer different settings and will be reviewed by modulation type.

StreamXpress supports adaptors that can modulate/playback the following formats:

-**ADTB-T** is a modulation sub-standard of the DTMB TV standard for mobile and fixed terminals used in the People's Republic of China, Hong Kong and Macau.

-**ATSC** is a modulation standard for terrestrial broadcast in the US, Canada and Mexico.

-**CMMB** is a modulation standard for mobile television and multimedia standard developed and specified in China

-**DAB+** is a modulation standard used for digital radio. StreamXpress also supports DAB+ (a non-backwards compatible upgrade of DAB) and DMB (video signals over a DAB modulated signal).

-**DMB-T/H** is a modulation standard for mobile and fixed terminals used in the People's Republic of China, Hong Kong and Macau.

-**DVB-C** is a modulation standard for cable TV used by countries that adopted DVB standards. This is also known as J.83 Annex A.

-**DVB-H** is a modulation standard for terrestrial handheld broadcasting used by countries that adopted DVB standards.

-**DVB-T** is a modulation standard for terrestrial broadcasting used by countries that adopted DVB standards.

-**DVB-T2** is a second generation modulation standard for terrestrial broadcasting used by countries that adopted DVB standards.

-**ISDB-T** is a modulation standard for terrestrial broadcasting used by countries that adopted Japanese standards.

-**QAM B** is a modulation standard for cable TV used mostly in North America. This is also known as J.83 Annex B.

-**QAM C** is a modulation standard for cable TV used mostly in Asia. This is also known as J.83 Annex C.

-**IQ** is a playback mode playing out Inphase and Quadrature phase of the modulated components.

-**T2-MI** is a modulation standard that defines the communication protocol used between the T2 gateway and the DVB-T2 modulator to carry synchronization information for SFN broadcasting, signalling information to control modulators transmission and data that is encapsulated within DVB-T2 Baseband frames.

-**DVB-S** is a modulation standard for satellite broadcasting.

-**DVB-S2** is a second generation modulation standard for satellite broadcasting.

**NOTE:** Most of the formats are optional components of DekTec hardware and not available for every hardware device. Please verify that your DekTec hardware device is capable and licensed for that mode (See DtlInfo). If the DekTec device is not licensed, the option will not show up in the list of modulation standards.

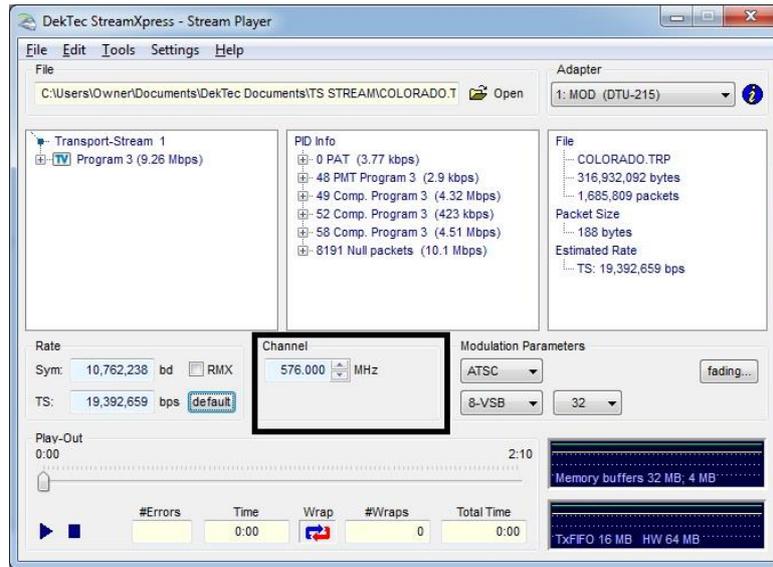
### 3.5.1 General RF settings

When playing a stream via an RF adapter, the user has to set different parameters that depend on the type of modulation. Each modulating standard has different parameters and settings and different bandwidth.

#### 3.5.1.1 RF Channel frequency setting

Most DekTec modulator devices are fully agile across the UHF/VHF band or the Lband.

The user has to select which part of the RF spectrum to send the modulated signal. Enter the channel to enter the **center** frequency of the digital modulated signal.



For example, if the modulated channel is 6 MHz wide and the RF channel selected is 576MHz, the RF signal will span between 573MHz and 579MHz.

**NOTE:** The StreamXpress can playback at any channel frequency but depending on the modulation format and the world region, commercial receiver built in TV or setopbox may have fixed channel lined up. Consult the local channel line up to make sure that the channel frequency selected in the StreamXpress will “fit” a specific RF channel in the commercial channel allocation table.

For example, in the US, channel 7 terrestrial channel is allocated between frequency 174MHz and 180MHz, to feed a TV/setopbox to channel 7, the user must use the center channel 177MHz representing the center of allocated RF channel 7.

### 3.5.1.2 Rate and symbol rate settings

A type of modulation and settings such as bandwidth, forward error correction will dictate the symbol rate and therefore data rate throughput that need to be fed to the modulator. As with most modulator the data rate needs to be very close to the theoretical data rate in order to function properly.

When setting the modulation parameters, the StreamXpress will calculate and display the output rate or symbol rate required to feed the modulator. If the file bitrate **is lower** than the required data rate/symbol rate for that modulation the StreamXpress can remultiplex the file in real-time to adapt to the required channel rate. The user can do this by ticking the RMX box.

If the datarate of the file **is higher** than the required data rate/symbol rate, the file cannot be played out properly and the TS rate display will turn red or the Out rate will turn orange if the RMX box is ticked. In this case choose a lower datarate file or adjust the modulation parameters.



### 3.5.1.3 Fading

StreamXpress incorporates the XpressSim software as part of its GUI. If the XpressSim software is licensed on the DekTec device, the fading button will be enabled. XpressSim allows inserting calibrated RF errors and distortions in the final RF output of the DekTec adaptor. Refer to the XpressSim manual for more information regarding the fading functions.

### 3.5.2 ADTB-T Modulation settings

If the DekTec Adaptor is licensed to support the ADTB-T modulation, the user can select the ADTB-T modulation and change its parameters.

Variable	Type	Description	Details	Diag
Bandwidth Selection	Drop down	Select the bandwidth of the modulated channel	#1	1
IL1, IL2	Drop down	Allow to the set the time interleaver.	#2	2
Constellation Mode	Drop down	Select the Constellation mode used for the modulation	#3	3
Guard interval	Drop down	Select the guard interval used for the modulation	#4	4
Code Rate	Drop down	Select the code rate used for the modulation	#5	5
F	Check box	Select frame numbering	#6	6
P	Check box	Insert ADTB-T pilot	#7	7



### **#1 Bandwidth Selection:**

The ADTB-T modulation supports multiple bandwidths per channel. With this setting the user can select between 5,6,7,8 MHz for the RF spectrum per channel.

### **#2 Time Interleaver:**

The ADTB-T modulation supports 2 time interleaver setting. Short 240 symbols (IL1) or long 720 symbols (IL2).

### **#3 Constellation Modes:**

The ADTB-T modulation supports multiple sub-modulation modes. Depending on the application and how error prone the channel can be the user can select different constellation mode. The StreamXpress supports 4NR-QAM, 4-QAM, 16-QAM, 32-QAM and 64-QAM.

### **#4 Guard Interval:**

The ADTB-T modulation uses Pseudo-Random Noise Code in the guard interval to allow for faster synchronisation and more accurate channel estimation. The StreamXpress offers 3 different codes: PN420, PN595 and PN945.

### **#5 Code Rate:**

The ADTB-T modulation offers multi Code rate. The StreamXpress support 0.4, 0.6 and 0.8 code rate.

### **#6 Frame Numbering**

Each ADTB-T RF frame is sequentially numbered for missing frame and reordering tracking. When selecting the "F: box, the StreamXpress will sequence the RF frames.

### **#7 Pilot Insertion**

The insertion of the Pilot in ADTB-T is optional and allows a quicker locking of the RF signal by the receiver. Select the "P" box for Pilot insertion.

## **3.5.3 ATSC Modulation settings**

The user can select the ATSC modulation and change its parameters. Every UHF/VHF DekTec modulator is licensed to support ATSC by default.

Variable	Type	Description	Details	Diag
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Variable	Type	Description	Details	Diag
<b>Modulation Modes</b>	Drop down	Select if the modulator is using 8-VSB or 16-VSB	#1	1
<b>Sideband Filters</b>	Drop down	Select the number of taps for the sideband filter	#2	2



### #1 Modulation Modes:

There are 2 modes defined by the ATSC standard 8 and 16-VSB. 16VSB was notably intended to be used for ATSC **digital cable**, but QAM has been chosen as the cable industry standard instead. 8VSB should be used as default.

### #2 Sideband Filter:

These setting allow choosing the number of taps for the sideband filters. Changing the sideband filters changes the shape of the RF envelope. The default value is 32 taps. Note that settings above 32 should be avoided as it will cost an excessive amount of CPU cycles to the PC with no real gain in the modulation.

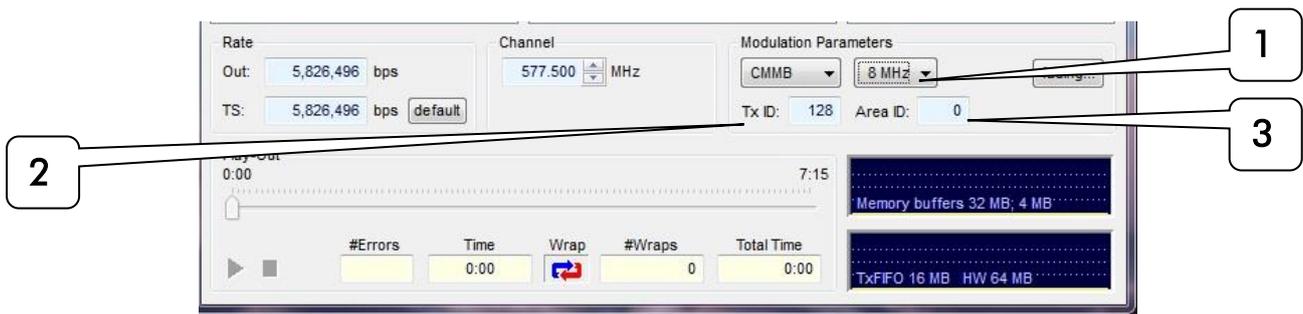
## 3.5.4 CMMB Modulation settings

If the DekTec Adaptor is licensed to support the CMMB modulation, the user can select the CMMB modulation and change its parameters.

**NOTE:** The CMMB modulation does not accept direct transport streams. It requires the use of the CMMB multiplexed file.

**NOTE:** The CMMB modulation is used both in the Satellite band and the UHF/VHF band. DekTec StreamXpress only support CMMB in the UHF/VHF band.

Variable	Type	Description	Details	Diag
<b>Channel Bandwidth</b>	Drop down	Select the modulator bandwidth between 2Mhz and 8Mhz	#1	1
<b>TxID</b>	Field	Select a number for Transmitter Identity (128-256)	#2	2
<b>Area ID</b>	Field	Select a number for Area Identity (0-127)	#3	3



### **#1 Bandwidth Selection:**

The CMMB modulation supports 2 bandwidths per channel. With this setting the user can select between 2 and 8 MHz for the RF spectrum per channel. The CMMB modulation uses 4K mode for 8 MHz channels and a 1K mode for 2 MHz channels.

### **#2 Tx ID:**

The Tx ID represents the transmitter identity in a Single Frequency Network. The value for the TxID field is ranging from 128 to 255.

### **#3 Area ID:**

The Area ID is used as an ID for the stream coming from the same transmitter but for different application or region. The value for the Area ID field is ranging from 0 to 127.

## **3.3.5 DAB(+) Modulation settings**

The user can select the DAB modulation and change its parameters if a DekTec card is detected and licensed for DAB. You can also use the DAB modulation option for DAB+ and/or DMB modulation. DAB does not use standard transport streams but uses ETI files. Those ETI files can contain multiple audio and/or (in case of DMB) video streams.

StreamXpress can playout existing ETI files and DekTec offers a command line utility to create the ETI files.

The ETI utility can be found in the same directory where StreamXpress is installed and is called DabMux.exe

If the DekTec card is enabled for DAB, use the DabMux application to create valid ETI(NI) files in a DOS prompt environment. See the DabMux manual on how to do this.

## **3.5.6 DMB-T/H Modulation settings**

If the DekTec Adaptor is licensed to support the DMB-T/H modulation, the user can select the DMB-T/H modulation and change its parameters.

Variable	Type	Description	Details	Diag
<b>Bandwidth Selection</b>	Drop down	Select the bandwidth of the modulated channel	#1	1
<b>IL1, IL2</b>	Drop down	Allow to the set the time interleaver.	#2	2
<b>Constellation Mode</b>	Drop down	Select to Constellation mode used for the modulation	#3	3
<b>Guard interval</b>	Drop down	Select to guard interval used for the modulation	#4	4
<b>Code Rate</b>	Drop down	Select to code rate used for the modulation	#5	5
<b>F</b>	Check box	Select frame numbering	#6	6



### **#1 Bandwidth Selection:**

The DMB-T/H modulation supports multiple bandwidth per channel. With this setting the user can select between 5,6,7,8 MHz for the RF spectrum per channel.

### **#2 Time Interleaver:**

The DMB-T/H modulation supports 2 types of interleavers setting: Short 240 symbols (IL1) or long 720 symbols (IL2).

### **#3 Constellation Modes:**

The DMB-T/H modulation supports multiple sub-modulation modes. Depending on the application and how error prone the channel is, the user can select different constellation mode. The StreamXpress supports 4NR-QAM, 4-QAM, 16-QAM, 32-QAM and 64-QAM.

### **#4 Guard Interval:**

The DMB-T/H modulation uses Pseudo-Random Noise Code in the guard interval to allow for faster synchronisation and more accurate channel estimation. StreamXpress offers 3 different codes: PN420, PN595 and PN945.

### #5 Code Rate:

The DMB-T/H modulation offers multi code rate. StreamXpress supports 0.4, 0.6 and 0.8 code rates.

### #6 Frame Numbering:

Each DMB-T/H RF frame is sequentially numbered for missing frame and reordering tracking.

## 3.5.7 DVB-C Modulation settings

The user can select the DVB-C modulation and change its parameters. Every UHF/VHF DekTec modulator is licensed to support DVB-C by default. DVB-C is also known as J.83 Annex A.

Variable	Type	Description	Details	Diag
Modulation Modes	Drop down	Set what QAM mode the modulator will use	#1	1



### #1 Modulation Modes:

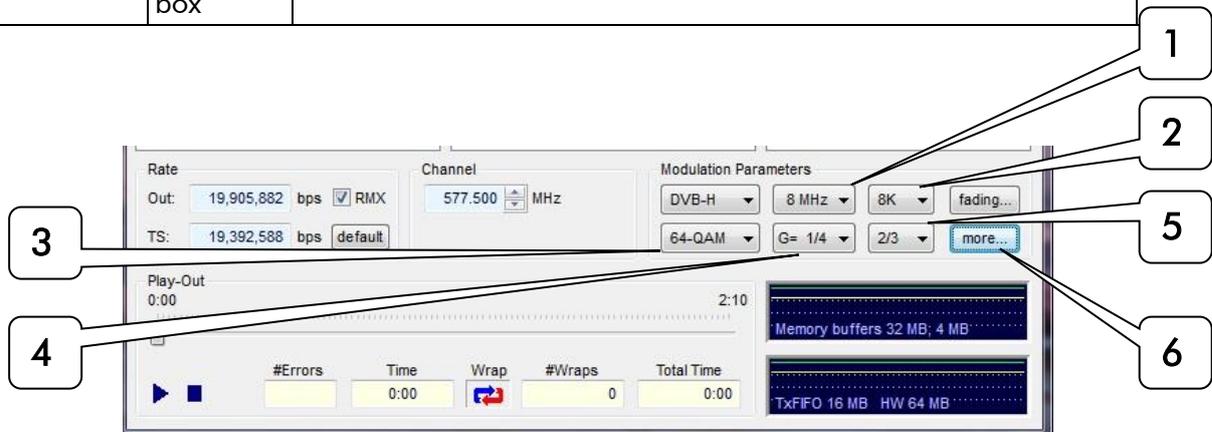
There are 5 modulation modes defined by the DVB-C standard: 16-QAM, 32-QAM, 64-QAM, 128-QAM and 256-QAM. 64-QAM and 256-QAM are the most popular modes.

## 3.5.8 DVB-H Modulation settings

The user can select the DVB-H modulation and change its parameters. Every UHF/VHF DekTec modulator is licensed to support DVB-H by default. DVB-H is the standard used for handheld devices.

**NOTE:** The DVB-H modulation share the same physical layer than the DVB-T modulation. DVB-H modulators accept transport streams that only are composed of MPE (Multi-Protocol Encapsulation) sections.

Variable	Type	Description	Details	Diag
<b>Bandwidth Selection</b>	Drop down	Select the bandwidth of the modulated channel	#1	1
<b>Modulation modes</b>	Drop down	Allow to set the number of active carriers	#2	2
<b>Constellation Mode</b>	Drop down	Select the Constellation mode used for the modulation	#3	3
<b>Guard interval</b>	Drop down	Select the guard interval used for the modulation	#4	4
<b>Code Rate</b>	Drop down	Select the FEC code rate used for the modulation	#5	5
<b>More</b>	Check box	Open a second window with more settings (See section below)	#6	6



### **#1 Bandwidth Selection:**

The DVB-H modulation supports multiple bandwidth per channel. With this setting the user can select between 5,6,7,8 MHz for the RF spectrum per channel.

### **#2 Modulation modes:**

The DVB-H modulation supports 3 modes: 2K, 4K and 8K. These modes represent the approximate number of active carriers. The exact number of carriers for DVB-H is:

1705 active carrier for 2K mode

3409 active carrier for 4K mode

6817 active carrier for 8K mode

### **#3 Constellation Modes:**

The DVB-H modulation supports multiple sub-modulation modes. Depending on the application and how error prone the channel is, the user can select different constellation mode. The StreamXpress supports QPSK, 16-QAM, 64-QAM.

### **#4 Guard Interval:**

The DVB-H modulation uses different length for the guard interval to enable echo cancelation. The StreamXpress offers 4 different guard interval length: 1/32, 1/16, 1/8 and 1/4. The fraction number represents the ratio of empty symbol versus useful symbol duration.

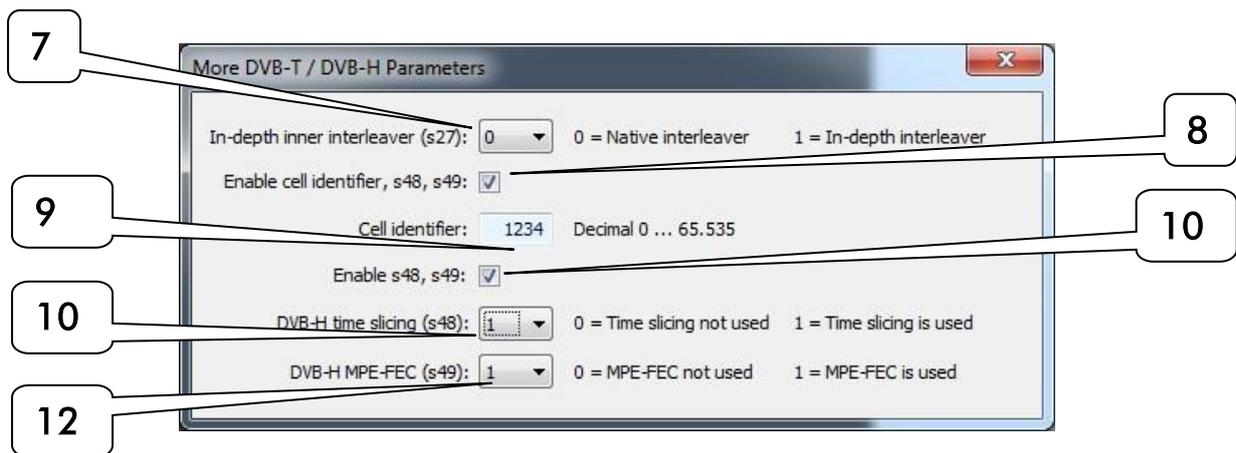
### #5 Code Rate:

The DVB-H modulation offers multi FEC code rate. The StreamXpress supports  $\frac{1}{2}$ ,  $\frac{2}{3}$ ,  $\frac{3}{4}$ ,  $\frac{5}{6}$   $\frac{7}{8}$  code rate.

### #6 More:

StreamXpress offers more settings for DVB-H modulation. Pressing on the “More” button will open a new window with extended settings.

Variable	Type	Description	Details	Diag
In Depth Interleaver	Drop down	Select whether to use native interleaver of in-depth interleaver	#7	7
Enable Cell Identifier	Tick box	Enable is S40 and S47 Cell Identifier	#8	8
Cell Identifier	Field	Enter the value of the Cell Identifier from 0 to 65535 when Cell Identifier is enabled.	#9	9
Enable S48,S49	Tick box	Enable the modification of S48 and S49 inside the TPS	#10	10
S48- Time Slicing	Drop down	Enable Time slicing messaging (When S48,S49 enabled)	#11	11
S49- MPE-FEC	Drop down	Enable MPE-FEC messaging (When S48,S49 enabled)	#12	12



This sub-menu allows modifying the TPS (Transmission Parameters Signalling) of DVB-H signal header. Each bit in the header is identified as Sxx (i.e. S1 is the first bit of the TPS)

### **#7 In-depth inner interleaver (S27):**

DVB-H offers the possibility in 2K and 8K mode to change the interleaver from native interleaver to in-depth interleaver. Native interleaver interleaves the bits over one COFDM symbol as in-depth interleaver interleaves the bits over four OFDM symbols in 2K and two OFDM symbols in 4K.

**NOTE:** When using 8K mode, the S27 bit should be set to 0.

### **#8 Enable cell identifier, S40 to S47:**

In DVB-H transmission, it is advantageous to know from which cell the signal is coming from to allow switching between cells when receiving the signal on a mobile device. The StreamXpress can set the TPS bits S40 to S47 as a cell identifier. To enable this setting, tick on the box.

### **#9 Cell identifier:**

This field represents the cell identifier value that is written in the bit S40 to S47 of the TPS. The value is from 0 to 65635

### **#10 Enable S48, S49:**

In DVB-H transmission, you can set a flag in the TPS for Time Slicing and FEC on the MPE sections. The StreamXpress can set the TPS bits S48 and S49 of the TPS. To enable this setting, tick on the box.

### **#11 Time Slicing S48:**

To save power on the receiver the modulator can use time slicing which allows turning on and off the receiver at a specific time. When that method is used, S48 is set to flag the receiver that the Time Slicing method is in use in at least one Elementary Stream..

### **#12 MPE-FEC S49:**

As part of the DVB-H modulation, standard OFDM FEC is applied. As mobile reception can be difficult at some location, the user has an option to protect the MPE section of the MPEG-2 TS containing the video and audio stream by applying FEC on the MPE sections. When the FEC is applied on the MPE sections, S49 is set to flag the receiver that MPE-FEC is in use in at least one elementary stream.

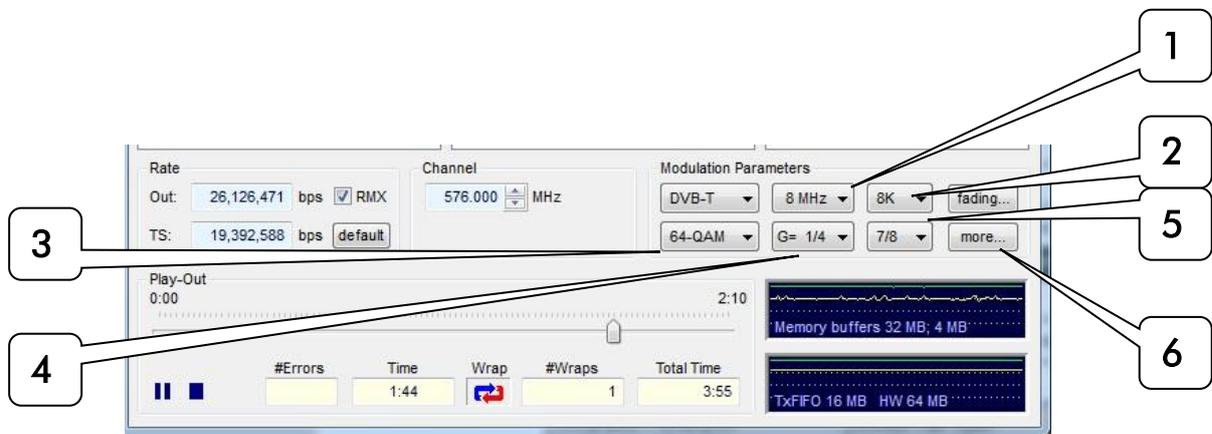
**NOTE:** In this section, the StreamXpress is just setting the bits for the TPS header but the modulator doesn't actually do time slicing or calculate and insert MPE-FEC.

## **3.5.9 DVB-T Modulation settings**

The user can select the DVB-T modulation and change its parameters. Every UHF/VHF DekTec modulator is licensed to support DVB-T by default. DVB-T is the standard used for Terrestrial broadcast where DVB has been adopted.

Variable	Type	Description	Details	Diag
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Variable	Type	Description	Details	Diag
<b>Bandwidth Selection</b>	Drop down	Select the bandwidth of the modulated channel	#1	1
<b>Modulation modes</b>	Drop down	Allow to set the number of active carriers	#2	2
<b>Constellation Mode</b>	Drop down	Select the Constellation mode used for the modulation	#3	3
<b>Guard interval</b>	Drop down	Select the guard interval used for the modulation	#4	4
<b>Code Rate</b>	Drop down	Select the FEC code rate used for the modulation	#5	5
<b>More</b>	Button	Open a second window with more settings (See section below)	#6	6



### **#1 Bandwidth Selection:**

The DVB-T modulation supports multiple bandwidth per channel. With this setting the user can select between 5,6,7,8 MHz for the RF spectrum per channel.

### **#2 Modulation modes:**

The DVB-T modulation supports 3 modes. 2K, 4K and 8K. These modes represent the approximate number of active carriers. The exact number of carriers is for DVB-T:

1705 active carrier for 2K mode

3409 active carrier for 4K mode

6817 active carrier for 8K mode

### **#3 Constellation Modes:**

The DVB-T modulation supports multiple sub-modulation modes. Depending on the application and how error prone the channel is the user can select different constellation modes. StreamXpress supports QPSK, 16-QAM, 64-QAM.

#### **#4 Guard Interval:**

The DVB-T modulation uses different length for the guard interval to allow echo cancelation. The StreamXpress offers 4 different guard interval length: 1/32, 1/16, 1/8 and 1/4. The fraction number represents the ratio of empty symbol versus useful symbol duration.

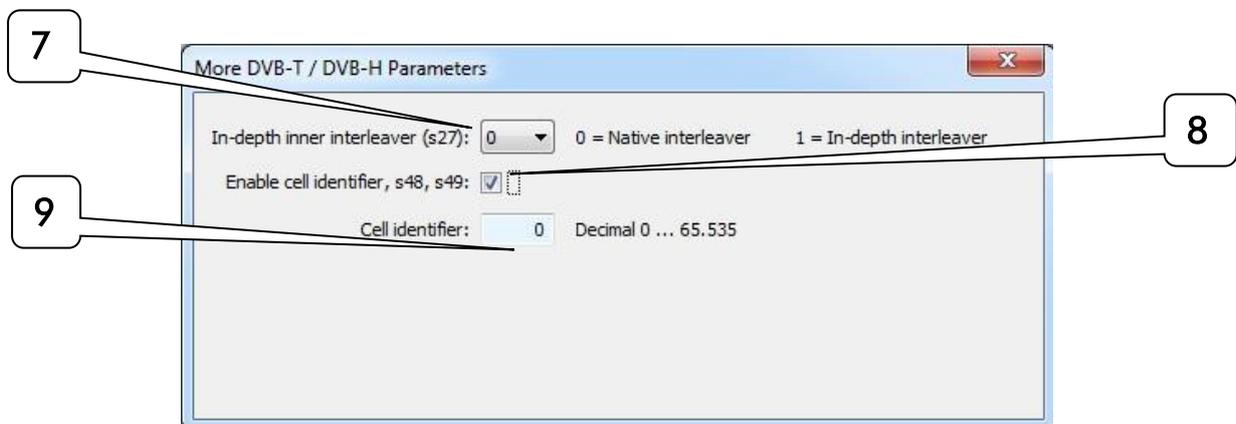
#### **#5 Code Rate:**

The DVB-T modulation offers multi FEC code rate. StreamXpress supports 1/2, 2/3, 3/4, 5/6 7/8 code rate.

#### **#6 More:**

StreamXpress offers more settings for DVB-T modulation. Pressing on the "more" button will open a new window with extended settings. See below.

Variable	Type	Description	Details	Diag
In Depth Interleaver	Drop down	This should be set to 0 for DVB-T	#7	7
Enable Cell Identifier	Tick box	Enable S40 and S47 Cell Identifier	#8	8
Cell Identifier	Field	Enter the value of the Cell Identifier from 0 to 65535 when Cell Identifier is enabled.	#9	9



This sub-menu allows modifying the TPS (Transmission Parameters Signalling) of DVB-T signal header. Each bit in the header is identified as Sxx (i.e. S1 is the first bit of the TPS)

#### **#7 In Depth Interleaver:**

This field is always set to 0 for DVB-T.

#### **#8 Enable Cell Identifier, S40 to S47:**

In DVB-T transmission, it is advantageous to know from which cell the signal is coming from to allow switching between cells when receiving the signal on a mobile device. The StreamXpress can set the TPS bits S40 to S47 as a cell identifier. To enable this setting, tick on the box.

### #9 Cell Identifier:

This field represents the Cell Identifier value that is written in the bit S40 to S47 of the TPS. The value is from 0 to 65635.

### 3.5.10 DVB-T2 Modulation settings

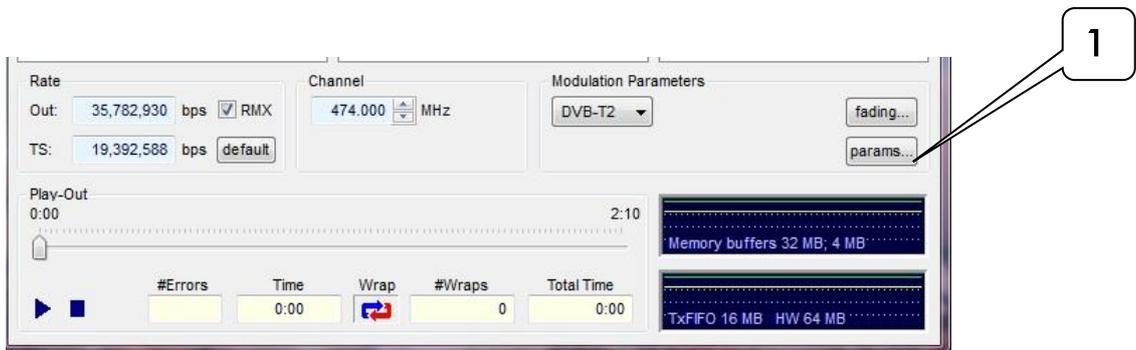
If the DekTec adaptor is licensed to support the DVB-T2 modulation, the user can select the DVB-T2 modulation and change its parameters.

DVB-T2 is the standard used for advanced Terrestrial broadcast where DVB has been adopted.

There are lots of parameters for DVB-T2 so most of the parameters are set under Params.

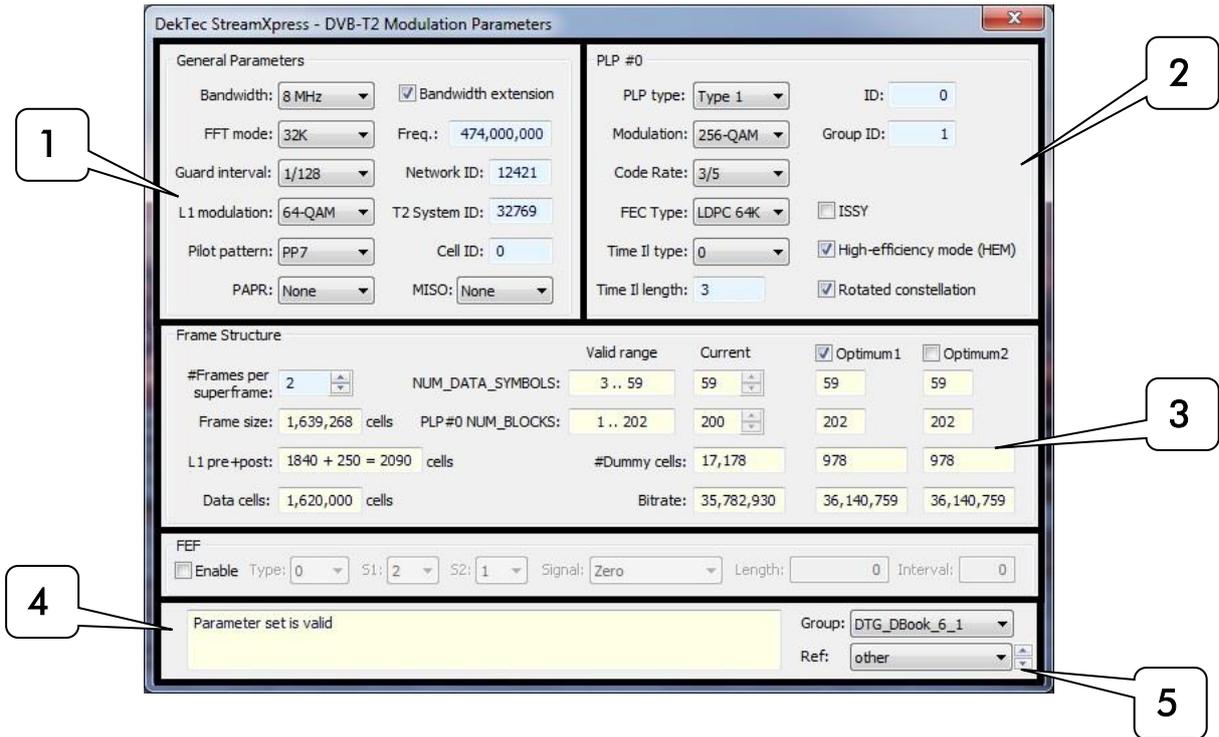
**NOTE:** StreamXpress offers only single PLP (Physical Layer Pipe) MPEG-2 TS playout. To generate multi PLP, please use the T2Xpress that can be licensed on most of DekTec UHF/VHF modulators.

Variable	Type	Description	Details	Diag
Params	Button	Select this to change the DVB-T2 modulation parameters		1



The DVB-T2 modulation parameters are organized in 5 sections:

- 1-General Parameters
- 2-PLP #0
- 3-Frame Structure
- 4-FEF (Future Extension Frames)
- 5-Message center and pre-set configurations

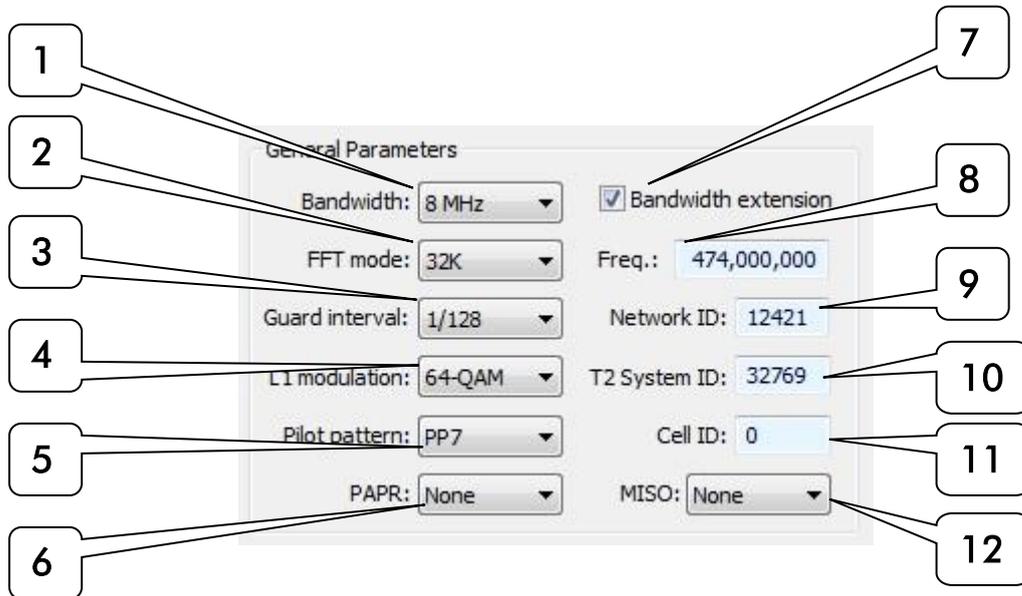


### 3.5.9.1 General parameters

This section allows the setting of the general T2 transmission parameters.

Variable	Type	Description	Details	Diag
Bandwidth	Drop down	Select the bandwidth of the modulated channel	#1	1
FTT mode	Drop down	Select the FFT (Fast Fourier Transfer) mode of the modulation	#2	2
Guard Interval	Drop down	Select the guard interval used for the modulation	#3	3
L1 Modulation	Drop down	Select L1 Modulation, the constellation of the L1-post signalling block	#4	4
Pilot pattern	Drop down	Select Pilot Pattern used for the data OFDM symbols	#5	5
PAPR	Drop down	Select the PAPR (Peak to Average Power Ratio) reduction if used	#6	6
Bandwidth Extension	Tick box	If checked, the extended carrier mode is used	#7	7
Freq.	Field	Center frequency of the RF Channel	#8	8
Network ID	Field	Uniquely identifies the DVB-T2 network	#9	9
T2 system ID	Field	Uniquely identifies a T2 system within the DVB-T2 network	#10	10
Cell ID	Field	Uniquely identifies a geographic cell in a DVB-T2 network	#11	11

Variable	Type	Description	Details	Diag
MISO	Drop down	Set the MISO (Multiple Input Single Output mode)	#12	12



### **#1 Bandwidth:**

The DVB-T2 modulation supports multiple bandwidth per channel. With this setting the user can select between 1.7, 5,6,7,8, 10 MHz for the RF spectrum per channel. Note the 1.7 MHz bandwidth is the same as the current DAB channel and is prone to be used for radio transmission.

### **#2 FFT modes:**

The DVB-T2 modulation supports 6 modes: 1K, 2K, 4K, 8K, 16K, and 32K. These modes represent the approximate number of active carriers. Note that DVB-T only offers 2K, 4K and 8K.

The exact total number of carriers is for DVB-T2:

853 active carriers for 1K mode

1,705 active carriers for 2K mode

3,409 active carriers for 4K mode

6,817 active carriers for 8K mode (6,913 in extended mode)

13,633 active carriers for 16K mode (13,921 in extended mode)

27,265 active carriers for 32K mode (27,841 in extended mode)

### **#3 Guard Interval:**

The DVB-T2 modulation uses different length for the guard interval to allow echo cancelation. The StreamXpress offers 4 different guards interval length: 1/128, 1/32, 1/16, 1/8, 1/4, 19/128, 19/256. The fraction number represents the ratio of empty symbol versus useful symbol duration.

#### **#4 L1 Modulation:**

The DVB-T2 L1 post-signaling block indicates which auxiliary stream is used as a transmitter signature as well as the exact location of the stream and also carries the transmitter-signature related information. The user can choose which modulation to use for the L1 signal. StreamXpress supports BPSK, QPSK, 16-QAM, 64-QAM. Note this is not the main sub modulation mode of the DVB-T2 which is set in the PLP area.

#### **#5 Pilot Patterns:**

DVB-T2 specification makes use of scattered pilot patterns for use by receivers to compensate for changes in channels in the time and frequency domain. StreamXpress allows for 8 different pilot patterns: PP1, PP2, PP3, PP4, PP5, PP6, PP7 or PP8.

#### **#6 PAPR:**

PAPR stands for Peak to Average Power Ratio. DVB-T2 offers two techniques for the reduction of the peak-to-average power ratio (PAPR), thus increasing the RF power-amplifier efficiency. These techniques are Active Constellation Extension (ACE) and Tone Reservation (TR). StreamXpress software allows choosing ACE, TR, ACE+TR or none.

#### **#7 Bandwidth Extension:**

DVB-T2 allows for the extension of the number of used carriers for the 8k, 16k and 32k mode while at the same time keeping the bandwidth limits of the RF channel. This mode is called the Extended Carrier Mode. This mode is only available for 8K, 16K, 32K FFT. If it is setup when the FFT mode is different that the available modes, the frame structure will be disabled and the TS rate will show -1 for error.

#### **#8 Frequency:**

This setting allows choosing the center frequency of the modulated RF channel. The frequency must be set in Hz. In the screen capture example the bandwidth is set to 8MHz so the RF output will span from 470MHz to 478MHz.

#### **#9 Network ID:**

This is a 16-bit field which uniquely identifies the current DVB-T2 network.

#### **#10 T2 System ID:**

This 16-bit field identifies uniquely the T2 system within the T2 network.

### #11 Cell ID:

This is a 16-bit field which uniquely identifies a geographic cell in a DVB-T2 network. A DVB-T2 cell coverage area may consist of one or more frequencies, depending on the number of frequencies used per T2 system. If the provision of the CELL\_ID is not used, this field shall be set to '0'.

### #12 MISO:

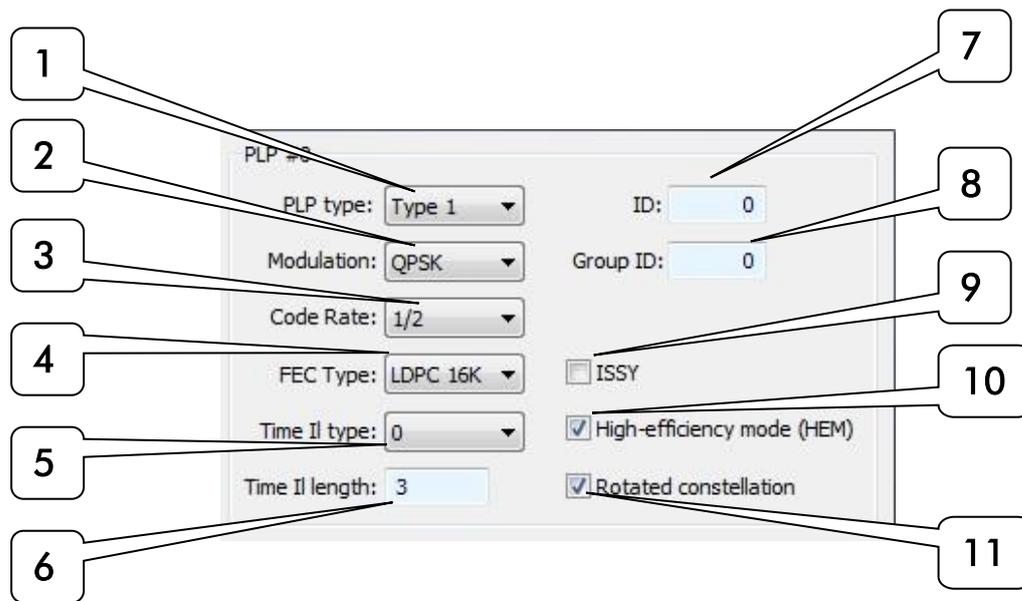
MISO stands for Multiple Input, Single Output (meaning multiple transmitting antennas but one receiving antenna). MISO processing consists of taking the input data cells and producing two similar sets of data cells at the output, each of which will be directed to the two groups of transmitters. When using the MISO feature, StreamXpress can output the TX1 first group of cells, TX2 second group of cells or can output the sum of both TX1 and TX2.

If MISO is not used select NONE.

### 3.5.10.2 PLP#0

DVB-T2 allows for the transmission of multi PLP (Physical Layer Pipe) but the StreamXpress is only capable of sending PLP#0. For streaming multi PLP, the T2Xpress software from DekTec can be used. Contact DekTec at [info@dektec.com](mailto:info@dektec.com) for more information. This section allows the setting of the PLP#0 transmission parameters.

Variable	Type	Description	Details	Diag
<b>PLP Type</b>	Drop down	Select the Type of PLP (Physical Layer Pipe) used.	#1	1
<b>Modulation</b>	Drop down	Select the type of sub modulation used for the PLP transmission	#2	2
<b>Code Rate</b>	Drop down	Select to Code Rate used for the modulation	#3	3
<b>FEC type</b>	Drop down	Select the type of FEC applied to the modulation	#4	4
<b>Time IL Type</b>	Drop down	Select how the Interleaving frame will be mapped	#5	5
<b>Time IL length</b>	Field	Enter the length of the time interleaving period	#6	6
<b>ID</b>	Field	Enter the PLP ID number	#7	7
<b>Group ID</b>	Field	Enter the Group ID of the PLP	#8	8
<b>ISSY</b>	Tick Box	Check if using ISSY (Input Stream SYNchronizer)	#9	9
<b>HEM mode</b>	Tick Box	Check if using HEM (High-Efficiency Mode)	#10	10
<b>Rotated Constellation</b>	Tick Box	Check if using rotated constellation	#11	11



### **#1 PLP type:**

The DVB-T2 modulation supports different type of PLP. With this setting the user can select between Type1, Type 2 and Common.

Type 1 PLP: PLP having one slice per T2 frame, transmitted before any Type 2 PLPs

Type 2 PLP: PLP having two or more sub-slices per T2 frame, transmitted after any Type 1 PLPs

Common PLP: PLP having one slice per T2 frame, transmitted just after the L1 signalling. The L1 field may contain data shared by multiple PLPs.

### **#2 Modulation:**

The DVB-T2 modulation supports 4 sub modulation modes. QPSK, 16-QAM, 64-QAM, 256-QAM.

### **#3 Code Rate:**

The DVB-T2 modulation offers multi FEC code rate. StreamXpress supports  $\frac{1}{2}$ ,  $\frac{2}{3}$ ,  $\frac{3}{4}$ ,  $\frac{3}{5}$ ,  $\frac{4}{5}$ ,  $\frac{5}{6}$  code rate.

### **#4 FEC type:**

The DVB-T2 allows for 2 types of FEC: LDPC 16K and LDPC 64K. LDPC stands for Low Density Parity Check.

### **#5 Time IL Type:**

This 1-bit field indicates the type of time-interleaving.

A value of '0' indicates that one Interleaving Frame corresponds to one T2-frame and contains one or more TI-blocks. A value of '1' indicates that one Interleaving Frame is carried in more than one T2-frame and contains only one TI-block

### **#6 Time IL length:**

This is a 8-bit field determined by the values set within the Time II Type field

-If the Time II Type is set to the value '1', this field shall indicate the number of T2-frames to which each Interleaving Frame is mapped.

-If the Time II Type is set to the value '0', this field shall indicate the number of T1 blocks per Interleaving Frame.

### **#7 ID:**

This 8-bit field identifies uniquely a PLP within the T2 system.

### **#8 Group ID:**

This 8-bit field identifies with which PLP group within the T2 system the current PLP is associated. This can be used by a receiver to link the data PLP to its associated common PLP, which will have the same PLP Group ID.

### **#9 ISSY:**

Data processing in the DVB-T2 modulator may produce variable transmission delay on the user information. The ISSY (Input Stream Synchronizer) subsystem provides suitable means to guarantee Constant-Bit-Rate (CBR) and constant end-to-end transmission delay for any input data format.

### **#10 HEM (High-Efficiency Mode):**

If checked, the PLP uses High-Efficiency Mode. If unchecked it uses the normal mode.

### **#11 Rotated Constellation:**

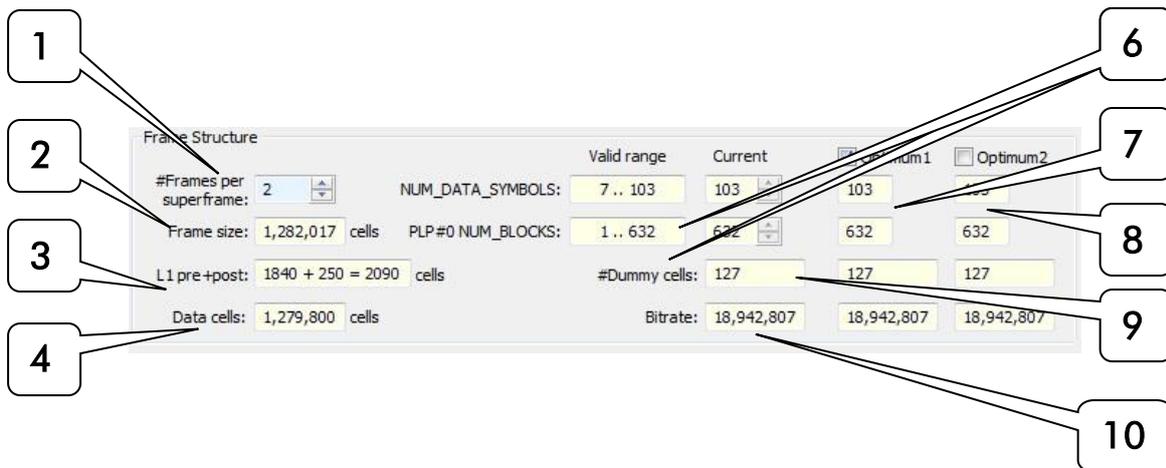
The use of the constellation rotation allows improvements in the power transmission requirements, achieving the required BER values with low values of SNR.

## **3.5.10.3 Frame structure**

This section mostly reports the impact of the PLP and general parameters settings on the modulation.

Variable	Type	Description	Details	Diag
<b># Frames per super frame</b>	Field	Select the number of T2 frames into super frames	#1	1
<b>Frame size</b>	Display Field	Displays the number of cells per frames	#2	2

Variable	Type	Description	Details	Diag
L1 pre and post cells	Display Field	Displays the number of cells used for L1 pre post headers	#3	3
Data Cells	Display Field	Displays the number of data cells per frames	#4	4
NUM_DATA_SYMBOLS	Display Field	Displays the range and or set current setting for number of Data symbols per T2 frame	#5	5
PLP#0 NUM_BLOCKS	Display Field	Displays the range and or set current setting for number of FEC blocks contained in the Interleaving Frame for the PLP#0	#6	6
Optimum 1	Display Field	Display the best settings for the Num_Data_Symbols and Num_Blocks per the modulation settings	#7	7
Optimum 2	Field	Display and allow to set the user settings for the Num_Data_Symbols and Num_Blocks per the modulation settings	#8	8
#Dummy cells	Display Field	Display the number of Dummy cells per T2 frame	#9	9
Bitrate	Display Field	Display the useful TS bitrate based on the modulation settings	#10	10



### **#1 Number of Frames per super frames:**

This 8-bit field indicates the number of T2-frames per super frame. The range is 1 to 255.

### **#2 Frame size:**

Depending on the modulation parameters, the StreamXpress will calculate the number of cells into each T2 frame. This display will show how many cells are in each T2 frame.

### **#3 L1 pre and post Cells:**

Depending on the modulation parameters, the StreamXpress will calculate the number of L1 pre and post cells (Signalling) into each T2 frame.

**#4 Data Cells:**

Depending on the modulation parameters, the StreamXpress will calculate the number of data cells (useful cells) into each T2 frame.

**#5 NUM\_DATA\_SYMBOL:**

This 12-bit field indicates the number of data OFDM symbols per T2-frame, excluding P1 and P2 preamble symbols. The StreamXpress will display the valid range for the Num\_Data\_Symbol per the modulation parameters. It also displays the current value used.

**#6 PLP#0 NUM\_BLOCKS:**

This 10-bit field indicates the number of FEC blocks for PLP#0 contained in the Interleaving Frame which is mapped to the next T2-frame. The StreamXpress will display the valid range for the NUM\_BLOCKS per the modulation parameters. It also displays the current value used.

**#7 Optimum 1:**

This field display the best settings for the Num\_Data\_Symbols and Num\_Blocks per the modulation settings. When un-ticked, the user can change the current setting using the up and down arrow.

**#8 Optimum 2:**

This field display the user defined optimum settings for the Num\_Data\_Symbols and Num\_Blocks per the modulation settings. When ticked, the user setting will become the value used.

**#9 Number of Dummy cells:**

If the data PLP and auxiliary streams do not exactly fill the cells allocated to data, dummy cells are inserted in the remaining cells of the T2-frame. This field display the number of dummy cells inserted per T2 frame per the modulation settings.

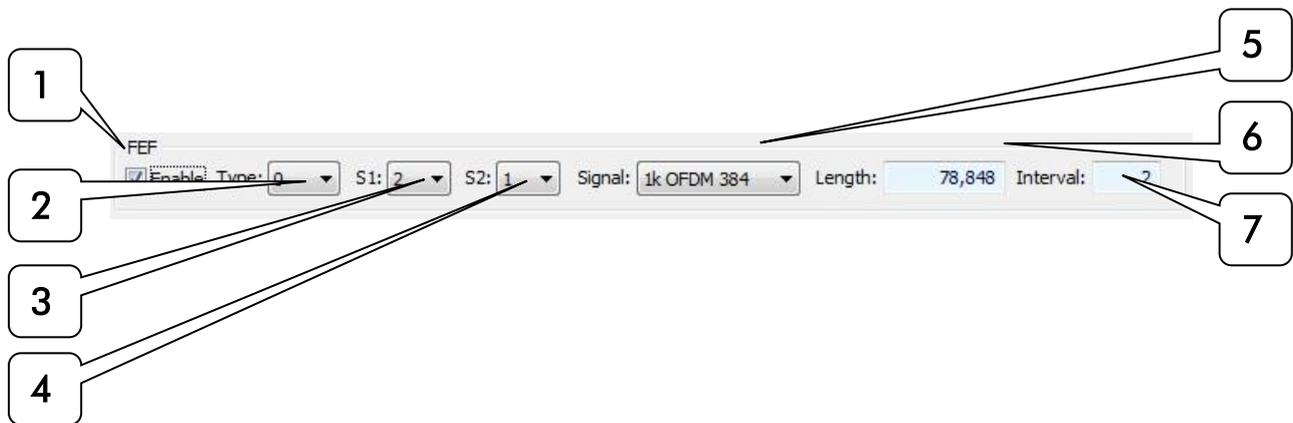
**#10 Bitrate:**

The StreamXpress will calculate and display, based on the modulation parameters, the actual TS bandwidth that can be used in the modulated signal.

**3.5.10.4 FEF (Future Expansion Frame)**

This section is for Future Expansion Frame of the DVB-T2 of the standard. Future Extension Frame (FEF) insertion enables carriage of frames defined in a future extension of the DVB-T2 standard in the same multiplex as regular T2-frames. The use of future extension frames is optional.

Variable	Type	Description	Details	Diag
Enable	Tick Box	Enable the use of FEF parts	#1	1
Type	Drop Down	Select the type of FEF used	#2	2
S1	Drop Down	Select the value of the S1 signalling field	#3	3
S2	Drop Down	Select the value of the S2 signalling field	#4	4
Signal	Drop Down	Select the type of generated signal during the FEF period	#5	5
length	Field	Select the length of the FEF part	#6	6
Interval	Field	Select the interval between 2 FEF parts	#7	7



### **#1 Enable (FEF):**

Tick this box to enable the use of FEF, which is optional.

### **#2 Type:**

This 4-bit field shall indicate the type of the associated FEF part. At this time all values are undefined and reserved for future use.

### **#3 S1:**

This field represents the value of the S1 signalling that would be used for FEF. Only the reserved (unused) value of the S1 parameters are available (2, 3, 4, 5, 6, 7) as this field is not currently defined and reserved for future use.

### **#4 S2:**

This field represent the value of the S2 signalling that would be used for FEF. Only the reserved (unused) value of the S2 parameters are available (1, 3, 5, 7, 9, 11, 13, 15) as this field is not currently defined and reserve for future use.

**#5 Signal:**

The generated signal during the FEF period can be Zero or a random test signal made from 1k OFDM transformations of a PRBS signal. The StreamXpress allows using Zero, 1k OFDM 852, 1k OFDM 384.

**#6 Length:**

This 22-bit field indicates the length of the associated FEF part as the number of elementary periods T, from the start of the P1 symbol of the FEF part, to the start of the P1 symbol of the next T2-frame.

Enter the length of the FEF part in this field.

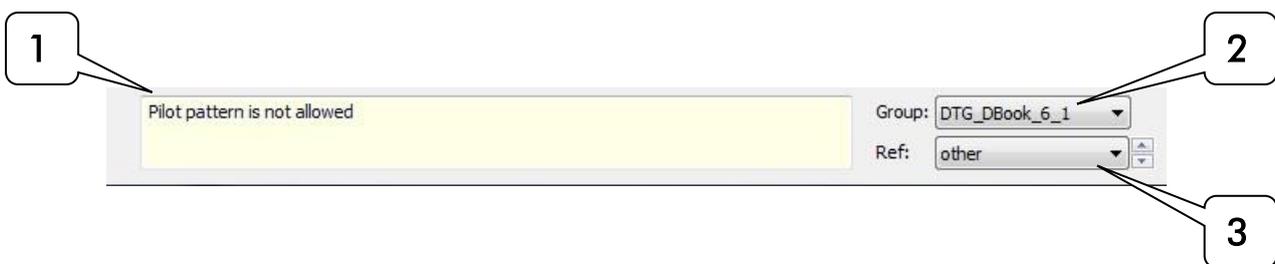
**#7 Interval:**

This 8-bit field indicates the number of T2-frames between two FEF parts. Enter the interval in the Interval field.

**3.5.9.5 Message center and pre-set configurations.**

This section advises if all configurations that have been manually entered are compatible with each other and will display any error messages. The user can also select pre-set values based on industry standard use case for quick recall of settings.

Variable	Type	Description	Details	Diag
Message Center	Display Field	Display if the configuration is valid	#1	1
Group	Drop Down	Select a group of configuration based on organization	#2	2
Ref	Drop Down	Select the configuration reference per the group selected above	#3	3



**#1 Message Center:**

This field will indicate if the selected parameters are compatible with each other for a standard modulation. If there is an error, the message center will show what element is not allowed and needs to be changed. Also the streaming will be disabled, the output rate of the main StreamXpress window will show -1 and will be orange.

### **#2 Group:**

The StreamXpress comes with pre-set configurations to help user select practical DVB-T2 transmission parameters. Each group represent an organization or a group of parameters defined for specific application. For each group of parameters, the reference settings are selected in the Ref section.

### **#3 Ref:**

This drop down allows the user to select a configuration defined by the group above. Note that the StreamXpress offers 100's of configurations possible and the user should refer to the groups documentation found online for more information about the use of each referenced configuration.

### **3.5.11 IQ Modulation settings**

If the DekTec Adaptor is licensed to support the I/Q modulation, the user can select the I/Q modulation mode and change its parameters.

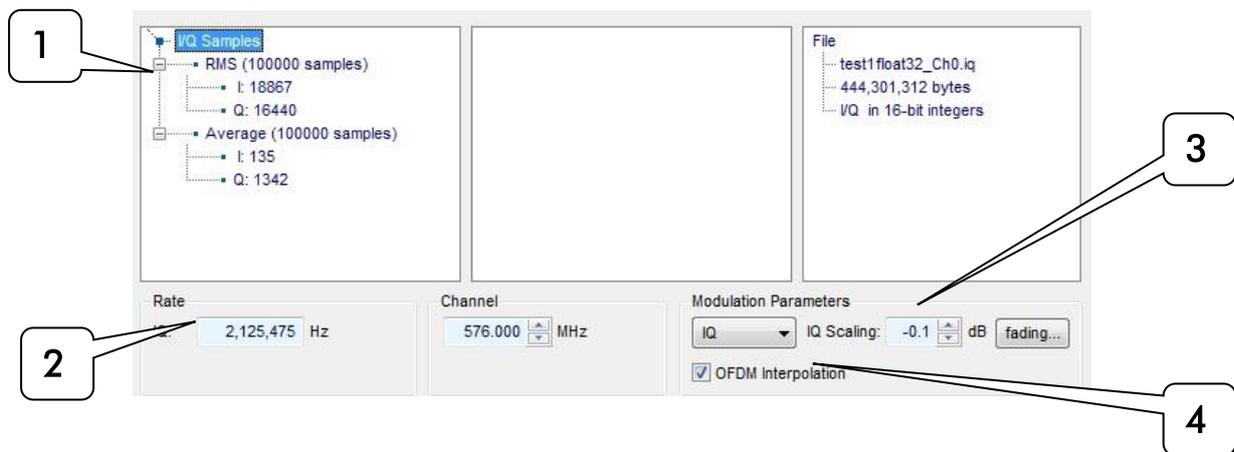
Variable	Type	Description	Details	Diag
I/Q Samples	Display	Display the information about the file	#1	1
I/Q rate	Field	Set the playback rate of the file	#2	2
IQ Scaling	Field	Offset the output level of the I/Q samples	#3	3
OFDM Interpolation	Tick Box	Select if OFDM interpolation should be used	#4	4

In order to the use I/Q playback, the user must open a valid I/Q file. DekTec supports multiple I/Q file formats:

Format	Description
I/Q Float32	Pairs of 32-bit floats in I, Q order
I/Q Int16	Pairs of signed 16-bit integers in I, Q order, little Endian: Byte #0: Least-significant byte I Byte #1: Most-significant byte I Byte #2: Least-significant byte Q Byte #3: Most-significant byte Q Etc.

Format	Description
I/Q Text	Text (ASCII)-based format consisting of pairs of four-character hexadecimal values with 0x prefix in I, Q order. The I and Q values are separated by a TAB and I/Q pairs are separated by a linefeed. Example: 0x2b45<TAB>0x1c3f<LF> 0xfeA9<TAB>0x0073<LF>

The I/Q file can be generated by DekTec T2Xpress or C2Xpress for example or be created by the user.



#### **#1 I/Q Samples:**

This field reads the selected file and display the amount of I and Q samples.

#### **#2 I/Q Rate:**

This field allow the user to select the playout rate of the I/Q samples.

#### **#3 I/Q Scaling:**

This field allow the user to change the output amplitude of the I/Q samples.

#### **#4 I/Q OFDM Interpolation:**

OFDM interpolation should be the default mode. QAM interpolation is only useful if the I/Q signal represents a QAM signal with sample rate equal to the symbol rate, and an RRC channel filter is required like in standard QAM modulation. The key characteristic of a channel filter is that some energy folds in the spectrum outside the symbol rate.

### **3.5.12 ISDB-T Modulation settings**

If the DekTec Adaptor is licensed to support the ISDB-T (Integrated Services Digital Broadcasting-Terrestrial) modulation, the user can select the ISDB-T modulation and change its parameters.

ISDB-T is the standard used for Terrestrial broadcast where ISDB-T has been adopted (Mostly Japan, Brazil and many other South American countries).

There are lots of parameters for ISDB-T so most of the parameters are set under Params.

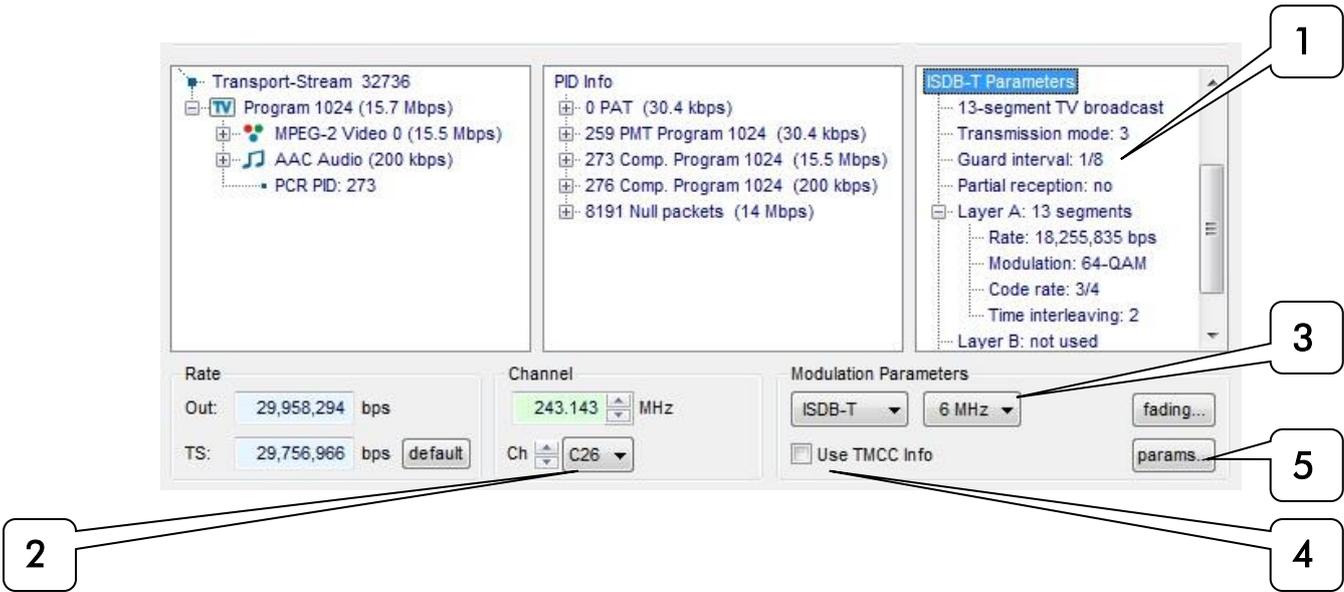
The ISDB-T format is a very versatile modulation format and allows up to three transmissions channels in a single RF Channels. The different channels can be Mobile, HDTV, and SDTV for example. There are 13 segments in an ISDB-T transmission that be allocated in different manners depending on the applications. 1seg is typically used for mobile TV broadcasting.

ISDB-T use UHF 470 MHz-770 MHz, bandwidth of 300 MHz, allocate 50 channels of the over air spectrum, namely ch.13-ch. 62, each channel is 6 MHz width. These 50 channels, ch.13-ch.62, are called "physical channel.

ISDB-T signals can be carried on cable channels without changing the modulation. In the case the RF channel is translated to a different frequency.

ISDB-T modulator accepts 188 bytes MPEG-2 TS but many can also accept TMCC format. The TMCC format is a 204 byte packet TS format. The first 188 bytes are reserved for the MPEG-2 TS and the 16 additional bytes carry the modulation information. The StreamXpress is capable of streaming the TMCC encoded stream and using the modulation information to modulate the MPEG-2 TS. DekTec offers a utility called TMCCENC.exe to create TMCC encoded streams. Please contact DekTec support for more information at [info@dektec.com](mailto:info@dektec.com).

Variable	Type	Description	Details	Diag
<b>ISDB-T Parameters</b>	Display	Display the ISDB modulation information if file is TMCC encoded	#1	1
<b>CH#</b>	Display/ Selection	Select the pre allocated RF output channel	#2	2
<b>Frequency</b>	Drop Down	Set the bandwidth of the RF channel	#3	3
<b>Use TMCC info</b>	Tick Box	Will appear when file open has TMCC encoded information. Tick to use the file settings	#4	4
<b>Params...</b>	Button	Select this to change the ISDB-T modulation parameters	#5	5



**#1 ISDB-T parameters:**

If a file is open with the TMCC file format, the StreamXpress will display the modulation parameters contains in the file. Note that the “use TMCC Info” tick box needs to be checked to use these parameters for transmission.

**#2 CH:**

The StreamXpress allows modulating to any agile RF channel using the Channel frequency field.

For ISDB-T the channel plan is already known and the user can select a “standard” RF channel for playout. There are 2 types of RF channels available in the StreamXpress: Channel 1 to 62 represent RF broadcast channel over the air. C31 to C62 represent the channel plan for ISDB over cable.

**#3 Frequency:**

The StreamXpress allows modulating on a 6MHz or 8MHz bandwidth. Note that 6MHz bandwidth is prevalent for ISDB-T.

**#4 Use TMCC Info:**

If the file opened is a TMCC file and contains ISDB-T modulation parameters, this tick box will appear. If checked, the modulation parameters will be derived from the TMCC file and will overwrite the parameters sets in Params.

**#5 Params:**

Select this to change the ISDB-T modulation parameters

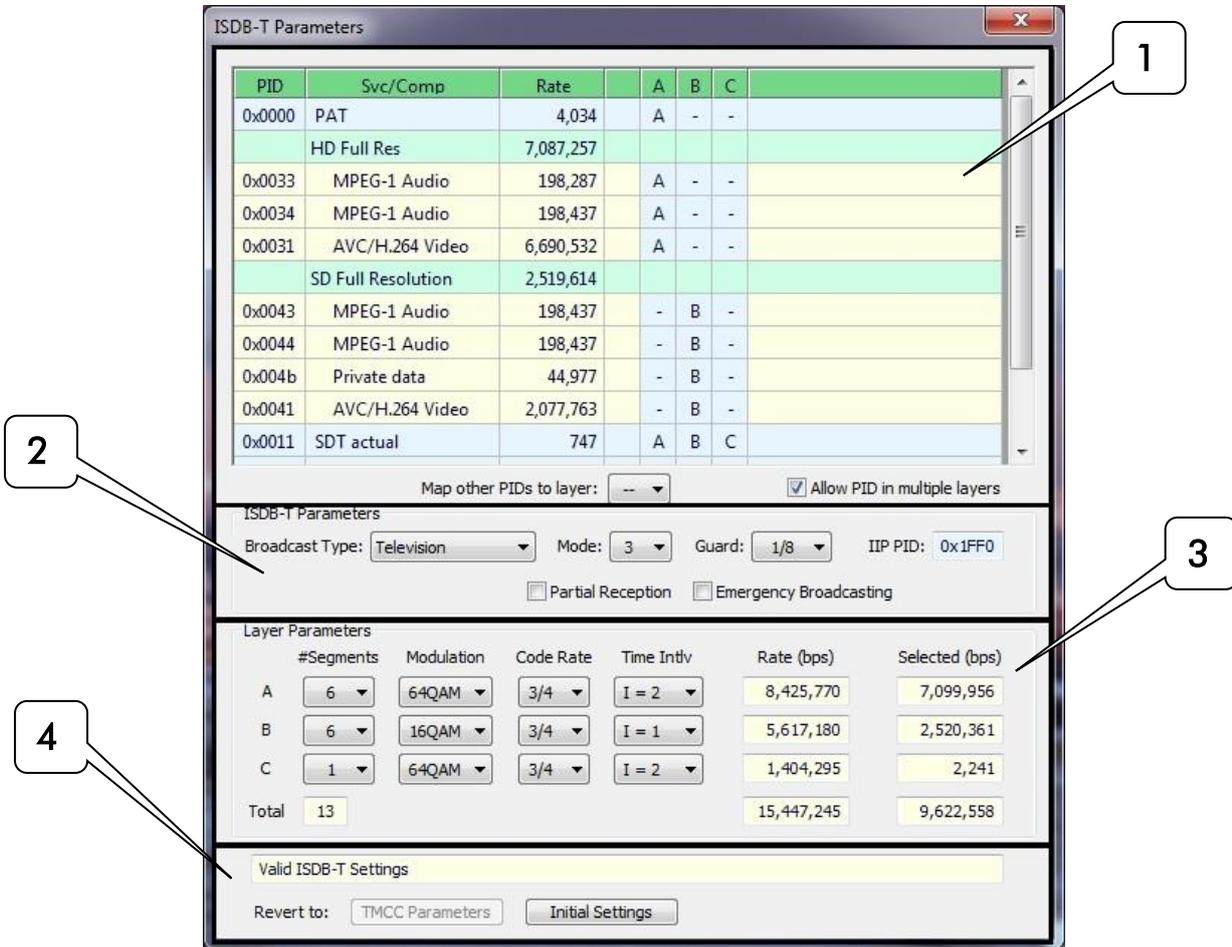
The ISDB-T modulation parameters are organized in 4 sections:

1-MPEG-2 TS components to layer mapping

2-ISDB-T Parameters

**3- Layer Parameters**

**4-Message center and pre-set configurations**



**3.5.12.1 MPEG-2 TS components to layer mapping**

This section allows selecting which component of the transport stream will be carried in which layer. Typically a complete program will be carried in a single layer.

Variable	Type	Description	Details	Diag
<b>PID- SVC- Bitrate</b>	Display	Display information about the opened Transport Stream	#1	1
<b>Active layer</b>	Selection	Select what active layer to assign the PID	#2	2
<b>Map other PIDS to Layer</b>	Drop down	Assign other PID to a specific layer	#3	3
<b>Allow PIDS in multiple layer</b>	Tick Box	Allow to duplicate the same PID in multiple layers	#4	4

PID	Svc/Comp	Rate	A	B	C
0x0000	PAT	4,034	A	-	-
	HD Full Res	7,087,257			
0x0033	MPEG-1 Audio	198,287	A	-	-
0x0034	MPEG-1 Audio	198,437	A	-	-
0x0031	AVC/H.264 Video	6,690,532	A	-	-
	SD Full Resolution	2,519,614			
0x0043	MPEG-1 Audio	198,437	-	B	-
0x0044	MPEG-1 Audio	198,437	-	B	-
0x004b	Private data	44,977	-	B	-
0x0041	AVC/H.264 Video	2,077,763	-	B	-
0x0011	SDT actual	747	A	B	C

Map other PIDs to layer: --  Allow PID in multiple layers

### **#1 PID-SVC-Bitrate:**

The StreamXpress reads the TS information from the opened file and display the PID, Service component type and bitrate of the services. The bitrate display help ensure the service/component will fit the bandwidth allocated to the layer.

### **#2 Active layer:**

For each component/service, the user can select which ISDB-T layer to assign the component. Select by clicking in the A, B, and C column. Unless the “Allow PID in multiple layers” is ticked, each component can only go in 1 layer.

### **#3 Map other PIDS to Layer:**

If a component, has not been assigned the user can select A, B, C as a default layer assignment.

### **#4 Allow PID in multiple layers:**

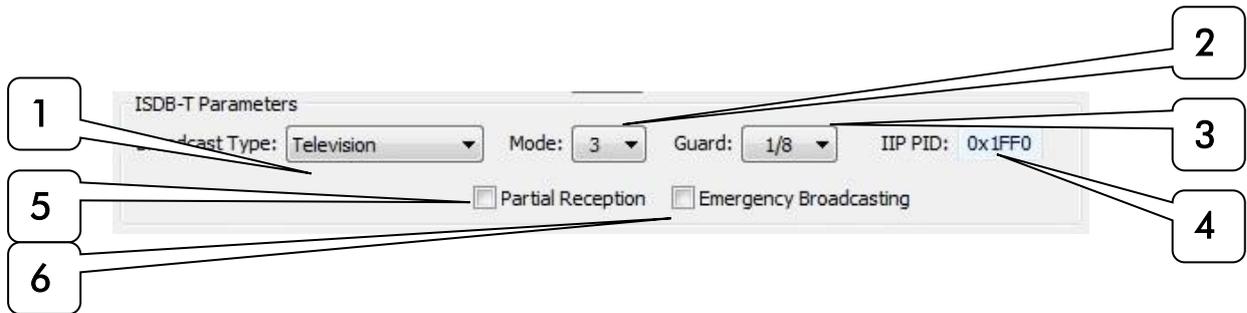
If this is enabled, a service or PID can be used in multiple layers.

## **3.5.12.2 ISDB-T parameters**

This section allows the selection of standard ISDB-T parameters.

Variable	Type	Description	Details	Diag
<b>Broadcast Type</b>	Drop down	Select the type of broadcast	#1	1
<b>Mode</b>	Drop down	Select the mode for the ISDB-T broadcast	#2	2
<b>Guard</b>	Drop down	Select the level of the guard interval rate	#3	3

Variable	Type	Description	Details	Diag
IIP PID	Field	Select the IIP (ISDB-T Information Packet) PID	#4	4
Partial Reception	Tick box	Set the partial Reception mode	#5	5
Emergency Broadcasting	Tick box	Set the Emergency Broadcasting flag on 1 segment	#6	6



### **#1 Broadcast Type:**

The ISDB-T offers 3 types of broadcasting: Digital television using the 13 segments, 1-Segment Radio and 3-Segment radio. Use this drop down to select the desired service type.

### **#2 Mode:**

The ISDB-T offers 3 modes for broadcasting: mode 1, 2 and 3.

Mode 1 uses 108 carriers per segment

Mode 2 uses 216 carriers per segment

Mode 3 uses 432 carriers per segment.

Use this drop down to select the desired mode.

### **#3 Guard:**

The guard interval is a time-redundant section of information that adds a copy of the latter portion of a symbol to the symbol's "front porch" with the aim of absorbing interference from multipath-delayed waves.

The guard interval can be set to 1/4, 1/8, 1/16, 1/32.

### **#4 IIP PID:**

IIP stands for ISDB-T Information Packet. IIP are not passed to the modulator. IIPs contain an important data table called TMCC (Transmission and Multiplex Configuration Control). Most significantly, the TMCC data includes the precise timing parameters required to enable a modulator to accurately synchronise with other modulators in a Single Frequency Network (SFN) and the modulation parameters that the modulator should use for each hierarchical layer. This field allows setting the PID used to transfer this data to the modulator.

### **#5 Partial reception:**

This transmission mode is used for Narrow band receptors. By limiting the range of frequency interleaving within a segment itself, it is possible to separate a segment independently from the remaining segments in the transmitted signal. In such a way, partial reception of services contained in a transmission channel can be obtained using a narrow-band receiver that has a bandwidth of one OFDM segment. It should be noted that partial reception uses a dedicated segment, which is positioned to be the central one among OFDM segments. If partial reception is used, layer A should have 1 segment.

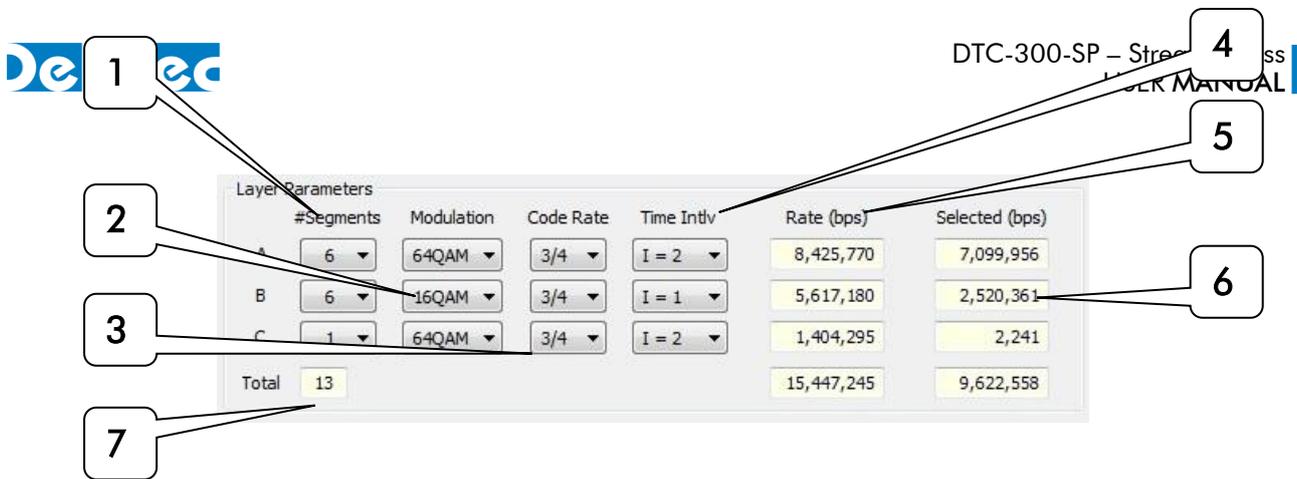
### **#6 Emergency broadcast:**

When set this tick box will enable the alarm broadcasting flag (1 bit) in the TMCC data.

### **3.5.12.3 Layers parameters**

This section allows the selection of modulation and segment allocation for each layer.

Variable	Type	Description	Details	Diag
<b># Segment</b>	Drop down	Select the number of segment for each Layer (A,B and C)	#1	1
<b>Modulation</b>	Drop down	Select the modulation mode for each Layer (A,B and C)	#2	2
<b>Code rate</b>	Drop down	Select the code rate for each Layer (A,B and C)	#3	3
<b>Time Intlv</b>	Drop down	Select the time interleaver for each Layer (A,B and C)	#4	4
<b>Rate (bps)</b>	Display	Displays the total available bitrate for each Layer (A,B and C)	#5	5
<b>Selected (Bps)</b>	Display	Displays the total selected component bitrate for each Layer (A,B and C)	#6	6
<b>Total</b>	Display	Display the total number of segments: (A+B+C)	#7	7



### **#1 Number of Segments:**

The ISDB-T segment offers 13 segments. These segments can be assigned to any of the 3 layers when broadcasting in normal mode. This drop down allows assigning segment to each of the A, B, and C layer.

### **#2 Modulation:**

Depending on the application, a layer can use different modulation. The modulation modes available are DQPSK, QPSK, 16QAM and 64QAM. Each layer can use a different modulation.

### **#3 Code rate:**

Depending on the application, a layer can use different code rate. The code rates available are  $\frac{1}{2}$ ,  $\frac{2}{3}$ ,  $\frac{3}{4}$ ,  $\frac{5}{6}$ ,  $\frac{7}{8}$ . Each layer can use a different code rate.

### **#4 Time Intlv:**

Time interleaver is unique to ISDB-T and is quite effective to improve both robustness against impulse noise and performance for mobile/portable reception. The time interleaver depends on the ISDB-T broadcast mode.

For mode 1, the settings are 0, 4,8,16.

For mode 2, the settings are 0,2,4,8.

For Mode 3, the settings are 0,1,2,4.

**NOTE:** It is recommended to use a middle value.

### **#5 Rate Bps:**

The total transport rate available for broadcast in a layer depends on the number of segments allocated, modulations parameters etc... This field displays the total available bitrate available for the layer.

### **#6 Selected Bps:**

This display represents the total bitrate for all the selected TS components in the Component section.

**NOTE:** The total bitrate of the component selected must be less than the channel rate for each segment. If the selected component rate is higher than that channel rate, this display will turn red and an error will be generated.

### #7 Total:

This display represents the total number of segment used for the broadcast. It adds all segments selected for layer A, B and C.

#### 3.5.12.4 Message center and pre-set configuration

This section displays any error and allow user to select pre-set configuration.

Variable	Type	Description	Details	Diag
Message Center	Display Field	Displays is the configuration is valid and point to any error		1
TMCC parameters	Drop down	Load the TMCC parameters present in the 204 byte packet TS file (If present)		2
Initial settings	Drop down	Load the original settings of the modulation		3



#### 3.5.13 T2MI Modulation settings

If the DekTec Adaptor is licensed to support T2 modulation, the user can select the T2-MI modulation mode.

To enable Single Frequency Network (SFN) operation, decisions on allocation and scheduling are taken once in a T2-Gateway, the results of which are distributed in such a format that each modulator in the network can unambiguously create an identical on-air signal. The DVB-T2 Modulator Interface (T2-MI) defines this format and allows reliable networks of transmitters (in both MFN and SFN configurations) to be constructed.

When a T2MI file encapsulated into a MPEG-2 TS is open, the StreamXpress will use the information contained in the T2-MI file to modulate the output signal. The user can only change the output frequency of the RF channel.

The screenshot shows three main sections:
 

- Rate:** Out: 40,000,000 bps, with a 'default' button.
- Channel:** 666.000 MHz, with up/down arrows.
- Modulation Parameters:** T2-MI dropdown menu and a 'fading...' button.

### 3.5.14 QAM B modulation settings

The user can select the QAM-B modulation and change its parameters. Every UHF/VHF DekTec modulator is licensed to support QAM-B by default. QAM-B is the North American standard used for digital cable. QAM-B refers to J.83 Annex B standard.

QAM-B modulated channel utilize 6MHz bandwidth.

Variable	Type	Description	Details	Diag
Modulation Mode	Drop down	Select the modulation mode	#1	1
Variable interleaver	Drop down	Select variable interleaver settings	#2	2

This screenshot is similar to the previous one but with specific settings and callouts:
 

- Rate:** Sym: 5,360,537 bd,  RMX, TS: 38,810,701 bps, 'default' button.
- Channel:** 666.000 MHz.
- Modulation Parameters:** QAM-B dropdown (callout #1), 256-QAM dropdown, and CW=0001 I=128 J=1 dropdown (callout #2). 'fading...' button.

#### #1 Modulation Mode:

The StreamXpress supports 2 modulation modes for QAM B: QAM 64 and QAM 256.

#### #2 Variable Interleaver:

QAM-B support variable interleaver to help protect burst of errors.

The CW represents the 4 bit control word. The I represent the number of taps of the interleaver and the J represent the increment. The StreamXpress supports all 13 modes defined in the specification.

### 3.5.15 QAM C modulation settings

The user can select the QAM-C modulation and change its parameters. Every UHF/VHF DekTec modulator is licensed to support QAM-C by default. QAM-C is the Japanese and some other Asian countries standard used for digital cable. QAM-C refers to J.83 Annex C standard. QAM-C modulated channel utilize 6MHz bandwidth.

Variable	Type	Description	Details	Diag
<b>Modulation Mode</b>	Drop down	Select the modulation mode	#1	1



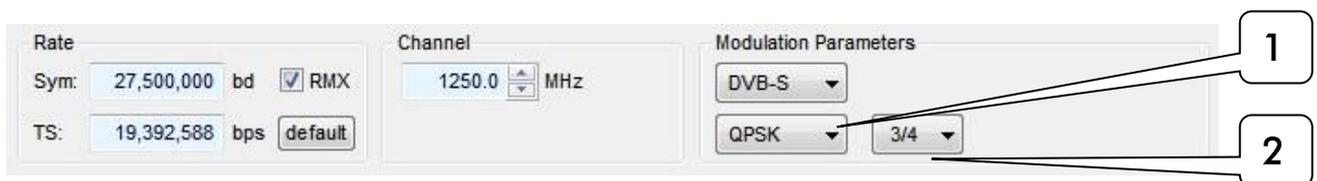
### #1 Modulation mode:

The StreamXpress supports 5 modulation modes for QAM C: 16-QAM, 32-QAM, 64-QAM, 128-QAM and 256-QAM.

### 3.5.16 DVB-S modulation settings

The user can select the DVB-S modulation and change its parameters if a DekTec satellite modulator card is detected. Every Lband DekTec satellite modulator is licensed to support DVB-S by default. DVB-S is a standard developed by the European agency but is used worldwide for satellite transmission.

Variable	Type	Description	Details	Diag
<b>Modulation Mode</b>	Drop down	Select the modulation mode. Only QPSK available		1
<b>Inner Code Rate</b>	Drop down	Select the Inner Code Rate	#2	2



The range of frequency for Lband is 950-2150MHz.

### #2 Inner Code Rate:

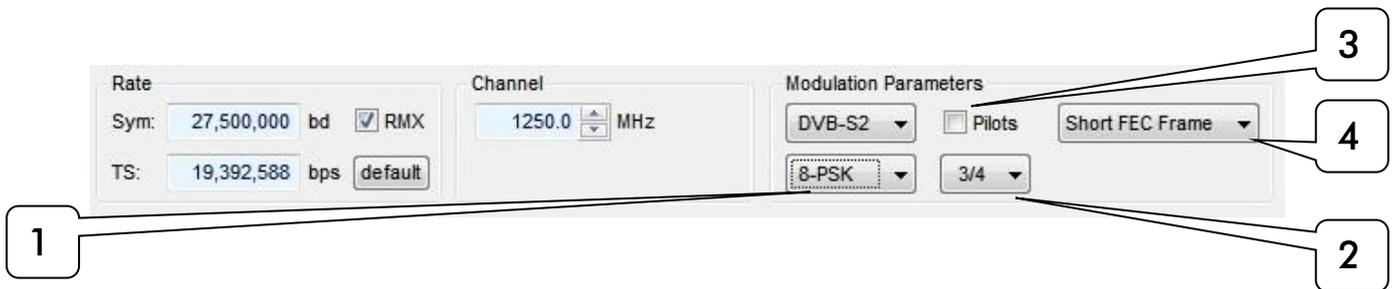
Depending on the channel noise, the user can select the Inner code rate of the DVB-S modulation. The StreamXpress supports all DVB-S code rate:  $\frac{1}{2}$ ,  $\frac{2}{3}$ ,  $\frac{3}{4}$ ,  $\frac{5}{6}$ ,  $\frac{7}{8}$ .

### 3.5.17 DVB-S2 modulation settings

The user can select the DVB-S2 modulation and change its parameters if a DekTec satellite card is detected and licensed for DVB-S2. DVB-S2 is a second generation standard developed by the European agency but is used worldwide for satellite transmission.

**NOTE:** DekTec adaptors do not support legacy DVB-DSNG 8PSK standard which has been replaced by DVB-S2 standard.

Variable	Type	Description	Details	Diag
Modulation Mode	Drop down	Select the modulation mode.	#1	1
Inner Code Rate	Drop down	Select the Inner Code Rate	#2	2
Pilots	Tick box	Select whether pilots are in use	#3	3
FEC frame length	Drop down	Select Short or Long FEC frames	#4	4



#### #1 Modulation mode:

DVB-S2 supports 4 modulations modes QPSK, 8PSK, 16APSK and 32 APSK.

The StreamXpress currently supports QPSK and 8PSK. Please contact DekTec for availability of 16APSK and 32APSK modulator cards.

#### #2 Inner code rate:

Depending on the channel noise and the modulation, the user can select the Inner Code Rate of the DVB-S2 modulation.

The StreamXpress supports for QPSK the following code rate:

$\frac{1}{4}$ ,  $\frac{1}{3}$ ,  $\frac{2}{5}$ ,  $\frac{1}{2}$ ,  $\frac{3}{5}$ ,  $\frac{2}{3}$ ,  $\frac{3}{4}$ ,  $\frac{4}{5}$ ,  $\frac{5}{6}$ ,  $\frac{9}{10}$ ,  $\frac{8}{9}$ .

The StreamXpress supports for 8PSK the following code rate:

$3/5$ ,  $2/3$ ,  $3/4$ ,  $5/6$ ,  $9/10$ ,  $8/9$ .

### **#3 Pilots:**

Pilots are symbols that are inserted at regular interval in order to aid in carrier synchronisation. They are used in for example at low FEC rate because DVB-S2 is able to work then at such low carrier-to-noise levels that the receiver might have difficulties in maintaining synchronisation. The StreamXpress has the option to turn the pilots on or off.

### **#4 FEC frame length:**

DVB-S2 offers 2 FEC frame length: Long (or normal) FEC frame or Short FEC frames. Long FEC frames are 64 800 bits and Short FEC frames are 16 200 bits. The StreamXpress support Short and Long (Normal) FEC frames.

## **3.5.18 ISDB-S modulation settings**

The user can select the ISDB-S modulation and change its parameters if a DekTec satellite card is detected and licensed for ISDB-S .ISDB-S has been adopted by Japan and some South American countries for satellite transmission.

ISDB-S do not use standard transport streams but uses a “super transport stream” structure composed of the Main signal, which consists of multiple MPEG-TS, carries the program contents and the TMCC signal, which informs the receiver of the modulation schemes applied, the identity of MPEG-TS, etc.

The StreamXpress can playout existing ISDB-S files and DekTec offers a command line utility to create the ISDB-S files.

The ISDB-S utility can be found in the same directory where the StreamXpress is installed and is called IsdbsMux.exe

If the DekTec card is enabled for ISDB-S, use the isdbsMux application to create a valid ISDB-S file in a DOS prompt environment.

Below includes the syntax to create a valid ISDB-S file.

**usage:** IsdbsMux [options] infile1 infile2...

'infile1' is an MPEG2 transport stream (188 byte packets)

Bitrate should correspond with the used modulation type

For example: 8PSK2/3 : 52.17 Mbps, BPSK1/2 : 13.04 Mbps

'outfile' is the output TS file (204 byte packets)

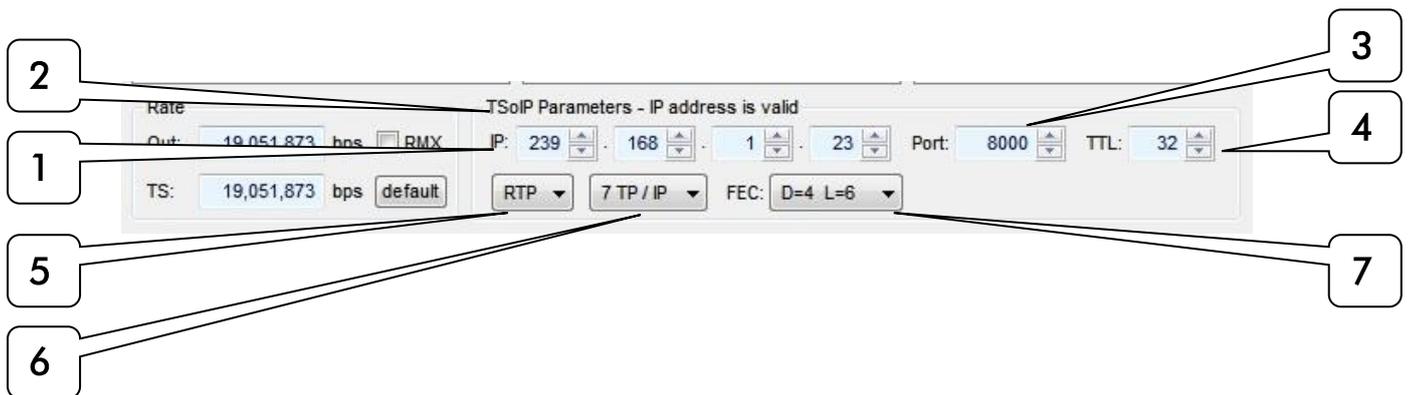
### **options:**

**-o outfile** : set the output file name



**NOTE:** The option to play through a standard NIC card requires a dongle license. Please contact DekTec at [info@dektec.com](mailto:info@dektec.com) for more information.

Variable	Type	Description	Details	Diag
IP address	Selection	Enter the destination IP address (Unicast or Multicast)	#1	1
IP address messaging	Display	Display information about the entered destination IP address	#2	2
Port number	Selection	Enter the destination Port number	#3	3
TTL	Selection	Enter the Time to Live (TTL) value	#4	4
RTP/UPD	Drop down	Select between UDP and RTP transmission	#5	5
Number of TS packets per IP	Drop down	Select the number of TS packets per IP packets	#6	6
FEC	Drop down	If in RTP mode, select the type of FEC applied	#7	7



### **#1 IP address:**

This field allow setting the destination IP address of the TSolP. There are 3 types of IP address: Unicast targeting a single device on a network, Multicast targeting multiple devices on the network and Broadcast targeting all devices on the network.

**NOTE:** If a network is not multicast aware, all multicast streams will be handled like broadcast.

**NOTE:** DekTec devices only support IPv4 addressing at this time.

Unicast address range is from 0.0.0.0 to 223.255.255.255, but not all of the addresses are unicast (See broadcast address).

Multicast address range is from 224.0.0.0 to 239.255.255.255

Address range 240.0.0.0 to 255.255.254 are reserved and should not be used (However, they can be used by StreamXpress).

Broadcast address depends on the subnet and is typically the last address in a subnet. 255.255.255.255 is also a local broadcast address.

### **#2 IP address messaging:**

This field display the status of the IP address entered. In order to playout the stream, the IP address entered needs to be valid.

The following displays are possible:

- Address is valid (Display of the address will be blue). Streaming is possible
- Validation IP address (Display of the address will be yellow). The StreamXpress is requesting the switch to verify if the unicast IP address is found in the network. Streaming during that time is not possible.
- IP address not found (Display of the address will be orange). The StreamXpress indicates that the switch responded that the destination IP address is not on the network. Streaming is not possible.
- Link is down (Display of the address will be red). The StreamXpress indicates that the Ethernet link is down. Streaming is not possible.

### **#3 Port :**

This field allow the selection of the destination UDP port number. The UDP port number range from 0 to 65535. Note most of the common used ports are below 1000 (Like FTP-Port 21 or HTTP-Port 80). It is advised to use port greater than 1000 to avoid potential confusion with other applications.

**NOTE:** Knowing the port number is required for the receiving end of the unicast or multicast.

### **#4 TTL :**

This field allows setting the TTL (Time to Live value) in the Ethernet header.

TTL is an 8-bit field. The maximum TTL value is 255. The time-to-live value can be thought of as an upper bound on the time that an IP datagram can exist in an Internet system. The TTL field is set by the sender of the datagram, and reduced by every router on the route to its destination. If the TTL field reaches zero before the datagram arrives at its destination, then the datagram is discarded. The purpose of the TTL field is to avoid a situation in which an undeliverable datagram keeps circulating on an Internet system. In theory, under IPv4, time to live is measured in seconds, although every host that passes the datagram must reduce the TTL by at least one unit. In practice, the TTL field is reduced by one on every hop.

### **#5 RTP/UDP :**

This field allow the selection of UDP only or UDP/RTP packets. The RTP (real Time protocol) header is an extension of the UDP header and allows adjusting of the network in order to improve the quality of service delivery of media.

The RTP adds mostly 2 elements to the UDP header. A UDP packet counter and a time stamp. The StreamXpress does increase the RTP counter for every packet sent and includes a packet time stamp.

**NOTE:** RTP is required for the use of FEC.

### **#6 Number of TS packets per IP :**

This field allow the selection of the number of TS packets per Ethernet packets (1 to 7). The standard size of an Ethernet packet is 1500 bytes. With the Ethernet, IP, UDP and RTP header, there is 1446 Bytes available for data. As each TS packet is 188bytes, the maximum number of TS packets that an Ethernet frame can carry at once is 7x188 packets. Less packets can be encapsulated into an Ethernet packet (1 to 7) but 7 is the most common and efficient way of encapsulating MPEG-2 TS.

### **#7 FEC :**

If the Ethernet link is lossy, it may be useful to use FEC in order to improve the quality of the delivery by adding redundant information to the main TSolP streaming.

The FEC scheme for DVB-IP is defined in SMPTE 2022. FEC works by sending extra packets of information along with the original payload. The FEC packets can be used at the receive end to recreate data packets that have been lost during transport. The amount of data that can be recovered is directly related to the amount of FEC data sent. There are 2 dimensions for the SMPTE2022: Row and Columns.

The Column FEC stream is sent with the same destination IP address but the port is incremented by 2 from the main TSolP port.

The Row FEC stream is sent with the same destination IP address but the port is incremented by 4 from the main TSolP port.

Depending on the combination of Rows and Columns, more or less lost IP packets can be recovered.

D represents the number of Row and L the number of Columns.

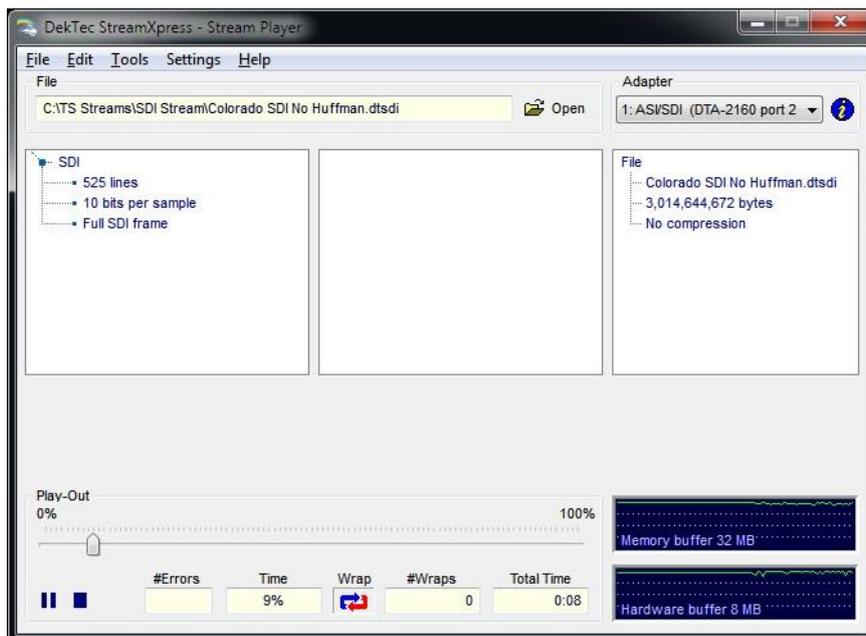
## **3.7 Playing an SDI (.dtsdi) file though a SDI interface**

The StreamXpress supports the playout of uncompressed SDI video over interfaces supporting SDI playout.

The format of the recorded SDI files supported by the StreamXpress is proprietary and is called dtsdi format. Dtsdi files are created using DtGrabber+ recording applications or DtRecord utility.

There are 2 sub formats for dtsdi files: Huffman compressed and no compression. Using Huffman compression for recording is recommended as it limits the required PCI bus bandwidth. The StreamXpress will detect and recognized automatically if a file is Huffman encoded or not.

**NOTE:** For USB-2 device like DTU-205 or DTU-245, Huffman encoded files **MUST** be used as the USB-2 bandwidth cannot handle uncompressed SDI files in most cases.



## 4. Using the StreamXpress with the DOS command prompt

For certain applications and uses, it is worthwhile to use the command prompt to start the StreamXpress. StreamXpress can be option in DOS prompt with some options. These commands will launch the application with the parameters specified in the options. This can be used for batch file or on start-up of a computer.

`-dte`

This command allows starting the StreamXpress with DTE-3100 support (If the DTE-3100 is licensed and enabled for the StreamXpress)

`-play`

This command allows starting the StreamXpress and start playing the file previously loaded.

`-n xx`

This command allows specifying the device number to use.

`-hide`

This command allows starting the StreamXpress as a process without launching the GUI.

`-once`

This command allows starting the StreamXpress and play the loaded file one time.

`-port xx`

This command allows starting the StreamXpress and selects a specific port of the device (If multiple ports are available).

`-rc xxxx`

This command allows starting the StreamXpress with the remote control option. Note that the `-rc` must be followed by a TCP port number. See [SpRcAPI.pdf](#) for more information.

`-t xxx`

This command allows starting the StreamXpress and specifies which device type to use when multiple adaptors are present. Possible adaptors include:

100, 102, 107, 110, 111, 112, 115, 116, 117, 140, 145, 160, 205, 245, 545, 2145, 2160 or 3100

## 5. Using the StreamXpress with DTE-3100 product.

The DTE-3100 is a networked ASI output. The DTE-3100 offers 2 modes:

-SMPTE where a TSolP stream can be converted to an ASI output

-DTAPI mode where the DTE-3100 can be connected to the StreamXpress for remotely over the network streaming ASI streams.

In order to use the StreamXpress with the DTE-3100, the DTE-3100 needs to be licensed for StreamXpress. The StreamXpress will connect to the DTE and stream over IP the open MPEG-2 TS file to the DTE-3100. The DTE-3100 will output ASI. This mode can be used to remotely stream a stored file to ASI.

To stream to the DTE-3100, the StreamXpress must be started from the DOS command prompt with the –DTE option (See section 4).

The DTE must be in the API mode to operate from the StreamXpress.



**DTE-3100 - Networked ASI Output**



**DTAPI Mode**

Serial number : 3100.000.533  
Hardware : Revision 3  
Firmware : Version 1.2

IP address : 169.254.124.213  
MAC address : 00-14-4f-00-82-15  
Link speed : 1000Mbps

Power : Auxiliary  
Temperature : 42°C / 108°F

Device Status
Network Settings
Application Switches
Firmware Upgrade

Applications

#	Application	Version	State	Description
1	DTAPI	v1.2	Active	Networked DVB-ASI output port for applications running on a PC. The application interfaces with the DTE-3100 using DekTec's DTAPI library.
2	SMPTE	v1.2	Activate	Standalone TSolP to ASI converter with UDP/RTP and 2D FEC support according to SMPTE-2022. An SNMP interface is exposed for management and control.

## Appendix A. StreamXpress .XML configuration Syntax

```

// *** Main StreamXpress Dialog
INIT_GUIPARS_PAR(m_Sx_Dlg, PAR_DLG, m_Always, NULL, L"MainDialog");

// Source
INIT_PARSET_PAR(m_Source, PAR_INT, m_Always, NULL, L"SignalSource");
INIT_PARSET_PAR(m_Filename, PAR_STRING, m_Always, NULL, L"Filename");

// Loop settings
INIT_PARSET_PAR(m_WrapAround, PAR_BOOL, m_Always, NULL, L"WrapAround");

// Low-level transmit parameters
INIT_PARSET_PAR(m_BurstMode, PAR_BOOL, m_IsAsi, NULL, L"BurstMode");
INIT_PARSET_PAR(m_ExtClock, PAR_BOOL, m_Always, NULL, L"ExtClock");
INIT_PARSET_PAR(m_RefClock, PAR_INT, m_Always, NULL, L"RefClock");
INIT_PARSET_PAR(m_TxMode, PAR_INT, m_Always, &ParSet::HasTxMode, L"TxMode");
INIT_PARSET_PAR(m_TxPolarity, PAR_INT, m_IsAsi, NULL, L"TxPolarity");

// Modulation parameters
INIT_PARSET_PAR(m_IqGain, PAR_INT, m_IsModulator, &ParSet::IsIq, L"IqGain");
INIT_PARSET_PAR(m_ModType, PAR_INT, m_IsModulator, NULL, L"ModType");
INIT_PARSET_PAR(m_ModTypeQual, PAR_INT, m_IsModulator, NULL, L"ModTypeQual");
INIT_PARSET_PAR(m_ParXtra0, PAR_INT, m_IsModulator, &ParSet::HasParXtra0, L"ParXtra0");
INIT_PARSET_PAR(m_ParXtra1, PAR_INT, m_IsModulator, &ParSet::HasParXtra1, L"ParXtra1");
INIT_PARSET_PAR(m_ParXtra2, PAR_INT, m_IsModulator, &ParSet::HasParXtra2, L"ParXtra2");
INIT_PARSET_PAR(m_RfFreq, PAR_INT64, m_IsModulator, NULL, L"CarrierFrequency");
INIT_PARSET_PAR(m_RfLevel, PAR_INT, m_IsModulator, NULL, L"RfLevel");
INIT_PARSET_PAR(m_RfOutputEnabledOnStop, PAR_BOOL, m_IsModulator, NULL,
L"RfOutputEnabledOnStop");
INIT_PARSET_PAR(m_RfMode, PAR_INT, m_IsModulator, NULL, L"Rfmode");

// RF-level
INIT_GUIPARS_PAR(m_Rf_Dlg, PAR_DLG, m_IsModulator, NULL, L"RfLevelDialog");
INIT_PARSET_PAR(m_SnrOn, PAR_BOOL, m_IsModulator, NULL, L"SnrOn");
INIT_PARSET_PAR(m_Snr, PAR_INT, m_IsModulator, NULL, L"Snr");

// Rate parameters
INIT_PARSET_PAR(m_PoRate, PAR_INT, m_Always, NULL, L"PlayOutRate");
INIT_PARSET_PAR(m_Rmx, PAR_BOOL, m_Always, NULL, L"Rmx");
INIT_PARSET_PAR(m_SymRate, PAR_INT, m_Always, &ParSet::HasSymRate, L"SymRate");
INIT_PARSET_PAR(m_TsRate, PAR_INT, m_Always, NULL, L"TsRate");

// Test signal generator
INIT_PARSET_PAR(m_TsgPid, PAR_INT, m_Always, NULL, L"TsgPid");

// *** Adapter-information parameters
INIT_GUIPARS_PAR(m_AdplInfo_Dlg, PAR_DLG, m_Always, NULL, L"AdplInfoDlg");

// *** Channel-modelling parameters
INIT_GUIPARS_PAR(m_Cm_Dlg, PAR_DLG, m_IsModulator, NULL, L"CmParsDlg");
INIT_GUIPARS_PAR(m_CmSnrStepSize, PAR_INT, m_IsModulator, NULL, L"CmSnrStepSize");
INIT_PARSET_PAR(m_CmEnable, PAR_BOOL, m_IsModulator, NULL, L"CmEnable");

```

```
INIT_PARSET_PAR(m_CmPars, PAR_CMPARS, m_IsModulator, NULL, L"CmPars");
```

```
// *** CMMB modulation parameters
```

```
INIT_PARSET_PAR(m_CmmbPars.m_Bandwidth, PAR_INT, m_IsModulator,
                &ParSet::IsCmmb, L"CmmbBandwidth");
INIT_PARSET_PAR(m_CmmbPars.m_Areald, PAR_INT, m_IsModulator,
                &ParSet::IsCmmb, L"CmmbAreald");
INIT_PARSET_PAR(m_CmmbPars.m_Txld, PAR_INT, m_IsModulator,
                &ParSet::IsCmmb, L"CmmbTxld");
```

```
// *** DTA-plus control parameters
```

```
INIT_GUIPARS_PAR(m_PlusDlg, PAR_DLG, m_IsModulator, NULL, L"DtaPlusDialog");
INIT_PARSET_PAR(m_PlusLevel, PAR_INT, m_IsModulator, NULL, L"DtaPlusLevel");
```

```
// *** DVB-T/DVB-H more parameters
```

```
INIT_GUIPARS_PAR(m_DvbH_CellIdSave, PAR_INT, m_IsModulator, &ParSet::IsDvbT,
                L"DvbHCellIdSave");
```

```
// *** DVB-T2 modulation parameters
```

```
INIT_GUIPARS_PAR(m_DvbT2_Dlg, PAR_DLG, m_IsModulator, &ParSet::IsDvbT2,
                L"DvbT2ParsDialog");
INIT_PARSET_PAR(m_T2Pars, PAR_T2PARS, m_IsModulator, &ParSet::IsDvbT2,
                L"DvbT2Pars");
INIT_GUIPARS_PAR(m_DvbT2_FollowMode, PAR_INT, m_IsModulator, &ParSet::IsDvbT2,
                L"FollowMode");
INIT_GUIPARS_PAR(m_DvbT2_Group, PAR_INT, m_IsModulator, &ParSet::IsDvbT2,
                L"ParSetsGroup");
```

```
// *** ISDB-T modulation parameters
```

```
INIT_GUIPARS_PAR(m_Isdbt_Dlg, PAR_DLG, m_IsModulator, &ParSet::IsIsdbT,
                L"IsdbtParsDialog");
INIT_GUIPARS_PAR(m_Isdbt_AllowMultiLayer, PAR_BOOL, m_IsModulator, &ParSet::IsIsdbT,
                L"IsdbtAllowMultiLayer");
INIT_PARSET_PAR(m_IsdbtPars.m_BType, PAR_INT, m_IsModulator, &ParSet::IsIsdbT,
                L"IsdbtBType");
INIT_PARSET_PAR(m_IsdbtPars.m_Emergency, PAR_INT, m_IsModulator, &ParSet::IsIsdbT,
                L"IsdbtEmergency");
INIT_PARSET_PAR(m_IsdbtPars.m_Guard, PAR_INT, m_IsModulator, &ParSet::IsIsdbT,
                L"IsdbtGuard");
INIT_PARSET_PAR(m_IsdbtPars.m_lipPid, PAR_INT, m_IsModulator, &ParSet::IsIsdbT,
                L"IsdbtIipPid");
INIT_PARSET_PAR(m_IsdbtPars.m_LayerOther, PAR_INT, m_IsModulator, &ParSet::IsIsdbT,
                L"IsdbtLayerOther");
for (Int l=0; l<3; l++) {
    INIT_PARSET_PAR(m_IsdbtPars.m_LayerPars[l].m_CodeRate, PAR_INT,
                    m_IsModulator, &ParSet::IsIsdbT,
                    _W(L"IsdbtParsLayer%d_CodeRate", l));
    INIT_PARSET_PAR(m_IsdbtPars.m_LayerPars[l].m_Modulation, PAR_INT,
                    m_IsModulator, &ParSet::IsIsdbT,
                    _W(L"IsdbtParsLayer%d_Modulation", l));
    INIT_PARSET_PAR(m_IsdbtPars.m_LayerPars[l].m_NumSegments, PAR_INT,
                    m_IsModulator, &ParSet::IsIsdbT,
                    _W(L"IsdbtParsLayer%d_NumSegments", l));
}
```

```

INIT_PARSET_PAR(m_IsdbtPars.m_LayerPars[0].m_TimeInterleave, PAR_INT,
                m_IsModulator, &ParSet::IsIsdbt,
                _W(L"IsdbtParsLayer%d_TimeInterleave", 1));
}
INIT_PARSET_PAR(m_IsdbtPars.m_Mode, PAR_INT, m_IsModulator, &ParSet::IsIsdbt,
                L"IsdbtMode");
INIT_GUIPARS_PAR(m_Isdbt_IsSubChOverride, PAR_BOOL, m_IsModulator, &ParSet::IsIsdbt,
                L"IsdbtIsSubChannelOverride");
INIT_GUIPARS_PAR(m_Isdbt_SubChOverride, PAR_INT, m_IsModulator, &ParSet::IsIsdbt,
                L"IsdbtSubChannelOverride");
INIT_PARSET_PAR(m_IsdbtPars.m_ParXtra0, PAR_INT, m_IsModulator, &ParSet::IsIsdbt,
                L"IsdbtParXtra0");
INIT_PARSET_PAR(m_IsdbtPars.m_PartialRx, PAR_INT, m_IsModulator, &ParSet::IsIsdbt,
                L"IsdbtPartialRx");
INIT_PARSET_PAR(m_IsdbtPars.m_Pid2Layer, PAR_MAPINTINT,
                m_IsModulator, &ParSet::IsIsdbt,
                L"IsdbtPid2Layer");
INIT_PARSET_PAR(m_UseTmcc, PAR_BOOL, m_IsModulator, &ParSet::IsIsdbt,
                L"IsdbtUseTmcc");
INIT_PARSET_PAR(m_IsdbtPars.m_Virtual13Segm, PAR_BOOL, m_IsModulator, &ParSet::IsIsdbt,
                L"IsdbtVirtual13Segm");

// *** More DVB-S2 modulation parameters
INIT_GUIPARS_PAR(m_S2_Dlg, PAR_DLG, m_IsModulator, &ParSet::IsDvbT,
                L"MoreDvbS2ParsDialog");

// *** More DVB-T modulation parameters
INIT_GUIPARS_PAR(m_Mdp_Dlg, PAR_DLG, m_IsModulator, &ParSet::IsDvbT,
                L"MoreDvbTParsDialog");

// TSolP parameters
INIT_PARSET_PAR(m_TSolP.m_Ip, PAR_IPADDR, m_IsTSolP, NULL, L"TsoipIpAddress");
INIT_PARSET_PAR(m_TSolP.m_FecMode, PAR_INT, m_IsTSolP, NULL, L"TsoipFecMode");
INIT_PARSET_PAR(m_TSolP.m_FecNumRows, PAR_INT, m_IsTSolP, NULL, L"TsoipFecD");
INIT_PARSET_PAR(m_TSolP.m_FecNumCols, PAR_INT, m_IsTSolP, NULL, L"TsoipFecL");
INIT_PARSET_PAR(m_TSolP.m_TimeToLive, PAR_INT, m_IsTSolP, NULL, L"TsoipTimeToLive");
INIT_PARSET_PAR(m_TSolP.m_NumTpPerIp, PAR_INT, m_IsTSolP, NULL, L"TsoipTpsPerIp");
INIT_PARSET_PAR(m_TSolP.m_Port, PAR_INT, m_IsTSolP, NULL, L"TsoipPort");
INIT_PARSET_PAR(m_TSolP.m_Protocol, PAR_INT, m_IsTSolP, NULL, L"TsoipProtocol");
INIT_PARSET_PAR(m_TSolP.m_DiffServ, PAR_INT, m_IsTSolP, NULL, L"TsoipDiffServ");

// Loop adaptation parameters
INIT_GUIPARS_PAR(m_Lpa_Dlg, PAR_DLG, m_Always, NULL, L"LoopAdaptationDialog");
INIT_PARSET_PAR(m_AdaptCc, PAR_BOOL, m_Always, NULL, L"AdaptCc");
INIT_PARSET_PAR(m_AdaptPcr, PAR_BOOL, m_Always, NULL, L"AdaptPcr");
INIT_PARSET_PAR(m_AdaptTdtTot, PAR_BOOL, m_Always, NULL, L"AdaptTdtTot");
INIT_PARSET_PAR(m_TdtTotAdaptMode, PAR_INT, m_Always, &ParSet::HasTdtTotAdaptMode,
                L"AdaptModeTdtTot");
INIT_PARSET_PAR(m_TdtTotDateTime, PAR_DATETIME, m_Always, &ParSet::HasTdtTotDateTime,
                L"TdtTotDateTime");

// Error injection parameters
INIT_GUIPARS_PAR(m_Eij_Dlg, PAR_DLG, m_Always, &ParSet::HasEij, L"ErrorInjectionDialog");
INIT_PARSET_PAR(m_EijBitErrEnable, PAR_BOOL, m_Always, &ParSet::HasEij, L"EijBitErrEnable");
INIT_PARSET_PAR(m_EijBitErrNumBits, PAR_INT, m_Always, &ParSet::HasEij, L"EijBitErrNumBits");
INIT_PARSET_PAR(m_EijBitErrProb, PAR_INT, m_Always, &ParSet::HasEij, L"EijBitErrProb");

```

```
INIT_PARSET_PAR(m_EijByteErrEnable, PAR_BOOL, m_Always, &ParSet::HasEij, L"EijByteErrEnable");  
INIT_PARSET_PAR(m_EijByteErrProb, PAR_INT, m_Always, &ParSet::HasEij, L"EijByteErrProb");  
INIT_PARSET_PAR(m_EijByteErrNumBytes, PAR_INT, m_Always, &ParSet::HasEij, L"EijByteErrNumBytes");  
INIT_PARSET_PAR(m_EijLostTpEnable, PAR_BOOL, m_Always, &ParSet::HasEij, L"EijLostTpEnable");  
INIT_PARSET_PAR(m_EijLostTpProb, PAR_INT, m_Always, &ParSet::HasEij, L"EijLostTpProb");
```

**// Sub loop**

```
INIT_GUIPARS_PAR(m_SI_Dlg, PAR_DLG, m_Always, NULL, L"SubLoopDialog");  
INIT_PARSET_PAR(m_UseSubLoop, PAR_BOOL, m_Always, NULL, L"UseSubLoop");  
INIT_PARSET_PAR(m_LoopBeginRel, PAR_DOUBLE, m_Always, NULL, L"LoopBeginRel");  
INIT_PARSET_PAR(m_LoopEndRel, PAR_DOUBLE, m_Always, NULL, L"LoopEndRel");
```

## Appendix B. PRBS generation

This appendix describes in detail how StreamXpress generates the PRBS signal as defined in ITU O.151.

A 23-bit register (`prbs_reg`) is initialized to all 1's. Then, for each bit of output:

- $\text{Output-bit} = \sim(\text{prbs\_reg\_bit17} \wedge \text{prbs\_reg\_bit22})$   
That is, bits 17 and 22 (zero-indexed) are exclusive or-ed and the result of that is negated. The result of this computation is written to the output buffer.
- $\text{Prbs\_reg} = ((\text{prbs\_reg} \ll 1) | (((\text{prbs\_reg} \gg 22) \wedge (\text{prbs\_reg} \gg 17)) \& 1)) \& 0x7FFFF$   
Bits 17 and 22 are exclusive or-ed. Then all bits in `prbs_reg` are shifted to the left and the result of the exclusive or of the previous bits 17 and 22 is stored as new bit 0.