Forward TS Product Line

General Information

Revision as of April 30, 2009.

Notice

The information in this document is subject to change without prior notice in order to improve reliability, design, or function and does not represent a commitment on the part of this company.

In no event will we be liable for direct, indirect, special, incidental, or consequential damages arising out of the use or the inability to use the product or documentation, even if advised of the possibility of such damages.

Throughout this manual, we make reference to product names that are trademarks of other companies. We are using these names for identification purposes only, with no intention of infringement of the trademarks.

FCC Information

FCC ID:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

Reorient or relocate the receiving antenna.
Increase the separation between the equipment and receiver.
Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
Consult the dealer or an experienced radio/TV technician for help.

Shielded cables and I/O cards must be used for this equipment to comply with the relevant FCC regulations. Changes or modifications not expressly approved in writing by SoftLab-NSK Ltd. may void the user's authority to operate this equipment.

Limited Warranty

Our company warrants this product against defects in materials and workmanship for a period of one year from the date of purchase. During the warranty period, products determined by us to be defective in form or function will be repaired or replaced at our option, at no charge. This warranty does not apply if the product has been damaged by accident, abuse, misuse, or as a result of service or modification other than by us.

This warranty is in lieu of any other warranty expressed or implied. In no event shall we be held liable for incidental or consequential damages, such as lost revenue or lost business opportunities arising from the purchase of this product.

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Introduction

This document contains a general description of the ForwardTS product line products. It covers the following topics:

- function, composition, capabilities of the products;
- information about the hardware and software;
- list of products with a short description;
- general algorithm for choosing a product.

See description of programs from ForwardTS software in «SLStreamer Lite, SLStreamer Pro: Programs for Configuring Digital Streaming Schemes, Monitoring & Controlling Their Operation. User's Guide».

General Information

1. Function & General Characteristics

ForwardTS is a product line designed to provide digital TV broadcasting using different information channels.

Reception and transmission of video and audio data streams (MPEG TS, Windows Media streams) via ASI/IP interfaces, the necessary intermediate data processing, and automated control of digital broadcasting.

ForwardTS products are software and hardware-software systems based on FD300/FD401 boards.

The products can be used to work with analog TV signal and/or with digital audio and video data (compressed or uncompressed).

The products of the product line support two digital video compression standards: MPEG-2 and AVC (MPEG-4 Part 10/H.264). Transport streams can be transmitted via ASI and/or IP interfaces.

2. Composition of Products

Products of the ForwardTS product line are software and hardware-software systems.

The hardware basis of the systems are the audio and video data input/output boards FD300 and FD401. For a detailed description of the boards, see the «Technical Features» Section.

The product line software includes ForwardT Software and ForwardTS software. For more details, see the «Software» Section.

The delivery set includes a USB dongle HASP HL. Using the dongle, the registration of certain functions of the Software is performed.

3. Product Groups

Depending on the problems solved, the ForwardTS product line products are divided into the following Groups (for a more detailed description, see the «Product List...» Section):

1. Products for inserting commercials into and overlaying titles on a programm from MPTS.

2. Encoders – products for converting analog or SDI signal to a compressed digital stream MPEG TS (MPEG-2, AVC) and streaming in the network. The products support broadcasting via Windows Media Encoder, Flash Media Encoder (WM9, FLV formats) for IP solutions.

3. Decoders – products for converting programs from a digital stream MPEG TS (MPEG-2, AVC) to analog or SDI signal.

4. Gateways – products for remultiplexing – passing programs from one transport stream to another without any insertions or changes in programs.

4. Examples of Problems Solved

Products of the ForwardTS product line allow you to solve a wide range of problems of digital broadcasting, including:

- converting signal received from a satellite tuner in a traditional analog format to a digital format without inserting programs of one's own («as is»);
- converting signal received from a satellite tuner in a traditional analog format to a digital format with inserting programs of one's own, local commercials, and overlaying titles;
- creating one's own broadcast channel in a digital format;
- broadcasting information and commercial data of one's own in public places (selling floors, entertainment areas, etc.) over Ethernet;
- rebroadcasting separate programs selected from a transport stream (ASI/IP) with the insertion of commercials, programs of one's own, and overlaying titles.
- multiplexing processed signal into a transport stream;
- converting signal received in a digital format to analog;
- transforming a stream from one digital interface to another (ASI-to-IP, IP-to-ASI).

5. Features

To work with ForwardTS products, you do not need to convert all video, graphics files, and other data to one specific format. For example, converting video to MPEG-2 files with a certain bitrate. Thus, when switching to broadcasting in a digital format, you can use yet all the data your company has.

Included in the Product Line is ForwardT Software, which is used in solutions for working with analog signal (in ForwardTA) as well. Therefore TV companies already using this Software in analog broadcasting can switch to a digital format without additional expenditure on retraining since all the data preparation workflow remains unchanged.

Technical Features

1. Basic Hardware. General Information

Hardware-software systems from the ForwardTS product line are based on the FD300 or FD401 boards (video and audio data input/output boards. The Table below lists possible ways of using the boards in ForwardTS products.

Hardware	Function
FD300 board	Input/output of analog signal
FD300 board with SDI option	Input/output of analog signal and digital signal in the SDI format
FD401 board	Input/output of digital signal as MPEG transport stream via ASI interface

2. FD300 Board

The Table below gives the FD300 board specification.

Video	
Video Data Format	PAL, SECAM: 720x576, 25 fps. NTSC: 720x480, 29.97 fps.
Internal Video Data Processing	YUV 4:2:2 or YUV with transparency 4:2:2:4, 8-bit per component.
Inputs	Analog: two independent video channels with the ability to connect: - up to 12 composite sources; - up to 6 S-Video sources; - up to 3 component sources (YUV, YUVS, RGB, RGBS). Digital (optionally): SDI. Two channels of time-base correction (TBC).
Outputs	Analog: - Y/C + CVBS; - YUV + CVBS; - YUVs/RGBs; - YUV + alpha channel. Digital (optionally): SDI.
Synchronization	Video output genlock to one of the video inputs.
Audio	
Audio Data Format	Uncompressed (PCM), 16 bit, from 8 to 48 KHz.
Inputs	3 stereo or 6 monochannels.
Outputs	3 stereo or 6 monochannels.

Synchronization	Audio synchronization to the reference video signal.
Additionally	Microphone amplifier for two stereo channels. Configurable audio delay (independently for each input channel). Routing any input channel to any output channel, the volume level being controllable. Balanced XLR connectors (optionally).

3. FD401 Board

The Table below gives the FD401 board specification.

Video	
Video Data Format	PAL, SECAM: 720x576, 25 fps. NTSC: 720x480, 29.97 fps.
Internal Video Data Processing	YUV 4:2:2

Inputs	Analog:
	  - CVBS;
	  - Y/C;
	  - YUV, YUVs (RGB, RGBs).
	Digital:
	  - SDI;
	  - ASI.

Outputs	Analog: CVBS; Digital: ASI.
Audio	

Inputs	Analog: 2 stereo or 4 monochannels, linear or balanced.
	Digital:
	  - AES/EBU 2 channels;
	  - SDI Embedded: 2 stereo or 4 monochannels.

Outputs	Analog: 1 stereo channel, linear.
Synchronization	Audio synchronization to the video signal.
Additionally	Configurable audio delay (independently for each input channel). Routing any input channel to any output channel, the volume level being controllable.

4. Network Protocols Used

Products of the ForwardTS product line support receiving/transmitting data streams using the following protocols:

- receiving transport streams MPEG TS – UDP, RTP/AVP, TCP, RTP/AVP over TCP;
- transmitting:
  - transport streams MPEG TS – UDP, RTP, RTSP, RTP/AVP, TCP, RTP/AVP over TCP;
  - Windows Media stream – HTTP.

Software

ForwardTS product line software includes ForwardT Software and ForwardTS software.

1. ForwardT Software

The main functions of ForwardT Software when included in ForwardTS product line are controlling the broadcast process, inserting commercials into programs, overlaying titles.

Programs included in ForwardT Software are described in the corresponding User's Guides (http://www.softlab-nsk.com/forward/index.html). Among them:

- about the broadcast automation program FDOnAir:
  - «FDOnAir: Broadcast Automation» – basic user's guide;
  - «FDOnAir: Additional Sections» – user's guide that provides the latest topical information about the program functions and user interface features;
  - «FDOnAir Commands» – complete description of commands used in FDOnAir to control broadcasting;
- about the FDTitle Designer program, which is used to provide overlaying titles: «FDTitle Designer: Title Project Editor».

2. ForwardTS Software

ForwardTS software is designed to work with video and audio data in the format of MPEG transport stream.

Included in the software package are program modules that provide creating and configuring schemes of receiving, processing, and transmitting video and audio data and their uninterrupted operation.

The following programs are designed to create, configure, and control the operation of the said schemes:

- SLStreamer Lite – to work using templates of typical streaming schemes. For example, to provide broadcasting a channel of one's own over IP network or inserting commercials in a program from MPTS, etc. A set of templates is supplied with the ForwardTS software package;
- SLStreamer Pro – to work with systems of any configuration and complexity not confined to templates. The systems can be configured and controlled remotely.

For a detailed description of the programs, see «SLStreamer Lite, SLStreamer Pro. Programs for Configuring Digital Streaming Schemes, Monitoring & Controlling Their Operation. User's Guide».

Other program modules from the ForwardTS software package are designed to perform specific operations such as selecting programs from the transport stream for further processing, decoding, compressing the processed programs by the MPEG-2 or AVC standards, inserting the programs into the transport stream, etc.

The operation parameters of the modules are adjusted using the SLStreamer Lite and SLStreamer Pro programs.

General Principles of Operaion

Different products of the ForwardTS product line are designed to build different schemes of receiving, processing, and streaming programs with video and audio data. By combining certain products, you can build systems of any complexity and configuration.

1. Program, Line

Program – logically connected video, audio and data related to them. Video and audio are synchronized. The data may contain titles, teletext, information about the program (name, owner, description), etc.

Line – a route of one program from an input to an output device.

Note: The current version of the ForwardTS product line products does not support teletext, titles, and other additional data. Supported are only video and audio.

2. General Scheme of Passing Programs

In the general case, the scheme of passing (receiving, processing, and transmitting) programs from a transport stream looks as follows:

1. The transport stream from the tuner is fed into the computer via ASI or IP interface.

2. The demultiplexer splits the stream into separate programs.

3. The video and audio of certain programs selected by the user are decoded.

4. After decoding, the video and audio come to the FDOnAir program input as «passthrough video», where FDOnAir can insert blocks of commercials or overlay titles (one progrm – one FDOnAir instance).

5. The resulting video and audio of each processed program is encoded anew.

6. After the encoding, the data come to the multiplexer input. Some of the programs can come to the multiplexer input directly from the demultiplexer output without any changes. The multiplexer joins all the selected programs in one transport stream.

7. The transport stream is transmitted then via ASI and/or IP interfaces.

3. Line Types

The following terms are used in the ForwardTS product line to denote different line types:

- Broadcasting – playing video clips, commercials, titles, etc. from local or remote disks according to the schedule without using input lines;
- Retransmission – inserting blocks of commercials, programs and overlaying titles on an existent program;
- Remultiplexing – broadcasting existent programs received from the transport stream without any changes;
- Encoding/Decoding – encoding (analog/SDI to MPTS), decoding (MPTS to analog/SDI) data.

The table below shows the correspondence between the line types and operations performed when passing a program from an input to an output device. «+» marks the operations performed when working by the selected scheme type.

Step	Operation	Line Type				
		Broadcasting	Retransmission	Remultiplexing	Encoding	Decoding
Receiving		-	MPTS	MPTS	analog or SDI	MPTS
Processing	1) demultiplexing	-	+	+	-	+
	2) decoding video and audio	-	+	-	-	+
	3) playing full-screen video with overlaying titles	+	+	-	-	-
	4) encoding video and audio	+	+	-	+	-
	5) multiplexing	+	+	+	+	-
Transmitting		MPTS	MPTS	MPTS	MPTS	analog or SDI

4. Retransmission Line Type

When working by the Retransmission scheme, performed is inserting blocks of commercials, programs and overlaying titles on an existing program. The Figure below schematically shows passing one program when working by this scheme.

To control broadcasting (prepare the schedule, transmit, control the broadcasting process), the FDOnAir program is used.
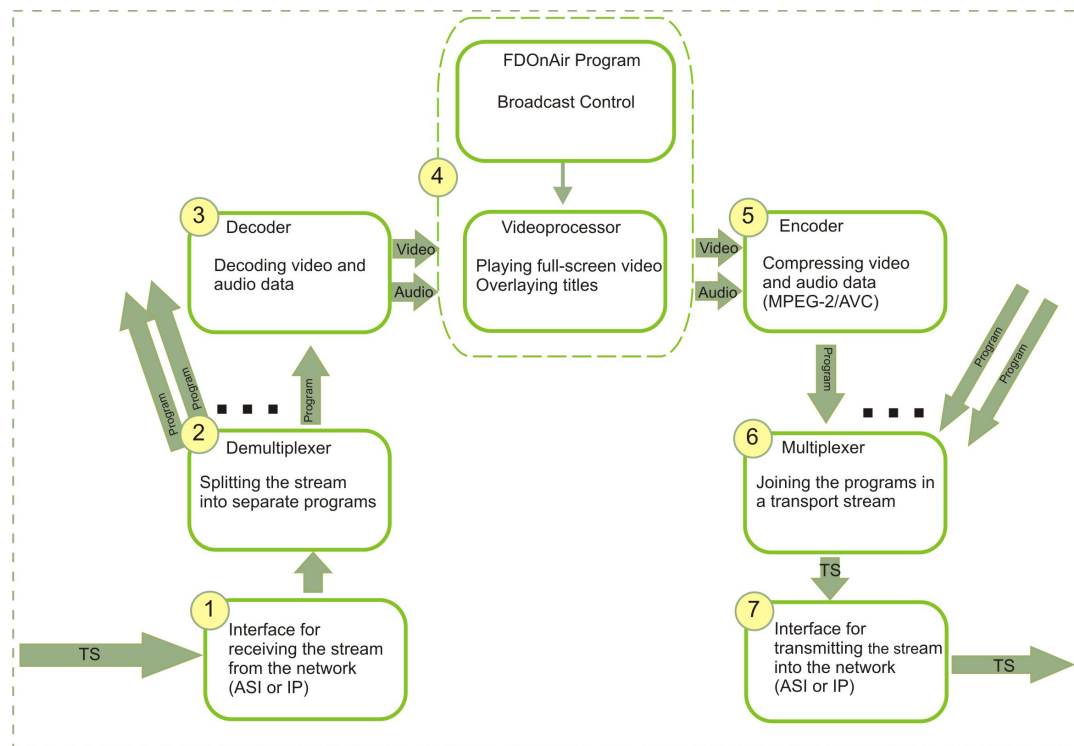
The transport stream from the tuner is fed into the computer via ASI or IP interface (1). The demultiplexer splits the stream into separate programs (2). One of the programs is selected for further processing.

The video and audio of the selected program are decoded (3) and come to the FDOnAir program input as "passthrough video", where blocks of commercials can be inserted and titles can be overlayed. All the processing is performed using the "Video processor" module (4).

After the processing, the resulting video and audio are compressed anew (5) and come to the multiplexer input (6). The multiplexer joins all the programs in one transport stream, which is transmitted then via ASI and/or IP interfaces (7).
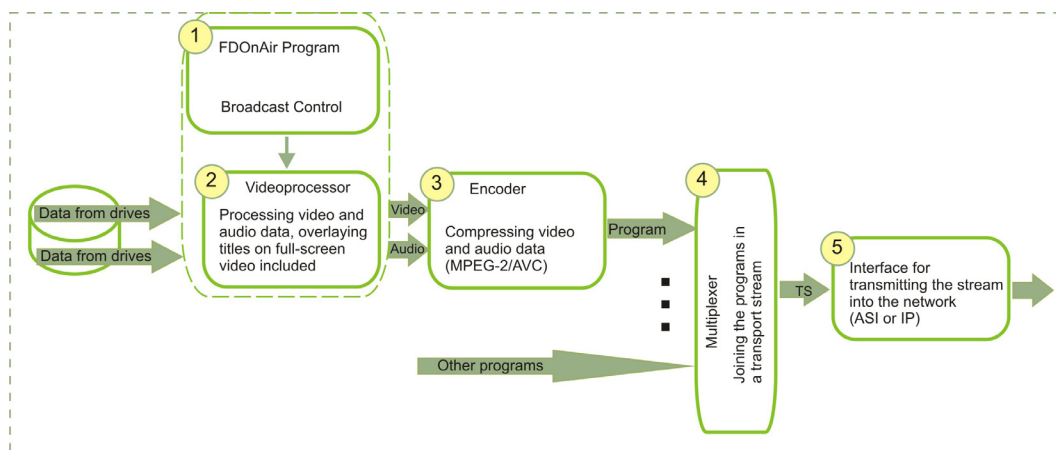
This scheme can be realized using the ForwardTS product line products designed to insert commercials into and overlay titles on a program from the transport stream (Group 1, for more details, see the "Product List..." Section).

5. Broadcasting Line Type

When working by this scheme, performed is playing video clips, commercials, titles, etc. from local or remote disks according to the schedule without using input lines (without video from the board input). No FD300 board is used.

The Figure below schematically shows passing one program when working by the Broadcasting scheme.

To control broadcasting (prepare the schedule, transmit, control the broadcasting process), the FDOnAir program is used (1).

Processing the video and audio data (e.g., overlaying titles) is performed using the program module "Video processor" (2).

The resulting video and audio data are encoded using the Encoder (3), whereupon come to the multiplexer input (4). The multiplexer joins all the programs in one transport stream, which is transmitted to the receiving end via ASI and/or IP interface (5).

This scheme can be realized using one of the products of the ForwardTS product line that are designed to insert commercials into and overlay titles on a program from the transport stream (for more details, see the "Product List..." Section).

6. Remultiplexing Line Type

Remultiplexing – broadcasting existent programs received from the transport stream without any changes.
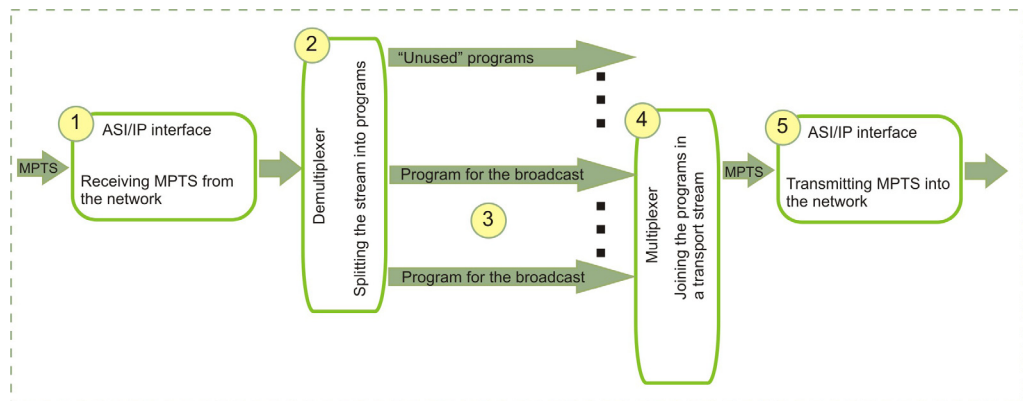
When working by this scheme, performed is the following sequence of operations. The transport stream from the tuner is fed into the computer via ASI or IP interface (1). The demultiplexer splits the stream into separate programs (2). Some of the programs selected by the user (3) come to the multiplexer input directly without any changes (4). The multiplexer joins all the selected programs in one transport stream, which is output via ASI and/or IP interfaces (5) further.

This scheme can be realized using the products of the ForwardTS product line that belong to the "Gateways" Group and also using the products designed to insert commercials into and overlay titles on a program from the transport stream (Group 1, for more details, see the "Product List..." Section).

General Principles of Operaion

Product List & Short Descriptions

1. Choosing a Product

Different products of the ForwardTS product line are designed to build different schemes of receiving, processing, and streaming programs with video and audio data.

The ForwardTS product line products are divided into groups by the solved problem types. Choosing a product within a group is determined by the type of the processed signal on the input/output (MPEG TS, Windows Media stream, SDI, analog) and the type of interface used to receive/transmit data (ASI, IP).

The Scheme below will help you to to make a decision when choosing a product.
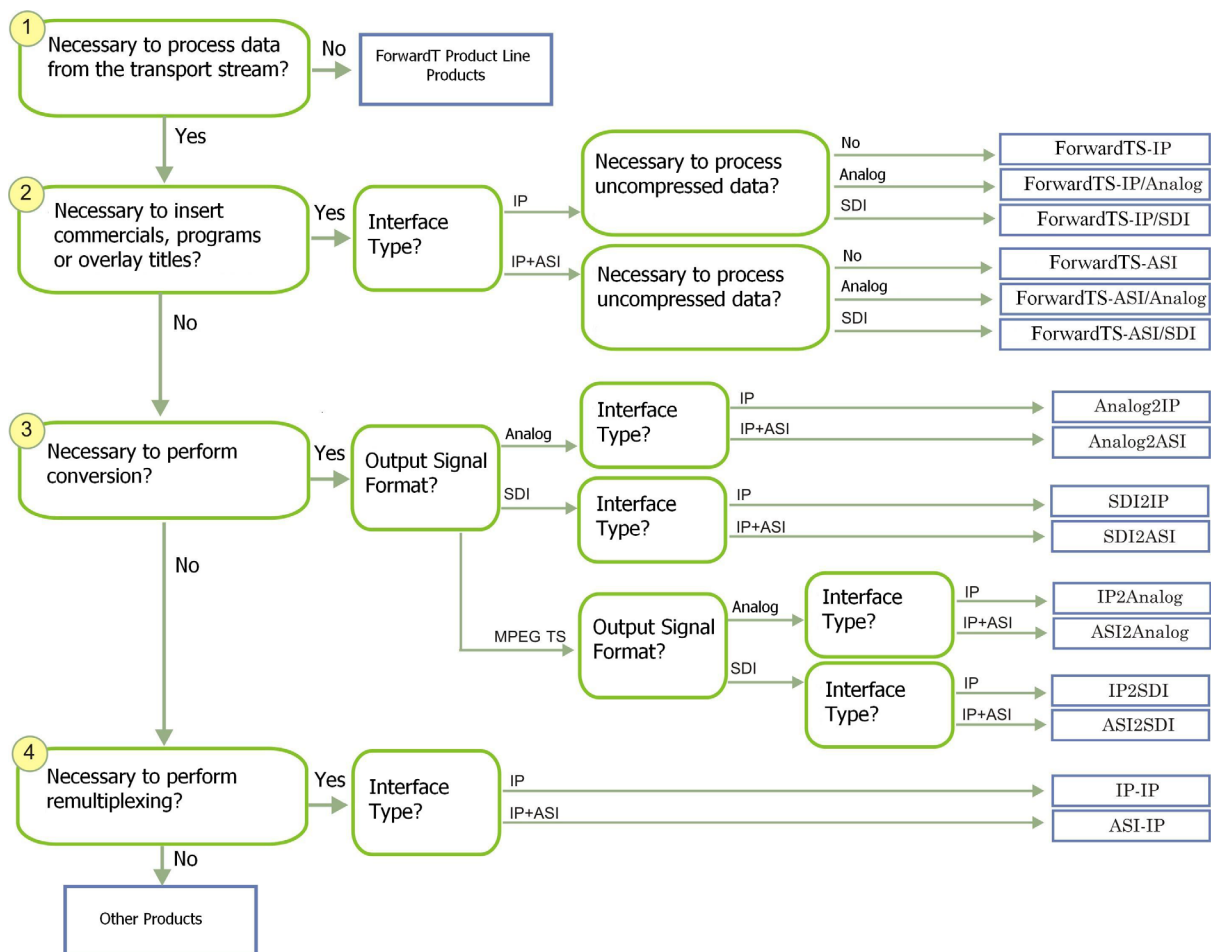
Note: "Processing" here implies any of the following operations with data: input, overlaying titles, output.

2. Products for Inserting Commercials into & Overlaying Titles on a Program from MPTS

Name	Description
ForwardTS IP	Input/output of MPTS via IP; overlaying graphics and/or inserting commercials into one of the programs.
ForwardTS IP/Analog	Input/output of MPTS via IP; overlaying graphics and/or inserting commercials into a program from MPTS or from an analog input; adding a progrm from an analog input to MPTS; output of one of the programs to an analog output.
ForwardTS IP/SDI	Input/output of MPTS via IP; overlaying graphics and/or inserting commercials into a program from MPTS or from the SDI input; adding a progrm from the SDI input to MPTS; output of one of the programs to the SDI output.
ForwardTS ASI	Input/output of MPTS via IP and/or ASI; overlaying graphics and/or inserting commercials into one of the programs.
ForwardTS ASI/Analog	Input/output of MPTS via IP and/or ASI; overlaying graphics and inserting commercials into a program from MPTS or from an analog input; adding a progrm from an analog input to MPTS; output of one of the programs to an analog output.
ForwardTS /SDI	Input/output of MPTS via IP and/or ASI; overlaying graphics and inserting commercials into a program from MPTS or from the SDI input; adding a progrm from the SDI input to MPTS; output of one of the programs to the SDI output.

3. Encoders

Products for converting analog or SDI signal to a transport stream transmitted via ASI and/or IP interface.

Name	Description
Analog2IP	Input of audio/video signal (CVBS, S-video, YUV), compression to MPEG-2/AVC/WM9/V4W/FLV, multiplexing of the transport stream, output to IP. Up to four MPEG-2/V4W channels, up to two WM9 channels, one AVC channel per a computer.
SDI2IP	Input of audio/video signal (CVBS, S-video, YUV, SDI), compression to MPEG-2/AVC/WM9/V4W/FLV, multiplexing of the transport stream, output to IP. Up to four MPEG-2/V4W channels, up to two WM9 channels, one AVC channel per a computer.
Analog2ASI	Input of audio/video signal (CVBS, S-video, YUV), compression to MPEG-2 or AVC, multiplexing of the transport stream, output to IP and ASI. Up to four MPEG-2 channels or one AVC channel per a computer.

Name	Description
SDI2ASI	Input of audio/video signal (CVBS, S-video, YUV, SDI), compression to MPEG-2 or AVC, multiplexing of the transport stream, output to IP and ASI.

4. Decoders

Products for converting programs from the transport stream to analog or SDI signal.

Name	Description
IP2Analog	Receiving a transport stream from IP, demultiplexing, decoding MPEG-2/AVC/WME/V4W/FLV, output to CVBS, S-video, YUV.
ASI2Analog	Receiving a transport stream from IP or ASI, demultiplexing, decoding MPEG-2/AVC, output to CVBS, S-video, YUV.
IP2SDI	Receiving a transport stream from IP, demultiplexing, decoding MPEG-2/AVC/WME/V4W/FLV, output to CVBS, S-video, YUV, SDI.
ASI2SDI	Receiving a transport stream from IP or ASI, demultiplexing, decoding MPEG-2/AVC, output to CVBS, S-video, YUV, SDI.

5. Gateways

Products for remultiplexing – passing programs from one transport stream to another without any insertions or changes in programs.

Name	Description
ASI-IP	Input/output of MPTS (MPEG-2/AVC) via IP or ASI with the ability of remultiplexing.
IP-IP	Input/output of MPTS (MPEG-2/AVC) via IP with the ability of remultiplexing.

Useful Links

Forward T Product Line: Description, Software Delivery, Documentation, Ready Solutions

http://www.softlab-nsk.com/forward/index.html

Tech Support

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Forums

http://www.softlab-nsk.com/forum (currently available in Russian only)