



### Control Word Generation and ECM Insertion for SimulCrypt applications.

The TokenMux sends the Control Words, generated according to the DVB specification, to the connected ECM generators and receives the ECMs back from the ECM generators. The ECMs are included in the Transport Stream according to the DVB recommendation (CASG).

This functionality can be used to apply one or more Conditional Access Systems. In the case of several CA systems, these may be applied to identical services thus allowing SimulCrypt. This mechanism uses an open protocol based on TCP/IP/ethernet.

### Generic Data Insertion

The high speed data interfaces on the TokenMux allow data inputs using Transport Packets, MPEG-2

sections and (time stamped) PES packets. Data, input as MPEG-2 sections, is inserted in the Transport Stream indicated by the stream type. This Data Inserter is also used for EMMs.

### Mechanics

The TokenMux cabinet is a 6U high, 19" rack mount unit with a depth of 400 mm (there should also be a 1U blind panel below the cabinet).

A cabinet has fourteen slots, the first of which is occupied by the System Integration Unit that is communicating with the Compression System Manager, or controls the system in stand-alone.

### Power

90 - 240 Volt AC, 50 - 60 Hz.

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# TokenMux



The TokenMux product is the foundation of Philips architecture for MPEG-2 video distribution. It is used to multiplex, re-multiplex and de-multiplex MPEG-2 Transport Streams.

## DVS3200-1 TokenMux The foundation for Philips MPEG-2 video distribution

- Remultiplex services from several Transport Streams into one Transport Stream automatically

### Applications

TokenMux systems can be applied in studios, uplink stations, (re-)distribution centers, cable head-ends and in-house video systems.

### TokenMux System

The basic requirements for the TokenMux are flexibility and modularity. This is realised by a high-speed, ring-based internal bus to which application units are connected. Application units exist for video encoder interfacing, AC-3 encoder interfacing, audio encoding, data insertion, VBI extraction, receiving incoming Transport Streams and generating outgoing Transport Streams.

These units can be inserted and extracted when the other units in the rack are still active ("hot swapping") in order to maintain and change configurations while ensuring continuous operation. The communication on the internal bus uses "Tokens". Transport Stream packets generated by units such as the Audio Encoder are further packetised into Tokens and written onto this bus. Other units, e.g. the Multiplexer unit, read these Tokens from the bus for further processing.

To perform these functions, the TokenMux is able to:

- Interface to the Philips MPEG-2 Video Encoder
  - MPEG-2 Audio Encoding of digital audio inputs
  - CVBS input for World System Teletext
  - VBI extraction for WST, VPS, WSS and closed captioning (option)
  - Inputs for DVB Subtitling
  - Inputs for MPEG-2 Transport Streams
  - Multiplexer for MPEG-2 Transport Streams
  - Support for active remultiplexing to automatically combine several Transport Streams
  - Supports multiple Conditional Access Systems for SimulCrypt applications
  - "Hot swap" of application units for continuous operation
  - Flexible configurations through modular architecture
  - Allows cascading of system racks
  - Supports various redundancy schemes for fault-tolerant operation
- Interface to the Philips MPEG-2 Video Encoder
- Interface to AC-3 stereo and multichannel encoders (ATSC compliant)
- Encode audio according to the MPEG-2 audio standard
- Extract World System Teletext from a PAL signal and insert it according ETS 300 472
- Extract Vertical Blanking Data (VBI): World System Teletext, Closed Captioning, WSS bits and VPS from a DSC signal and insert it in the Transport Stream (option)
- Receive DVB Subtitle information that is locked to service
- Insert digital data as MPEG-2 private data streams
- Generate Control Words and reinsert Entitlement Control Messages (ECM) and Entitlement Maintenance Messages (EMM) for Conditional Access systems
- Receive Transport Streams from cable, satellite, terrestrial and telecommunication networks
- Generate Transport Streams for cable, satellite, terrestrial and telecommunication networks
- Scramble the Transport Packets according to the DVB Common Scrambling Specification

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**The System Integration Unit contains the agent for system management. It can operate in two modes, it either receives the control information from the external management system or it operates in stand-alone mode. In both cases it distributes control information to the concerned units by means of Tokens.**

The TokenMux provides an internal time stamp mechanism to ensure full synchronisation of video, audio and data in a service. This applies to services compressed by the Video and Audio Encoder units as well as for pre-compressed services received from incoming Transport Streams. The MPEG time stamps in the outgoing Transport Streams are based on these internal time stamps. This mechanism allows for flexible combinations of multiplexing, de-multiplexing and re-multiplexing functions in a single system for maximum economics and convenience.

**TokenMux functions**

The TokenMux uses dedicated units to perform specific functions. The basic function is provided by a main unit, e.g. the Audio Encoder, and dedicated interface units provide specific interfaces to the main units.

**Video Encoder Interfacing**

The TokenMux receives the Packetised Elementary Streams (PES) packets from the Philips MPEG-2 Video Encoders and packetises these into MPEG-2 Transport Streams packets. The program reference clock is obtained from the Video Encoder and it is distributed within the TokenMux for synchronisation. The Video Encoder is controlled via the TokenMux.

**Teletext Extraction**

The TokenMux extracts the World System Teletext bytes from a PAL signal and packetises these according to ETS 300 427. This function is combined with Video Encoder interfacing in a single unit.

**VBI extraction (option)**

The World System Teletext data, Wide Screen Signalling bits, VPS information and Close-Captioning data present in the DSC input signal is inserted in the Transport Stream according to an extension to ETS 300 427 for reinsertion in the VBI at the receiving side.

**DVB Subtitles**

DVB Subtitling information is received from subtitle generators according to an open protocol based on TCP/IP/ethernet. The TokenMux locks the DVB subtitle streams to the video elementary streams

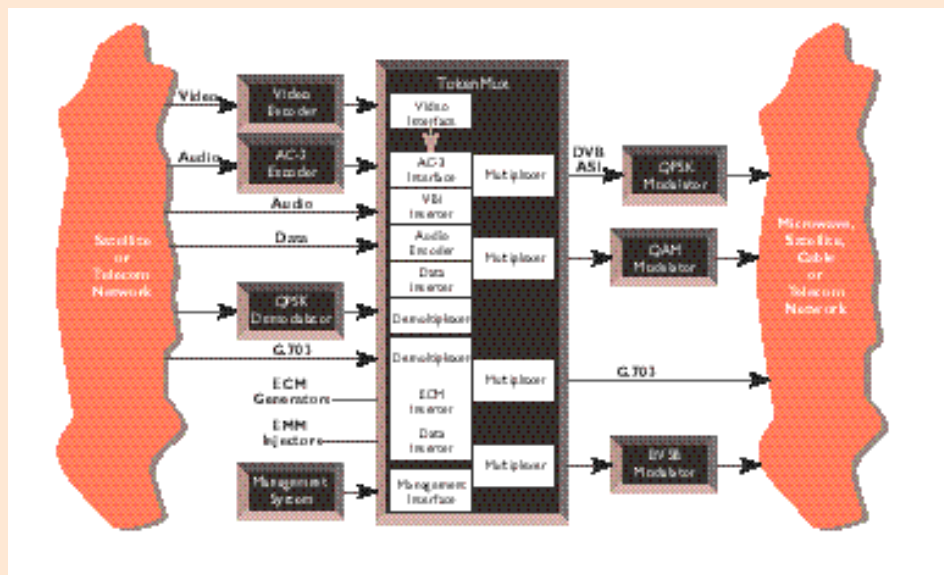
**AC-3 encoder interfacing**

The TokenMux receives the output of the AC-3 multichannel or stereo encoder and packetises this into MPEG-2 Transport Stream packets.

**Audio Encoding**

The TokenMux encodes digital audio streams into ISO/IEC 11172-3 (ISO/IEC 13181-3) with the following characteristics:

- Layers: 1 and 2
- Bit rates: 32 - 448 kbit/s according to the MPEG standard
- Modes: Stereo, joint stereo, dual channel, double mono and mono
- Sample rates: 32 kHz or 48 kHz



**Active Remultiplexing**

The TokenMux is able to combine services from incoming Transport Streams and remultiplex these together with locally generated services while the PSI and SI related to these services are automatically derived from the PSI and SI present in the incoming Transport Stream.

The bit rate of services remultiplexed is checked against a pre-set maximum.

**Outgoing Transport Streams**

The Tokens generated by the input units are read from the internal bus. The TokenMux uses the internal time stamps to compute the MPEG-2 time stamps.

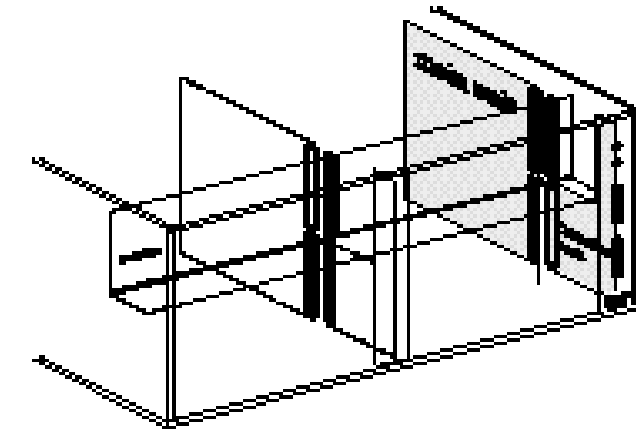
If conditional access is applied, the Transport Packet is scrambled with the Control Word as received from the Control Word generator.

- Dynamic compression range: 20 bit
- One TokenMux unit contains two independent Audio Encoders; these can be used in stand-alone operation or they can be locked to other streams, e.g. the video elementary stream.

**Incoming Transport Streams for Re-multiplexing**

**Passive remultiplexing**

The TokenMux is able to filter elementary streams from incoming MPEG-2 Transport Streams and include these in the outgoing Transport Streams and generate PSI and SI for these. Streams to which conditional access has been applied cannot be descrambled; however, they can be included in scrambled form in the outgoing Transport Stream by also including the ECMs and EMMs.



**TokenMux Interfacing**

Interface	Connector	Definition
Video Encoder Input	Sub D 25 pin	Philips proprietary
Teletext input	BNC	PAL
VBI extraction	BNC	DSC
DVB subtitles	BNC	Open Philips definition based on TCP/IP
Audio Input	XLR	IEC 958 professional balanced
	BNC	IEC 958 professional unbalanced
	cinch	SPDIF, electrical
	EIAJ CP 340	SPDIF, optical
Incoming Transport Stream	Sub D 25 pin	ECL, Philips proprietary
	BNC	G.703, E3
	BNC	G.703, DS3
	BNC	DVB ASI electrical
Outgoing Transport Stream	Sub D 25 pin	EDL, Philips proprietary
	BNC	G.703, E3
	BNC	G.703, DS3
	BNC	G.703, E2
	BNC	DVB ASI electrical
Commercial IRD Aux Data	Sub D 9 pin	RS-232
Private Data	BNC (10Base2)	Open Philips definition based on TCP/IP