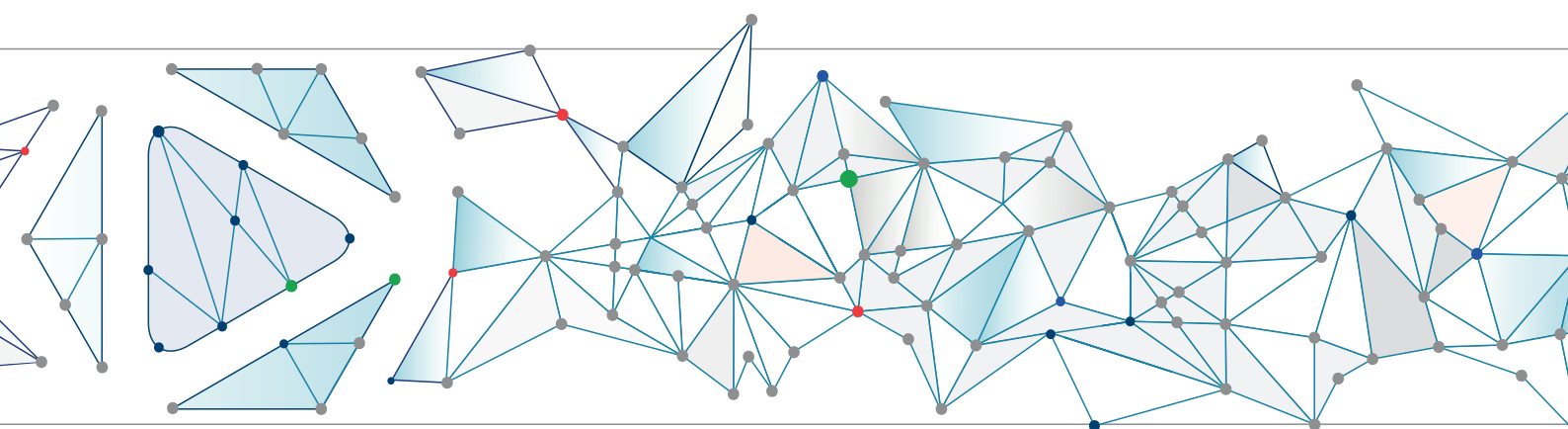


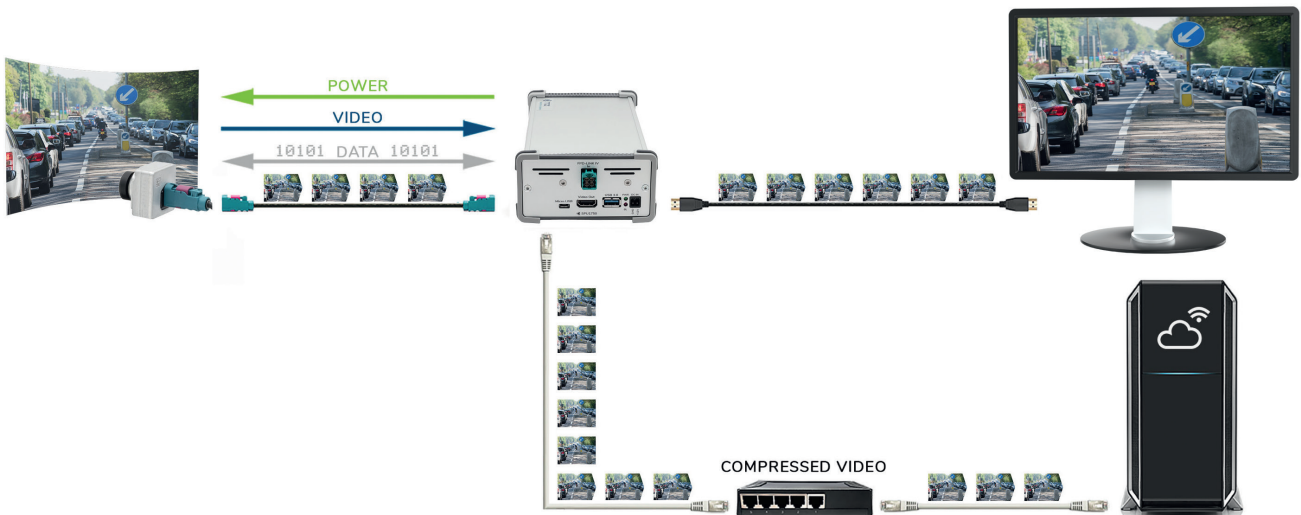


SIGNAL PROCESSING UNIT FOR AUTOMOTIVE VIDEO LINKS

Conversion of Automotive Video Links to digital
consumer video world and ethernet

The answer to your challenges is here

Conversion of Automotive Video Links to digital consumer video world and ethernet

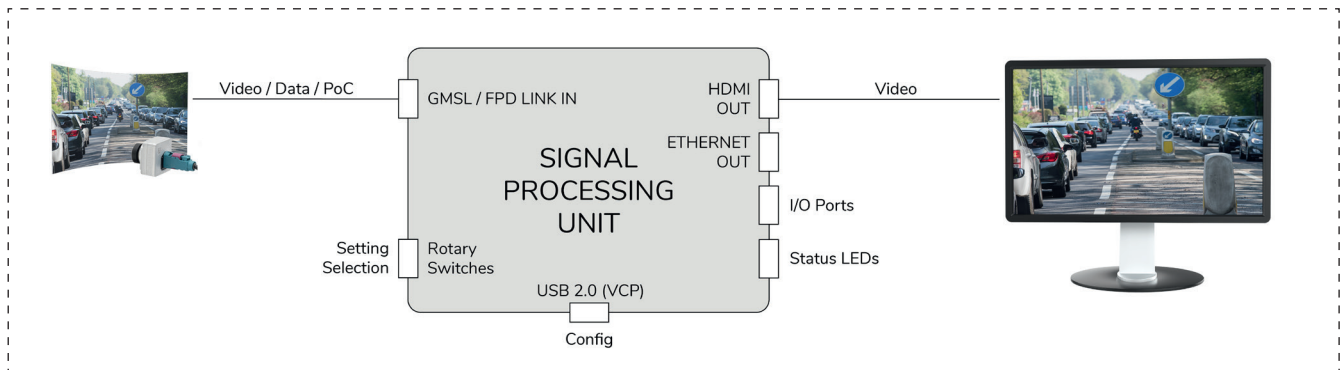


TZ's SPU's are unique devices that can fully commission automotive cameras autonomously, making them immediately operational and providing the camera's data in a suitable format. Primarily designed for direct visualization of camera images on standard monitors, without the need for additional devices or PCs, the TZ.SPU also supports compressed video streaming for remote applications.

Specifically engineered for modern, high-resolution automotive cameras operating in RAW mode, the TZ.SPU performs all necessary operations, including standard image processing and tone mapping (HEQ), to deliver optimal output in standard RGB format. Additionally, the TZ.SPU supports both RAW and RGB cameras, ensuring flexibility across different camera types.

The SPU comes with TZ.SPU App support, providing an intuitive interface for configuring and managing SPU settings tailored to various camera requirements. Users can adjust key parameters, configure imagers, serializers, and deserializers, and access raw data as needed. The app also supports live video streaming via RTSP and includes real-time histogram visualization for detailed image analysis. Additionally, it enables the customization of control commands and the capture of snapshots or image sequences.

General Device Structure

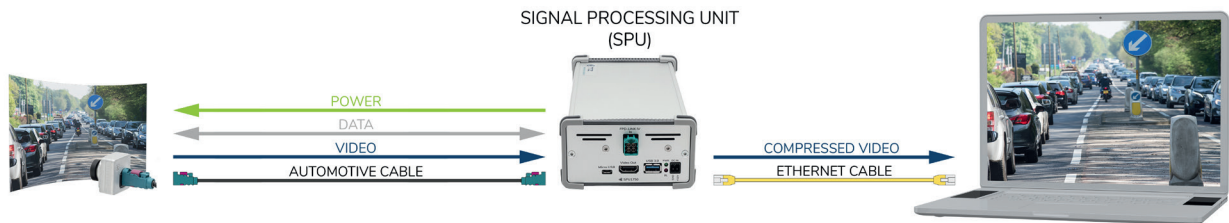


Typical Customer Applications

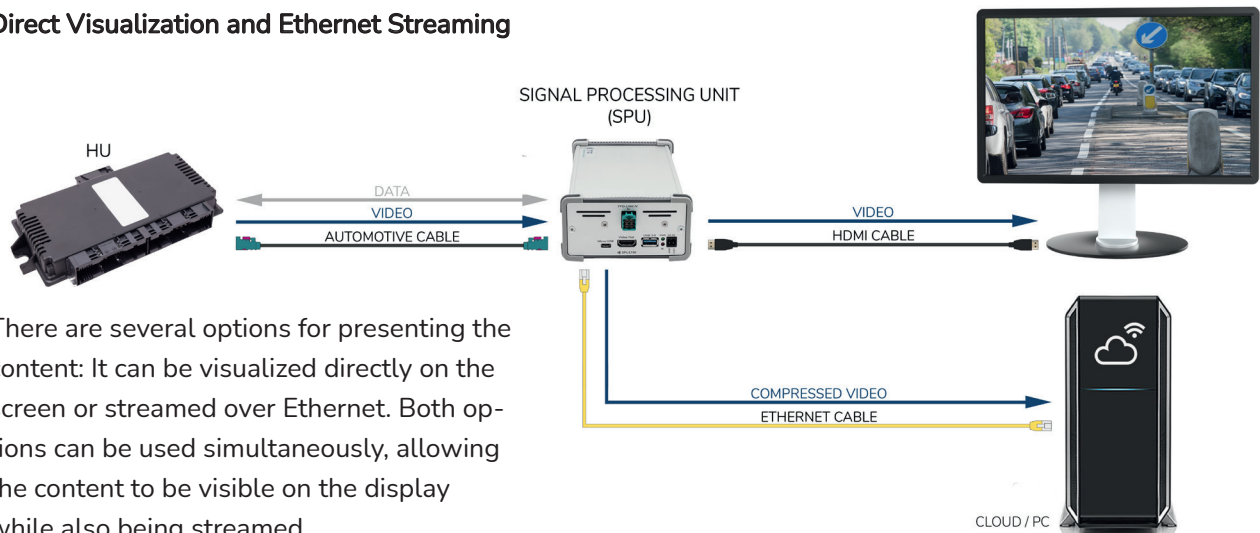
- ▶ Cloud based testing at remote test center
- ▶ Easy testing at users working desk
- ▶ In-Car recording of video signals in experimental vehicles
- ▶ Calibration of camera lenses in laboratory environments
- ▶ Demonstration setups
- ▶ Hardware in the loop tests
- ▶ Environmental tests
- ▶ End of line testing

Use Cases

Camera Recording



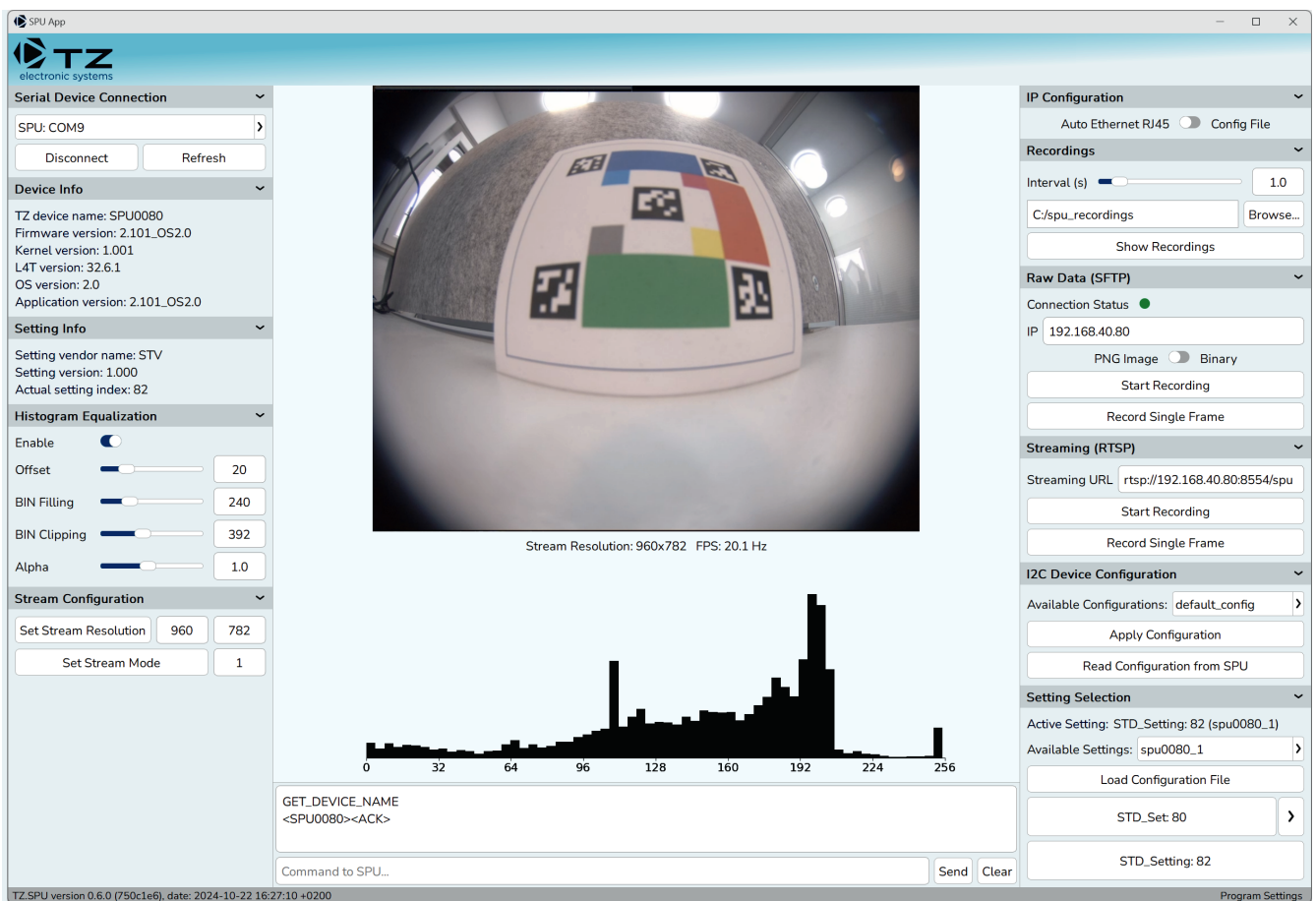
Direct Visualization and Ethernet Streaming



There are several options for presenting the content: It can be visualized directly on the screen or streamed over Ethernet. Both options can be used simultaneously, allowing the content to be visible on the display while also being streamed.

TZ.SPU APP

With the TZ.SPU-App, you can fully leverage the potential of the SPU. From optimizing configurations for specific customer needs to accessing RAW data, the app offers a wide range of possibilities. Its live preview feature provides instant feedback, while the app's customizable configuration makes it a versatile tool to streamline workflows and enhance the overall efficiency of TZ.SPU operations.



TZ.SPU Features

The TZ.SPU app provides easy access to essential data for your analysis and allows you to optimally configure the SPU for your application – all through a user-friendly interface, featuring:

▶ **Video Preview**

- **Live Video Feed:** Stream in real-time video feed via RTSP
- **Live Histogram Visualization:** Display real-time histogram data for analysis

▶ **Camera-RAW-DATA Access:**

- **Snapshot Creation:**
 - Generate snapshots or image sequences of raw data
- **RGB Reference Snapshot Creation from RTSP Stream (processed data)**
 - Generate snapshots or image sequences of RGB data

▶ **Control Command Editing:**

- Control the SPU via customized commands

▶ **User-Friendly Parameter Modification:**

- Easily adjust ISP HDR2SDR settings (High Dynamic Range Raw Luminance Data (HDR) conversion to Standard Dynamic Range SDR (3x8bit RGB) for direct visualization and Remote Video Streaming)

▶ **Deserializer and Serializer Register Access:**

- Direct access to the deserializer register for enhanced functionality

▶ **Imager Register Access:**

- Access to the imager register for precise configuration

▶ **Control Channel Playback:**

- Configurable and automatable playback of register sequences

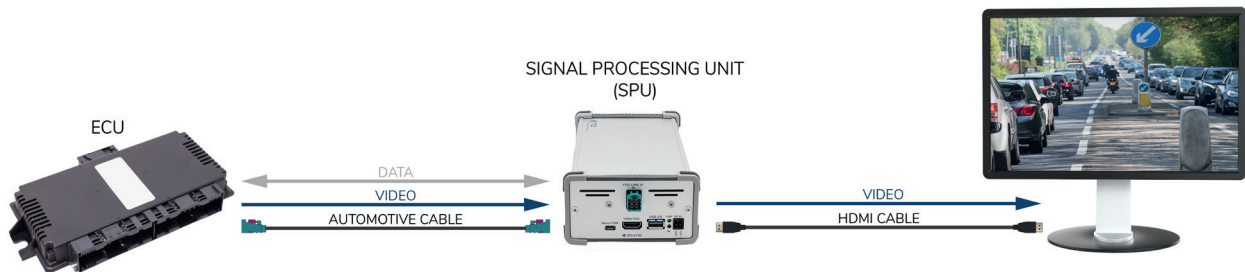
▶ **Custom Configuration Setup:**

- Customize and save your own settings

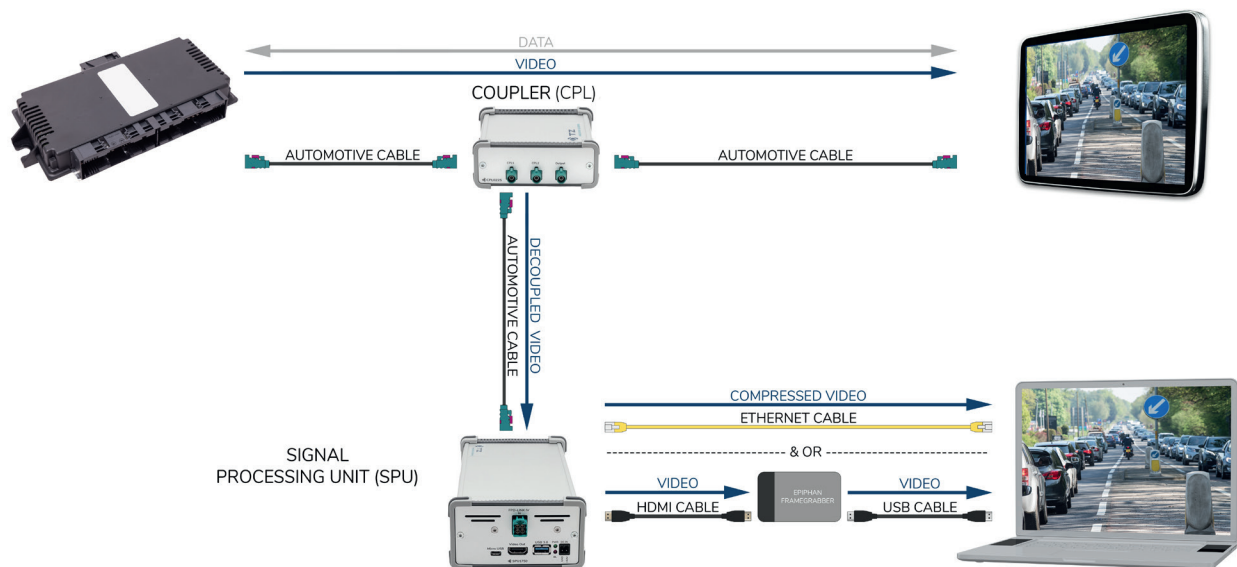
▶ **Additional Features Coming Soon:** Stay tuned for further enhancements and functionalities

Use Cases

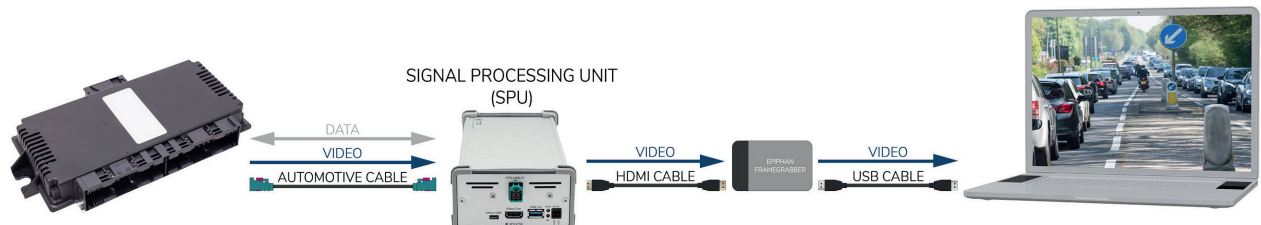
ECU Visualization



HU Validation & Recording



ECU Validation



Key Features

- Easy conversion of an Automotive Video Link to HDMI and/or compressed Ethernet stream (simultaneous output possible)
- Available for Maxim GMSL, GMSL2, GMSL3, TI FPD-Link III or FDP-Link IV
- Conversion of RAW10, RAW12 and RAW14 (including De-bayering) video signals to RGB24
- Virtual Channel filtering and selection
- Scaling, Framerate adaption
- Power over COAX supply (e.g. for cameras)
- Internal storage and playback of register tables for camera (serializer + imager) initialization
- Built-in control channel master for register access of the SerDes over USB (Virtual Com-Port)
- RAW data capturing as 16-bit grayscale PNG or binary file via SFTP access
- ISP for RAW formats including tone mapping, histogram equalization, offset adjustment
- External access to deserializer pins like I2C, GPIO or UART for the usage with host adapters e.g. Aardvark
- Up to 80 pre-configured settings plus 20 user defined settings for different link settings, resolutions and color formats
- TZ GUI for simple and quick settings configuration
- Easy firmware updates via USB
- Internal storage of USB playback commands
- USB-based remote control

Technical Data

PC interface (configuration)	USB 2.0 (VCP)
Power supply	+12V (DC)
Operating temperature	0°C...50°C

Signal Processing Unit Variations

Part No	Technology	Input & Output Connector	Video Out Connector	Features
SPU0061	GMSL2	FAKRA	HDMI 2.0	DSC & RGMII
SPU0070	FPD-LINK III	FAKRA	HDMI 2.0	
SPU0080	GMSL1, GMSL2	FAKRA	HDMI 2.0	
SPU0180	GMSL2	FAKRA	HDMI 2.0	Tunneling Mode
SPU0600	GMSL2	H-MTD	HDMI 2.0	Tunneling Mode
SPU1750	FPD-LINK IV	HFM	HDMI 2.0	
SPU2700	GMSL3	FAKRA	HDMI 2.0	Tunneling Mode



SPU0061



SPU0070



SPU0080



SPU0180



SPU0600



SPU1750



SPU2700

Signal Processing Unit Features

Part No	Features																		
SPU0061																			
SPU0070																			
SPU0080																			
SPU0180																			
SPU0600																			
SPU1750																			
SPU2700																			

 Maxim Integrated
  Texas Instruments
  HDMI
  HDMI 2.0
  Remote Control

 Scalable output stream
  Setting Switches
  TZ GUI Support
  External access to DES pins
  I2C Passthrough

 UART Passthrough
  Power over Coax
  POI Passthrough of Input
  CAN Playback
  TMD5 over HDMI

 DSC Coding
  RGMII
  Ethernet Streaming
  Grey Symbols for not yet implemented features
  Tunneling Mode

Suitable Add-on Products

Part No	Description
SW0081	2:1 FAKRA Switch
SW0090	8:1 FAKRA Switch
CPL0210	For lines with power over COAX
CPL0215	For lines without power over COAX



SW0081



SW0090



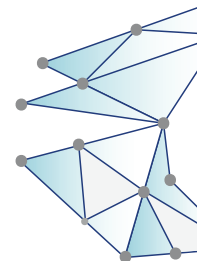
CPL0210



CPL0215



we empower
automotive video
innovations



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