

# Komunikacijska elektronika

## P4 – dodatne teme

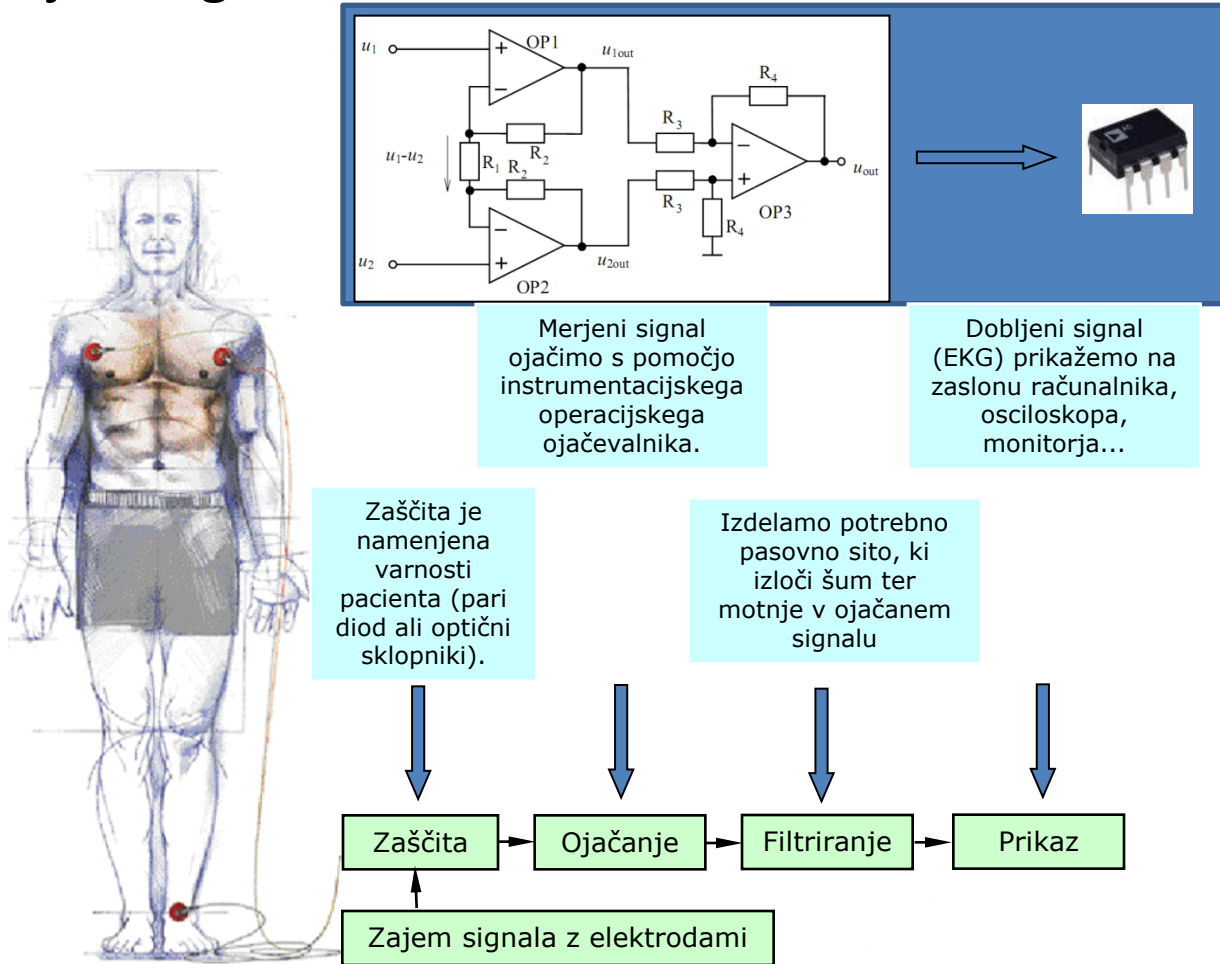
2012/2013

doc. dr. Matej Zajc



# Instrumentacijski ojačevalnik v analognem svetu

## Primer: Zajem signala EKG



Power Amplifiers

# XTRA™ Series XPA 4002

High powered, dual channel amplifiers for large installations

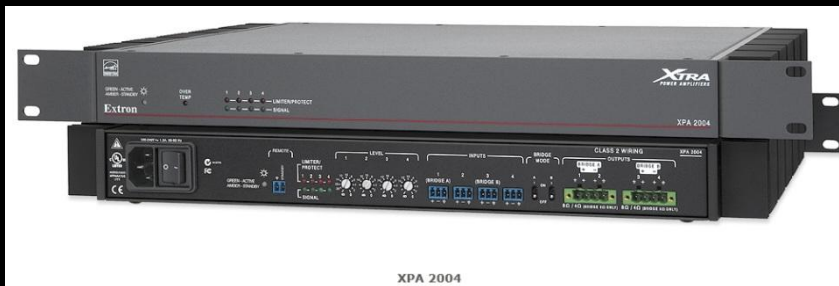
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# JMP 9600

Two-Channel JPEG 2000  
HD Video Player

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XPA 2004



SW2 HDMI LC - Two Input HDMI Switcher

# Diferencialni signali v digitalnem svetu

- Govorimo o takoimenovanem: LVDS (low voltage differential signaling)
- Želja po hitrem prenosu podatkov po cenenih vodnikih kot na primer UTP
- Popularno tako v LCD televizorjih, industrijskih kamerah, kot tudi prenosnikih, itd.
- Na primer pri prenosnikih se uporablja za prenos videa iz grafične kartice na LCD zaslon.

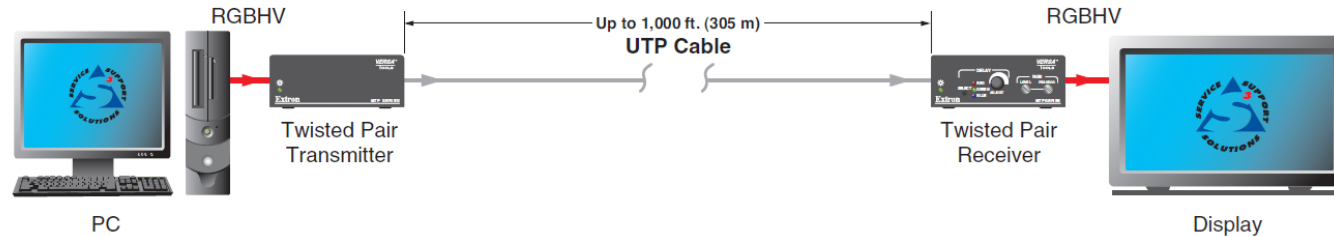
# Tipična implementacija LVDS

- Transmitter na vhodu po žicah pošilja tok 3,5 mA, kjer smer toka določa logični nivo (digitalni signali!)
- Tok teče čez bremenski upor npr 100  $\Omega$ . Tako imamo padec napetosti cca 350 mV.
- Sprejemnik detektira polariteto napetosti, da določi logični nivo signala .  
Posamezne bite.
  
- Podobno kot pri analognih signalih vezje ojača diferencialni signal ter je tako dokaj robustno na motnje (skupen signal: common mode).

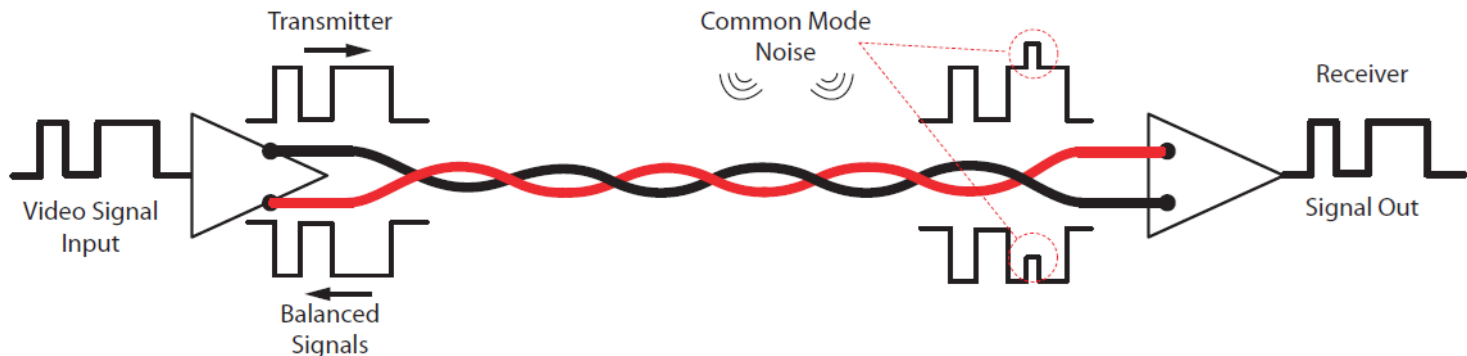
# Primeri

- **QUICKRING** – video vodilo
- **FDP-Link** – vodilo med grafično kartico in LCD zaslonom
- **LDI standard** – vodilo za prenos med DVD in TV (HDMI)
- **Camera Link** – serijski protokol za video vmesnike
- **HyperTransport**
- **FireWire**

[http://www.extron.com/download/files/whitepaper/tp\\_intro\\_wp.pdf](http://www.extron.com/download/files/whitepaper/tp_intro_wp.pdf)



PC  
RGB video transmission over UTP  
- unshielded twisted pair cable



Balanced video signal transmission  
over twisted pair

Viri motenj

- Neonske luči
- Motorji
- Napajalniki, itd.




## Twisted Pair



### **Sending AV Signals Over Twisted Pair Cables: An Introduction**

AV over twisted pair is the transmission and distribution of audio and analog video, as well as control signals over wiring traditionally associated with data networking and telephone systems. This wiring is commonly known as UTP, or unshielded twisted pair. Special interfacing equipment is required to send video and audio signals over UTP wiring. UTP-based AV systems are appealing for many applications because they offer numerous advantages in terms of cost and implementation, and deliver performance comparable to systems using RGB coaxial cabling.

 [Download White Paper](#)



### **Sending AV Signals Over Twisted Pair Cables: Optimizing Performance**

Special system design and signal processing considerations are essential in order to ensure optimized performance. This paper details the two primary factors that affect twisted pair AV system performance, cable length and skew, and offers guidelines on how to properly calibrate signals and select the best equipment and UTP cable for high performance transmission of signals in a twisted pair AV system.

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Interface

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# M-LVDS – The Bus Standard

## Signal Integrity for Backplane and Cables

**Application Notes** [see all](#)

- [Introduction to M-LVDS \(TIA/EIA-899\)](#)  
(slla108.pdf, 123 KB)  
27 Feb 2002 [Download](#)
- [M-LVDS Signaling Rate Versus Distance](#)  
(slla127.pdf, 77 KB)  
09 Apr 2003 [Download](#)
- [TIA/EIA-485 and M-LVDS, Power and Speed Comparison](#)  
(slla106.pdf, 33 KB)  
02 Feb 2002 [Download](#)
- [Wired-Logic Signaling with M-LVDS](#)  
(slla119.pdf, 322 KB)  
31 Oct 2002 [Download](#)
- [Interoperability of M-LVDS and BusLVDS](#)  
(slla121.pdf, 44 KB)  
06 Feb 2003 [Download](#)
- [Transmission at 200 Mbps in VME Card Cage Using LVDM](#)  
(slla088a.pdf, 9.26 MB)  
04 Jan 2002 [Download](#)

Texas Instruments provides a broad range of innovative Multipoint LVDS devices that deliver the speed, power, robustness required for backplane and multipoint bus applications. With contention features for data and control signals, single- and eight-channel transceivers, a quad driver, single-channel receivers, and clock buffer devices for 1.8 and dual 1.4 fan-outs, TI's M-LVDS products are ideal for distributing clock and synchronization signals.

**Applications:**

- AdvancedTCA (ACTA) and MicroTCA
- Clock, sync control and data
- Cellular base stations
- Central-office switches
- Test & Measurement

**Features:**

- Meets M-LVDS standard (TIA/EIA-899)
- 11.3 mA driver output current
- 50 mV receiver thresholds
- Contention provisions:
  - Driver short-circuit limited to 43 mA
  - Devices must limit their bus voltage from 0 to 2.4 V
  - Drivers tested with 32 contending nodes
- Failsafe support

Device	Signaling Rate (Mbps)	No. of Tx/Rx	Input	Output	ESD HBM (kV)	Function
<a href="#">SN65MLVD047A</a>	200	4/0	LVTTTL	M-LVDS	9	Quad Driver
<a href="#">SN65MLVD080</a>	250	8/8	LVTTTL, M-LVDS	M-LVDS, LVTTTL	8	Octal Half-Duplex Transceiver
<a href="#">SN65MLVD128</a>	250	8/1	LVTTTL	M-LVDS	9	Repeater
<a href="#">SN65MLVD201</a>	200	1/1	LVTTTL, M-LVDS	M-LVDS, LVTTTL	8	Half-Duplex M-LVDS Transceiver
<a href="#">SN65MLVD040</a>	250	4/4	LVTTTL, M-LVDS	M-LVDS, LVTTTL	7	Quad Half-Duplex Transceiver
<a href="#">SN65MLVD2</a>	250	0/1	M-LVDS	LVTTTL	8	Single Channel M-LVDS Receiver
<a href="#">SN65MLVD048</a>	250	0/4	M-LVDS	LVTTTL	8	Quad M-LVDS Receiver

\* New Products

**Introduction to Differential Signaling and Device Technologies**

**Evaluation Modules**

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**Selection Guide**