Vhodno izhodne naprave

Laboratorijski vaji 8, 9 - LV1, LV2

Meritve dolžine, karakteristične impedance linije in različnih situacij z odboji

Laboratorijski vaji 8, 9 - LV1, LV2

- 8.0: Uvod v meritve prenosnih linij
- 8.1: LV1-1: Meritev dolžine linije (l)
- 8.2: LV1-2: Meritev karakteristične upornosti linije (R_0)

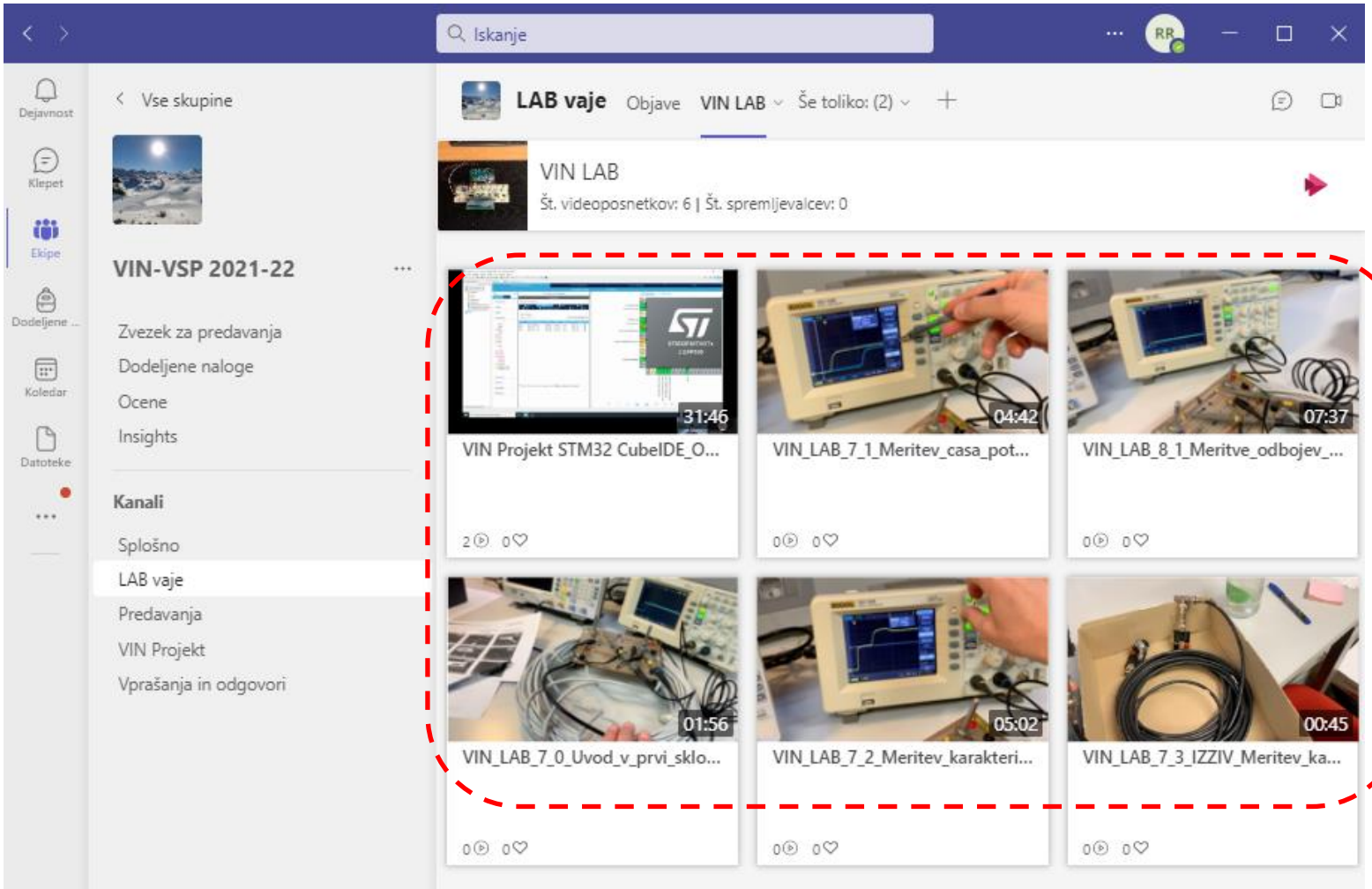
- 9.1: LV2-1 : Meritve odbojev (razmerja Rv, Rb)
- 9.2: LV2-2 : Vpliv časa vzpona/padca – omejevanje odbojev

LV1,2 : Izzivi

a) Meritev karakteristične upornosti linije z multimetrom (R_0)
b) Preizkusi različnih tipal (IR,UZ razdalja, PIR, Hall, …)
c) Meritve deformacij UTP kabla

Laboratorijski vaji 7, 8 - LV1, LV2

- MS Teams



Vhodno izhodne naprave

Laboratorijska vaja 8 - LV1

Meritve dolžine, karakteristične impedance linije

Laboratorijska vaja 8 - LV1

- 8.0: Uvod v meritve prenosnih linij

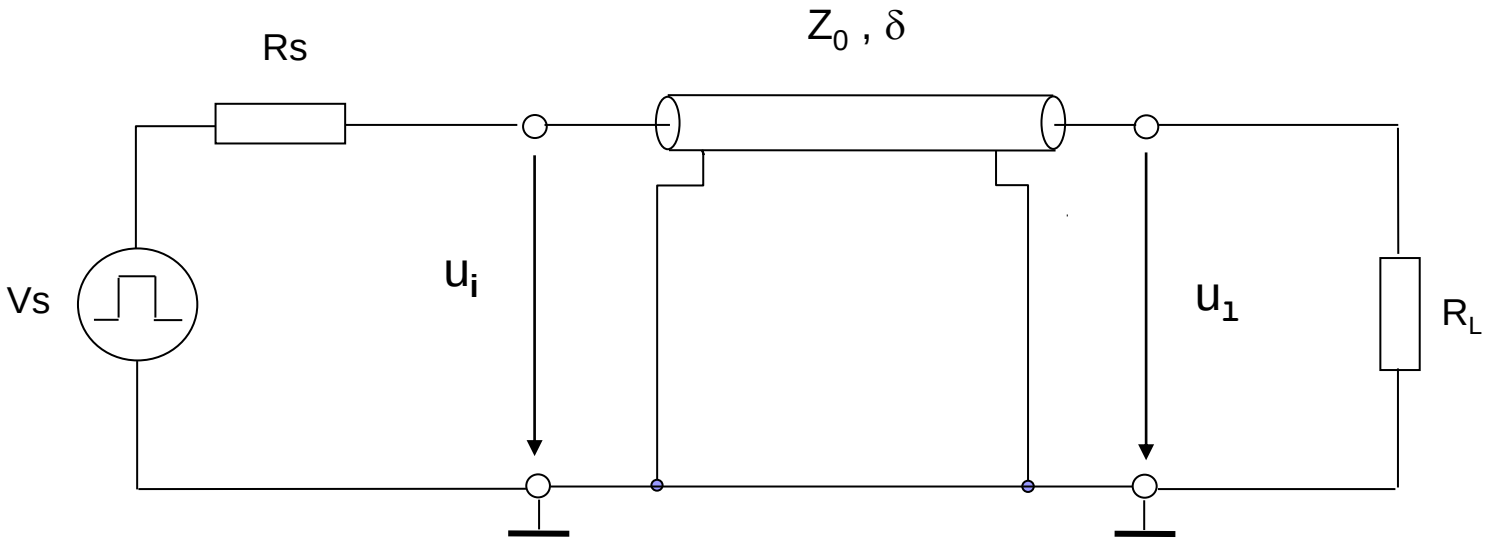
- 8.1: LV1-1: Meritev dolžine linije (l)

- 8.2: LV1-2: Meritev karakteristične upornosti linije (R_0)

LV1,2 : Izzivi

a) Meritev karakteristične upornosti linije z multimetrom (R_0)
b) Preizkusi različnih tipal (IR,UZ razdalja, PIR, Hall, …)
c) Meritve deformacij UTP kabla

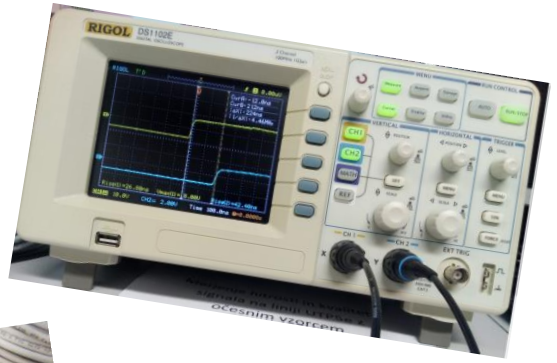
Model linije



V_S - Napetost izvora [V]
R_S - Upornost izvora - izhodna upornost oddajnika [Ω]
Z_0 - Karakteristična impedanca linije [Ω]
R_L- Upornost bremena - vhodna upornost sprejemnika [Ω]
δ - Zakasnitev signala na enoto dolžine [ns/m]
u_i - Napetost na vhodu v linijo [V]
u_1 - Napetost na izhodu linije [V]

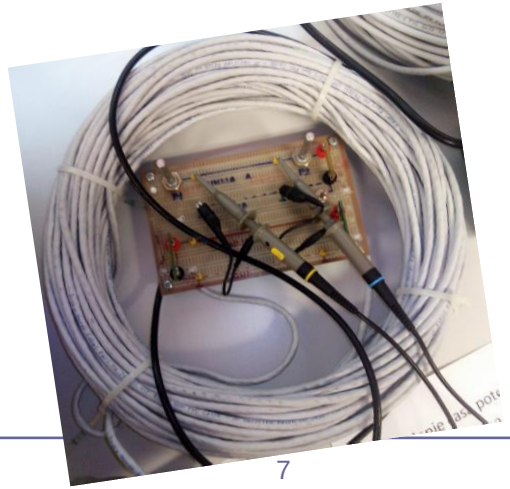
Seznam uporabljenih instrumentov:

- funkcijski generatorji HP 33120A, RIGOL DG 3101A
- osciloskopi RIGOL DS 1102E

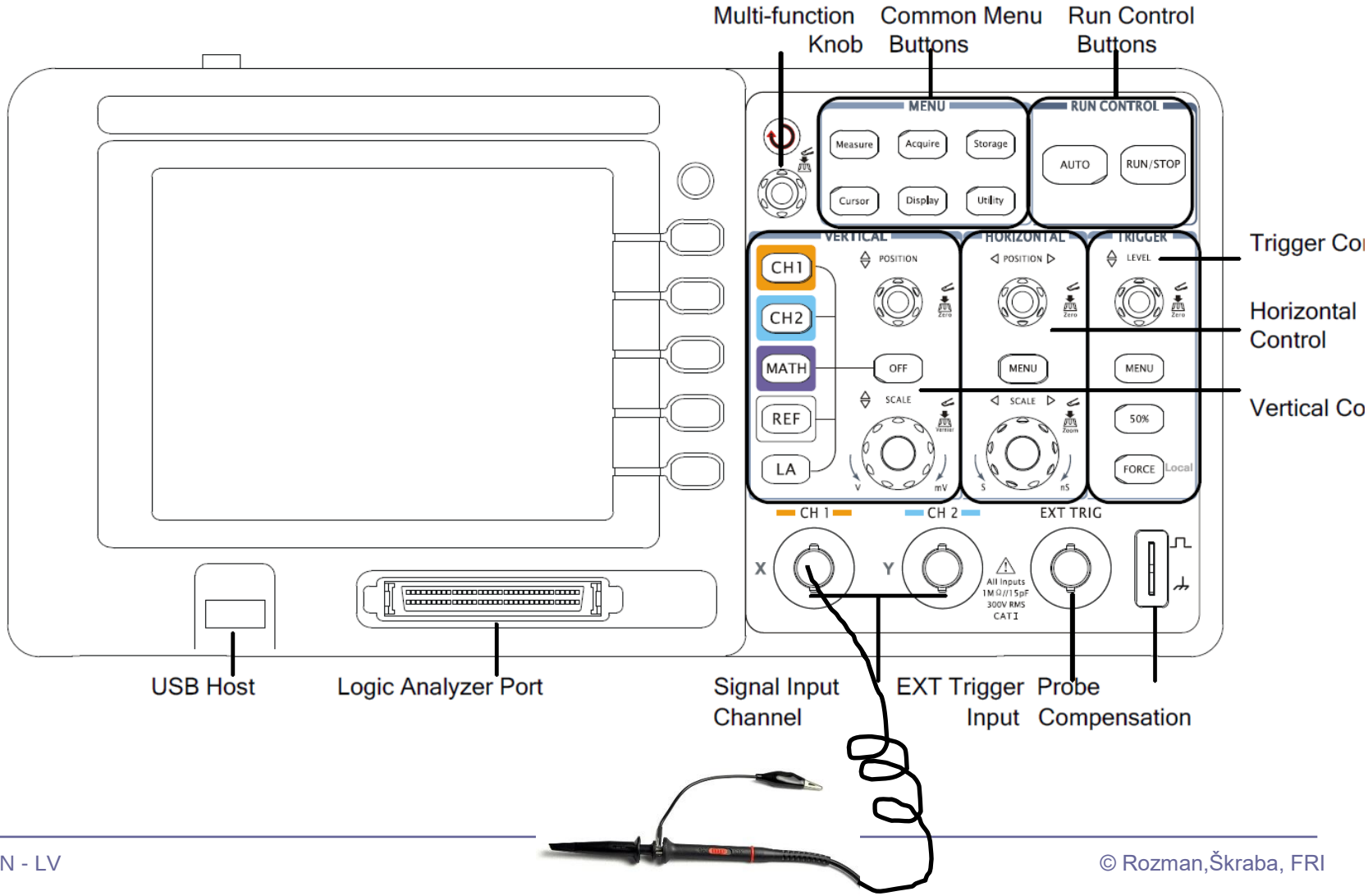


Linije

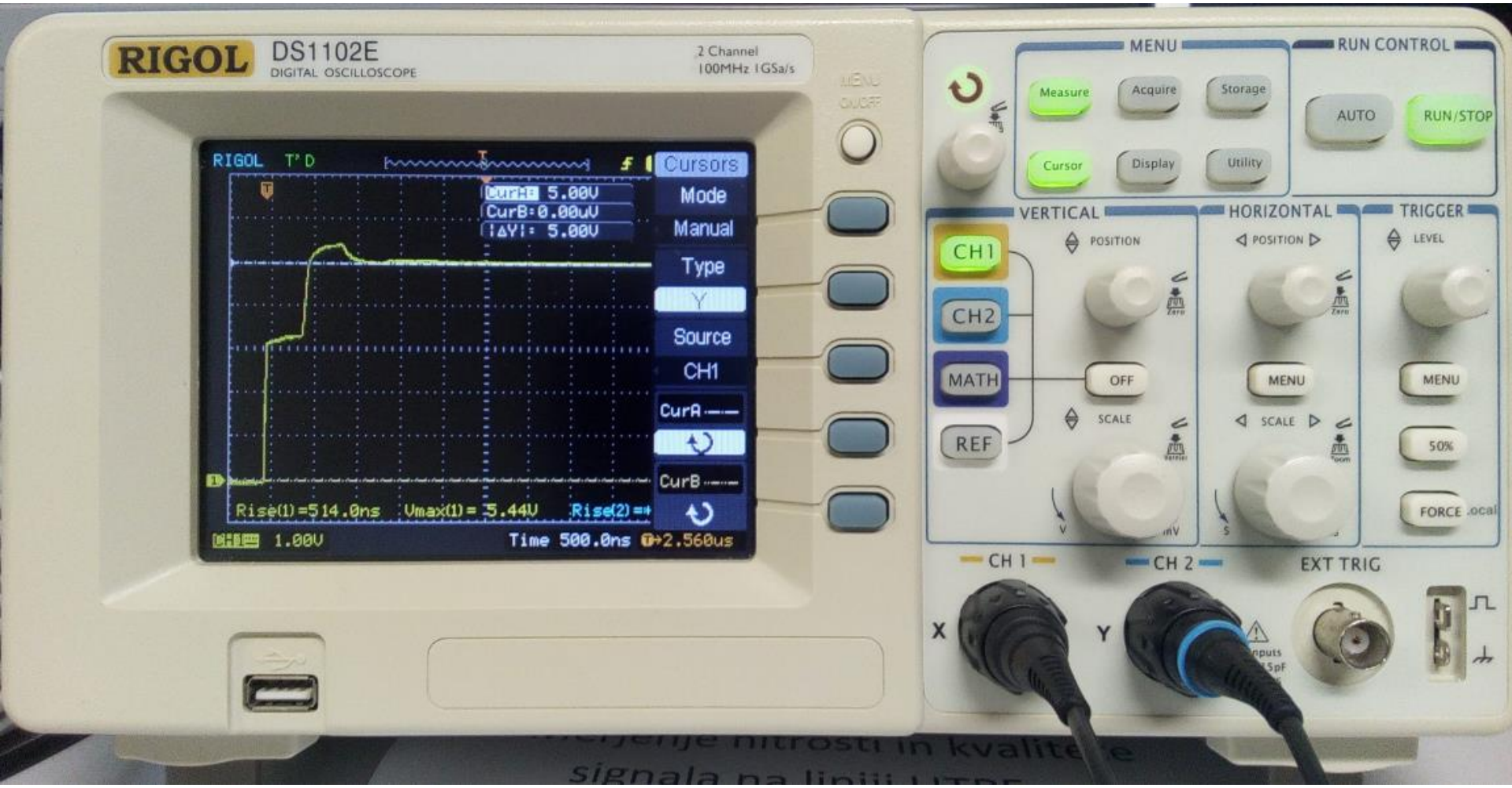
- Koaksialni kabel
- UTP Cat5e



Prednja stran osciloskopa - shema



Prednja stran osciloskopa - realna



Prednja stran osciloskopa - kontrole

Y-os (el. napetost)

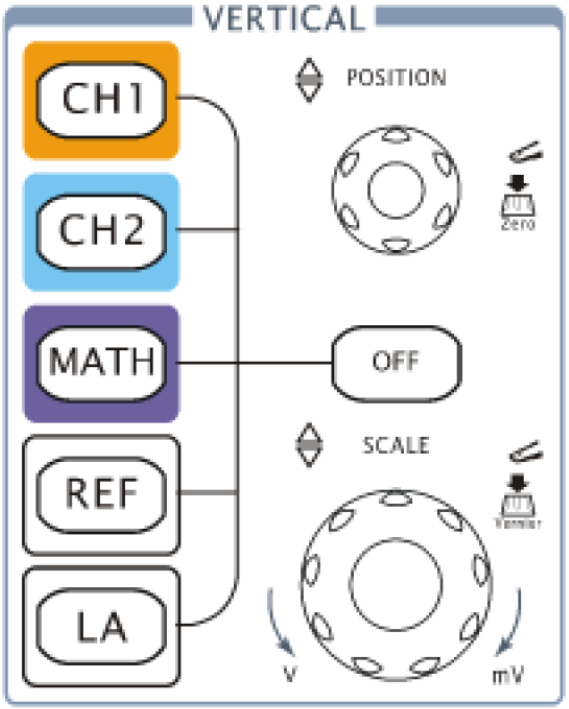
- **nastavitev merila [V/razdelek]**
- **pozicioniranje**

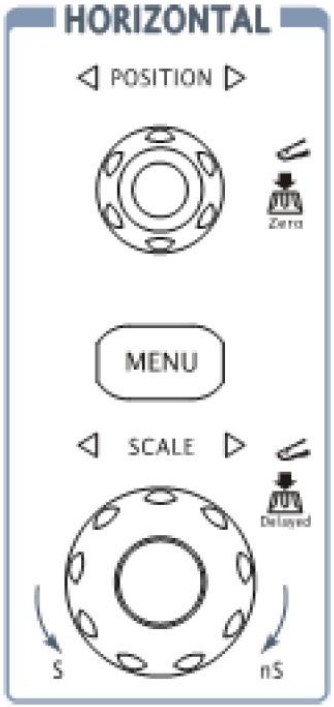
X-os (čas)

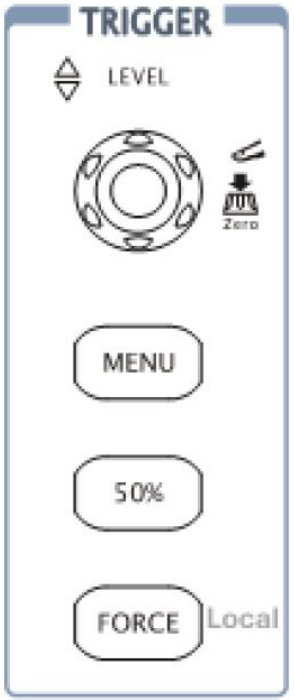
- **nastavitev merila [s/razdelek]**
- **pozicioniranje**

Prožilnik

- **začetek dogodka**
- **običajno 50%**



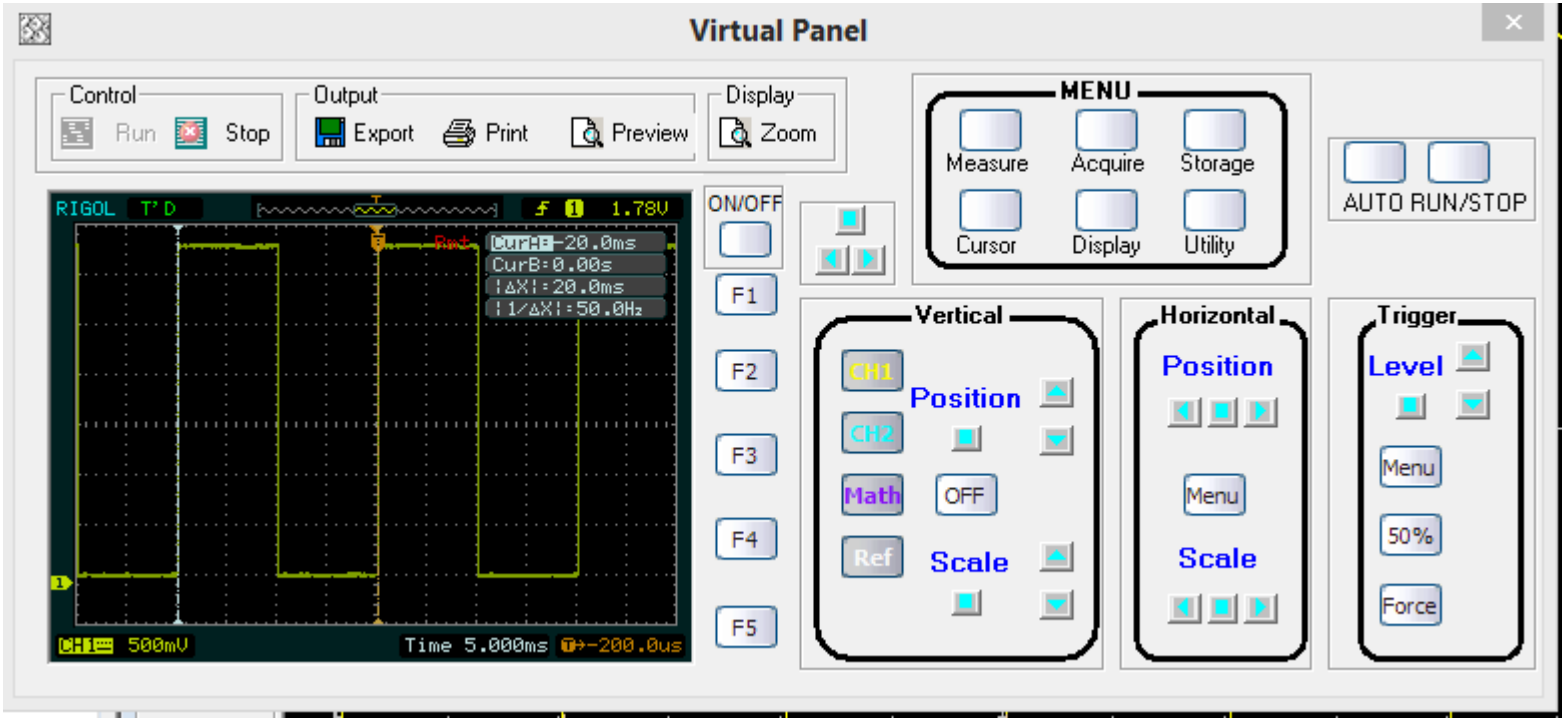




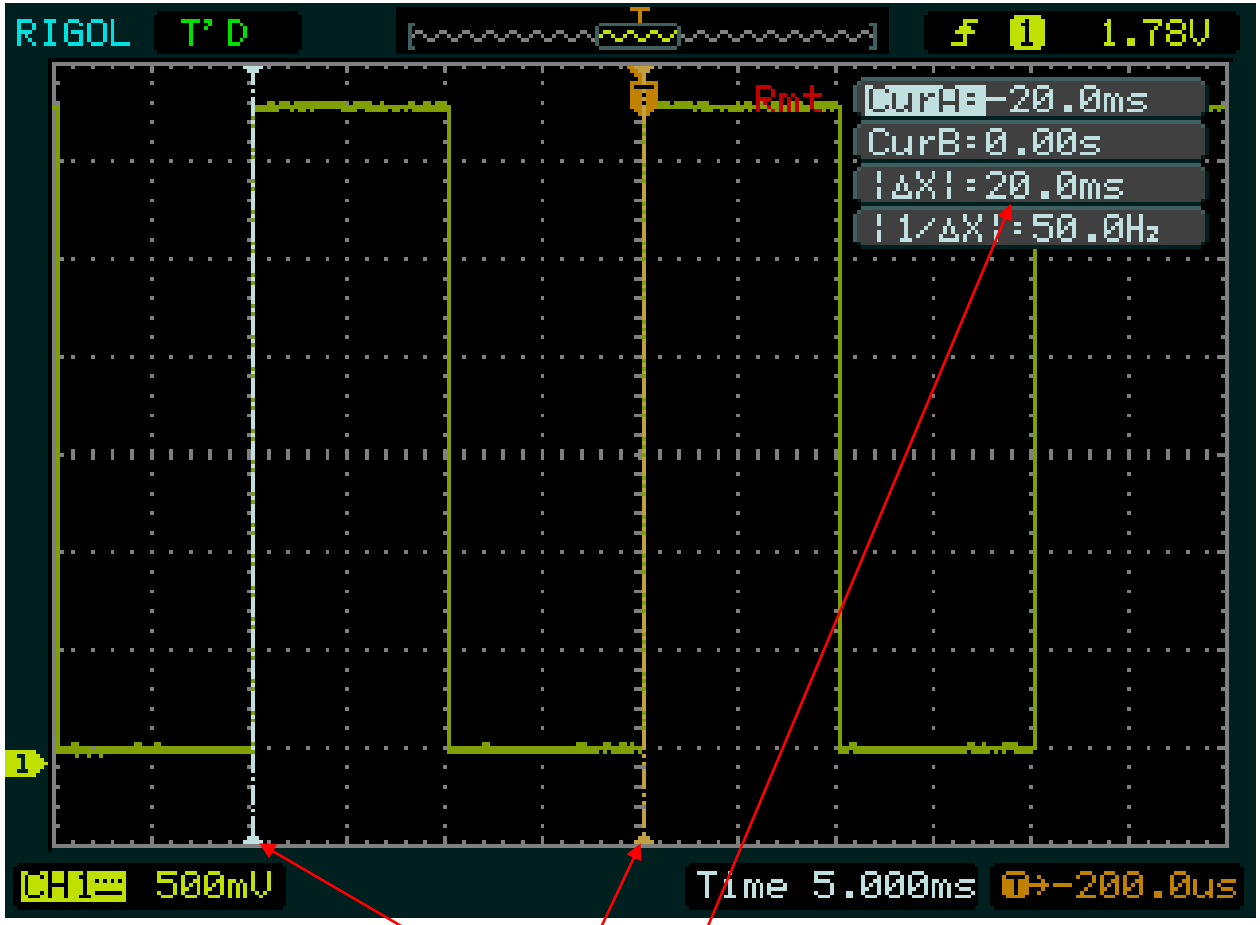
https://www.rigolna.com/products/digital-oscilloscopes/1000/
https://www.youtube.com/watch?v=TAQflYAa2VM

Spoznavanje merilne opreme…

PC aplikacija za osciloskop (USB povezava)



Zaslon osciloskopa – meritev periode



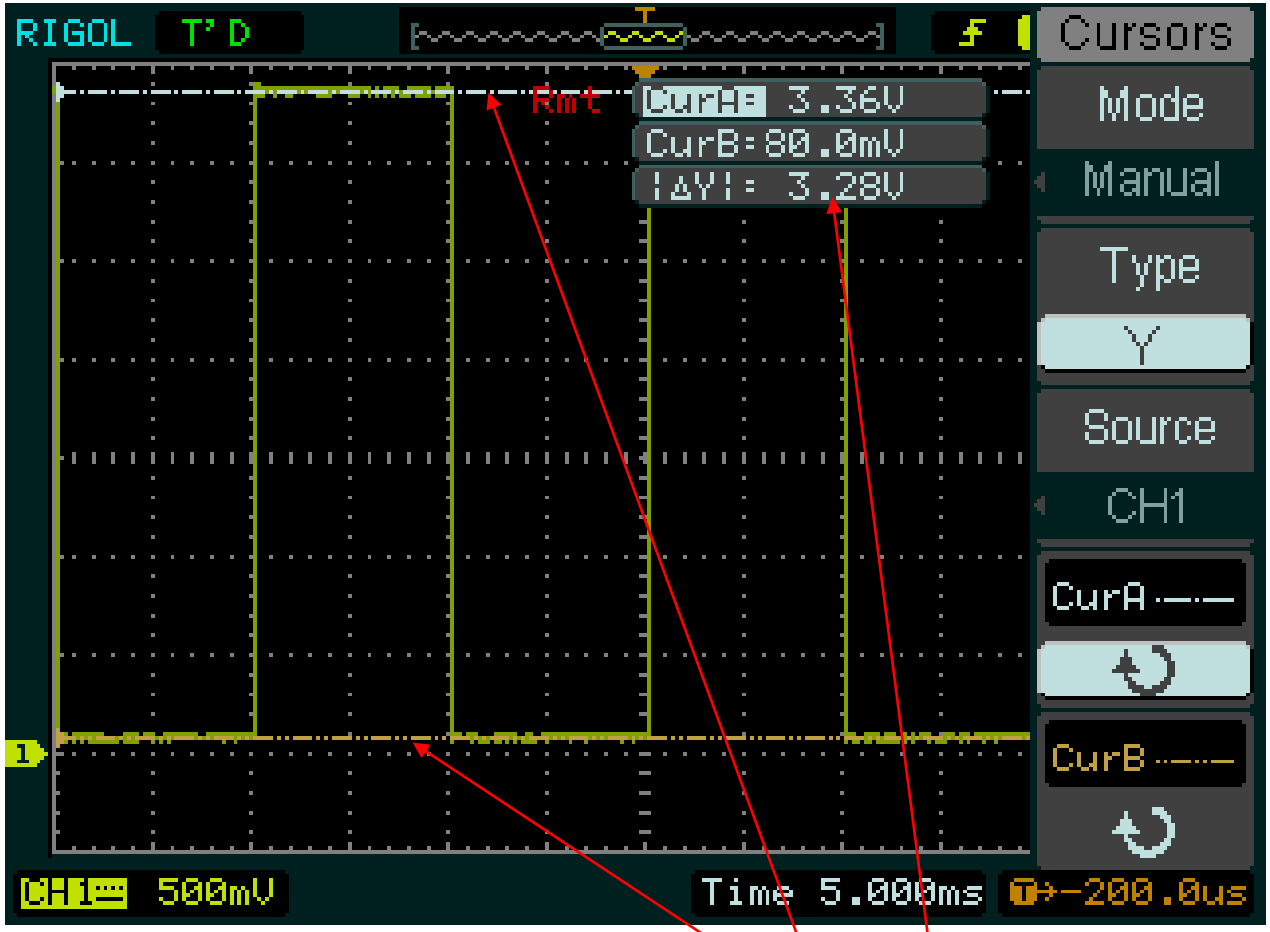
Programska nastavitev:

- **Delay 10ms**
- **Perioda 20ms**

Meritev periode signala:

- **20ms**

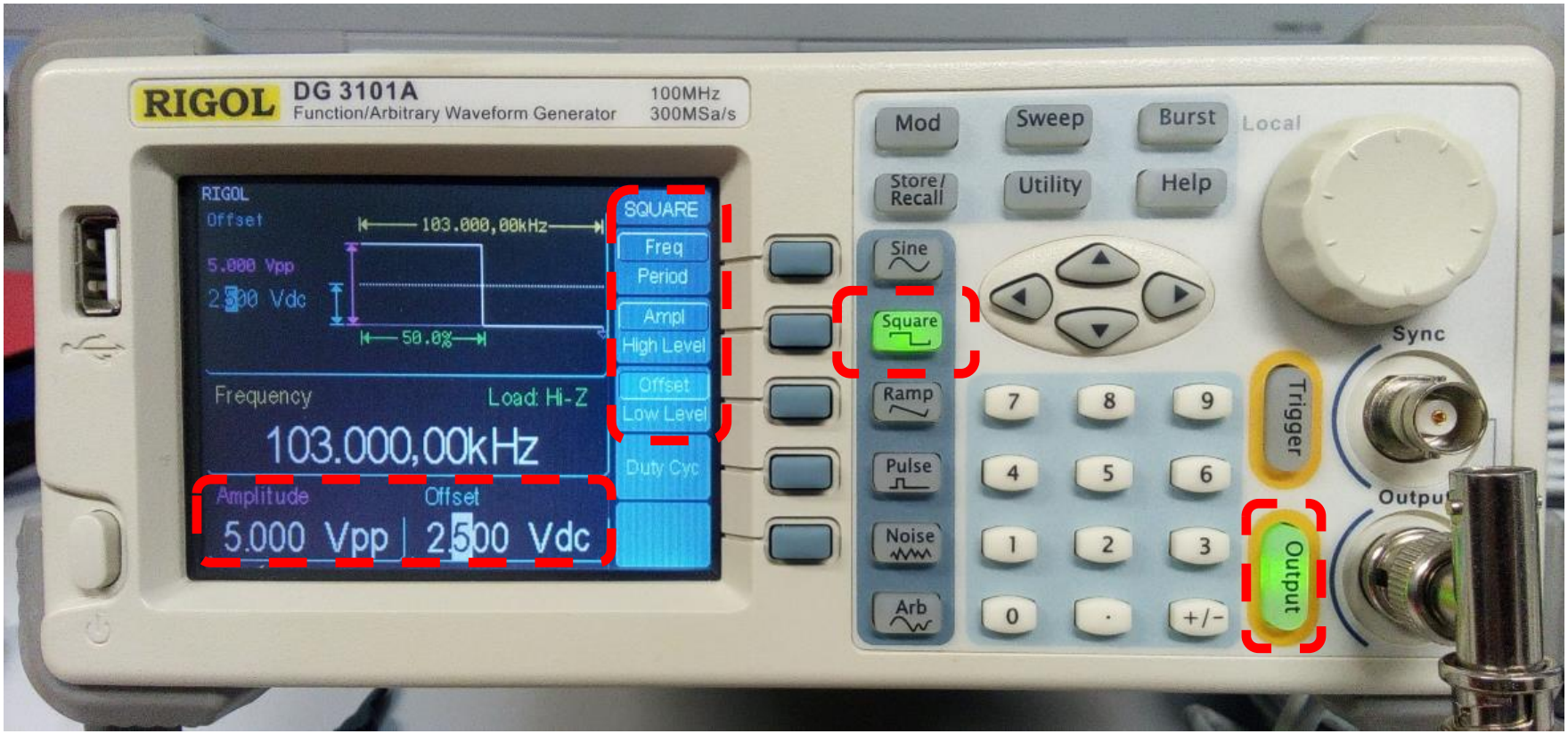
Zaslon osciloskopa – meritev amplitude



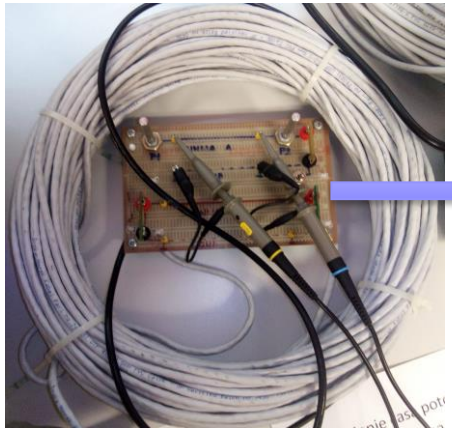
Meritev amplitude signala:

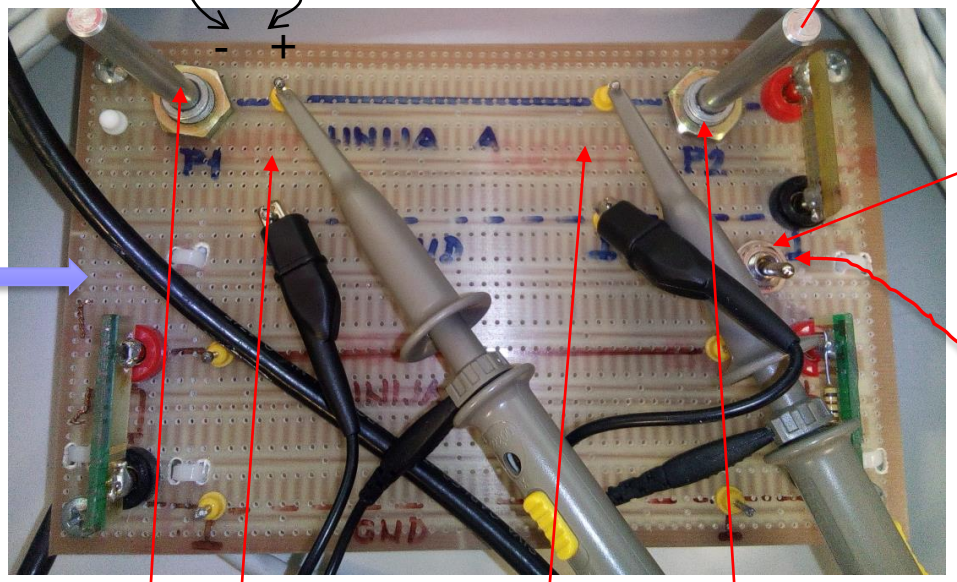
- **3.28V**

Generator signalov



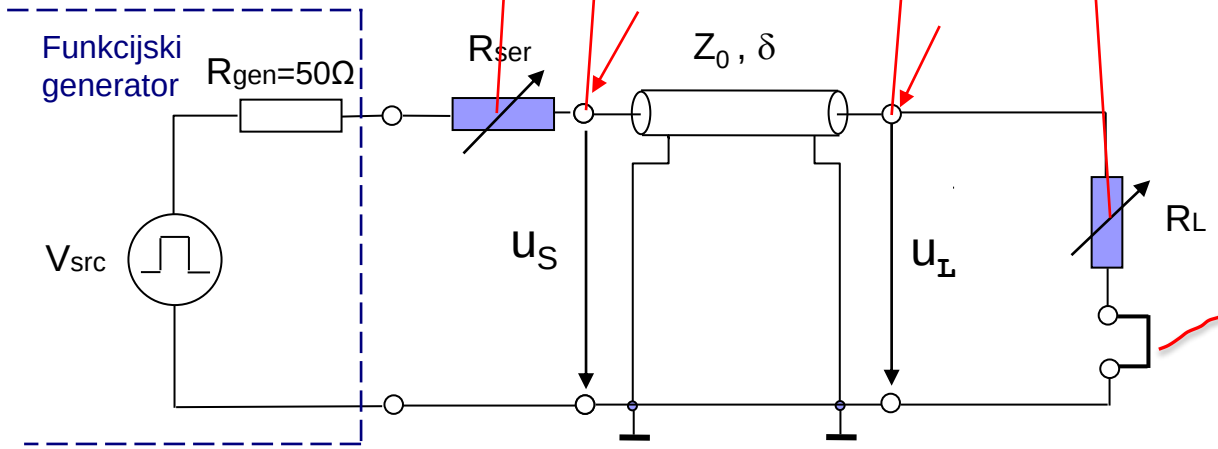
Meritve prenosne linije





Srednji položaj:
Odprte sponke!

Merilni točki



Laboratorijska vaja 8 - LV1

- 8.0: Uvod v meritve prenosnih linij
- 8.1: LV1-1: Meritev dolžine linije (l)
- 8.2: LV1-2: Meritev karakteristične upornosti linije (R_0)

LV1,2 : Izzivi

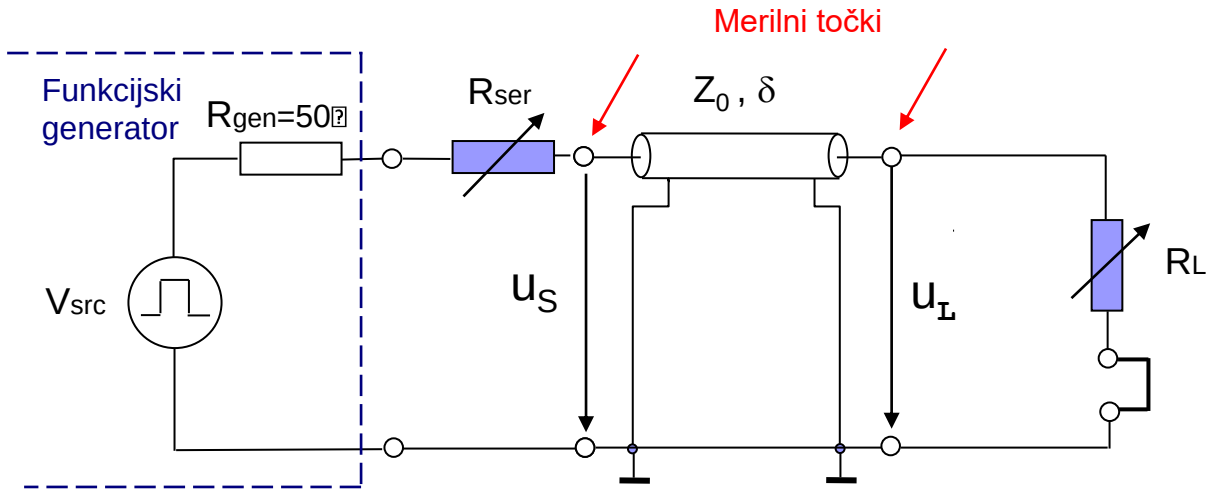
a) Meritev karakteristične upornosti linije z multimetrom (R_0)
b) Preizkusi različnih tipal (IR,UZ razdalja, PIR, Hall, …)
c) Meritve deformacij UTP kabla

LV 1.1: Meritev dolžine prenosne linije

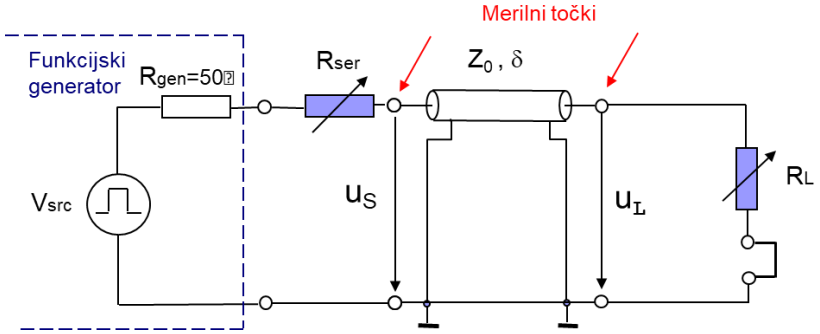
Impulzni generator uporabite kot izvor signala za napajanje linije, s pomočjo osciloskopa pa izmerite čas potovanja signala po liniji (τ). Razmislite ob kakšnih pogojih lahko najbolje opravite meritev ?

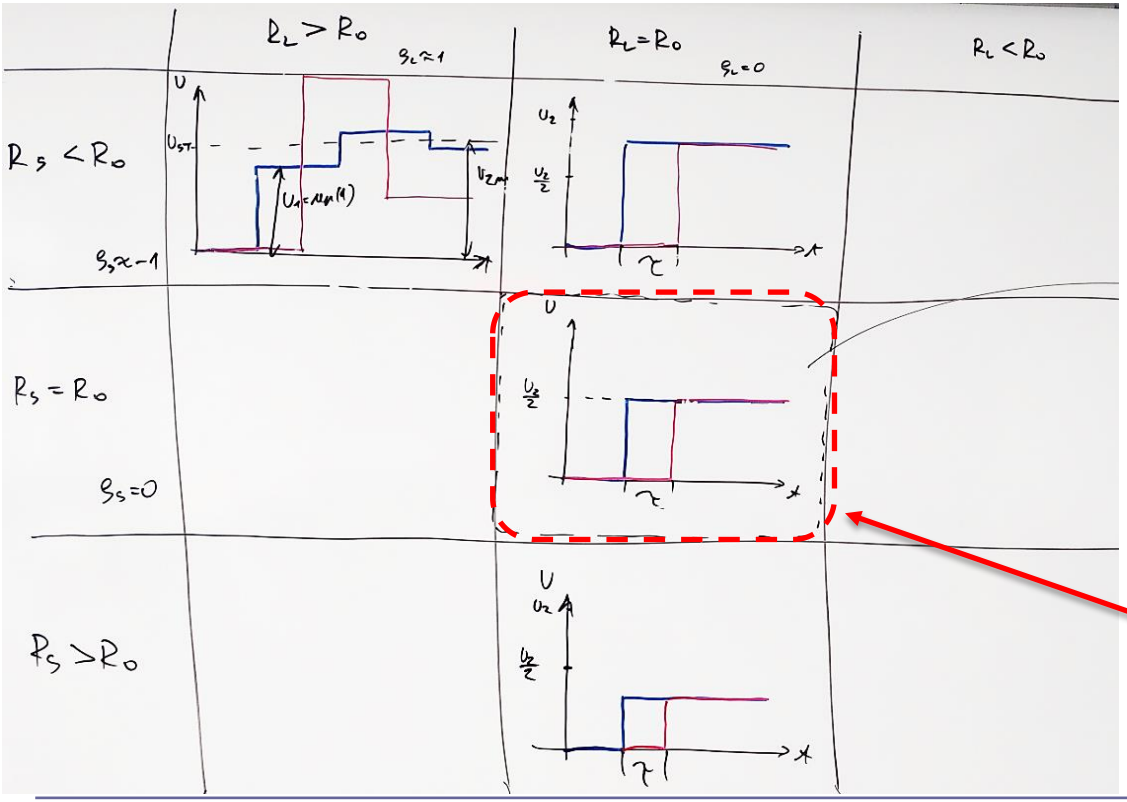
Izračunajte še dolžino prenosne linije, če poznate zakasnitev na enoto dolžine:

- Koaksialni kabel δ = 5,1ns/m (≈ 66% svetlobne hitrosti)
- Parica (UTP Cat 5e) δ = 4,8ns/m (≈ 69% svetlobne hitrosti)



LV 1.1: Meritev dolžine prenosne linije



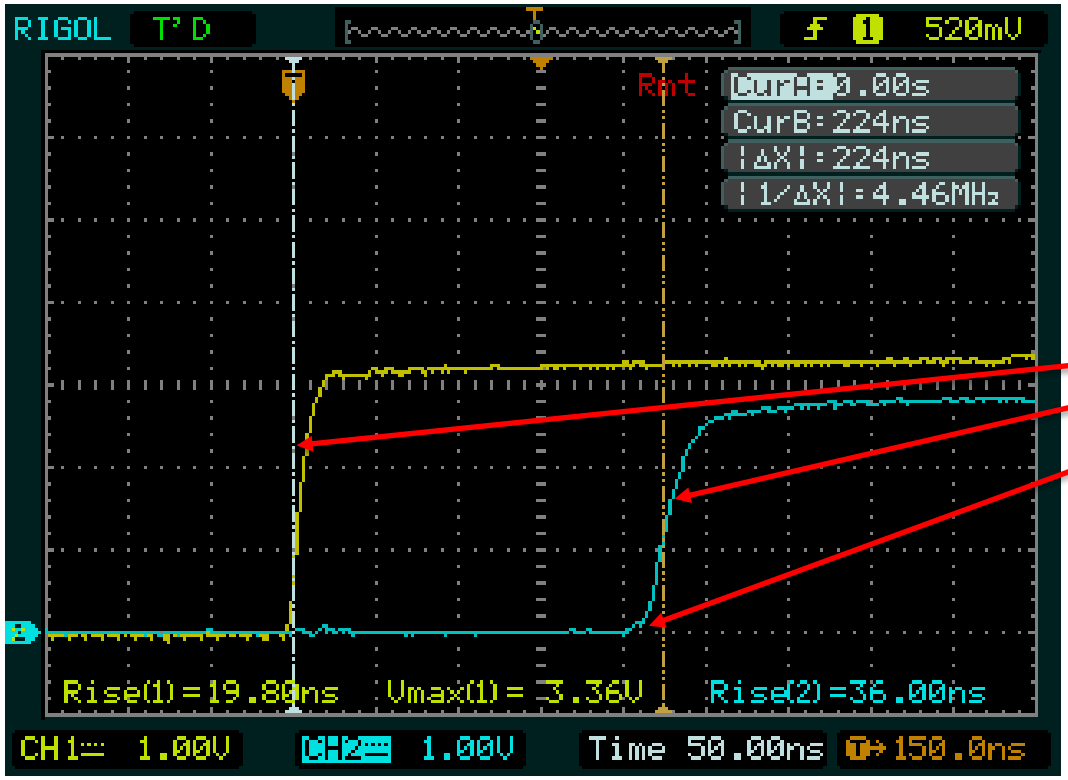


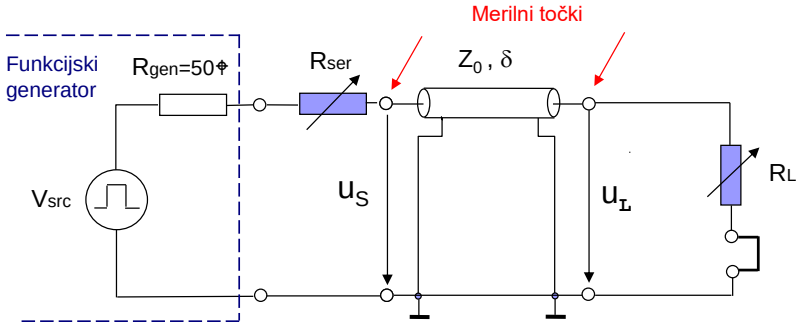
Izberemo kvadrant

LV 1.1: Meritev dolžine prenosne linije

Izračunajte še dolžino prenosne linije, če poznate zakasnitev na enoto dolžine:

- Koaksialni kabel δ = 5,1ns/m (≈ 66% svetlobne hitrosti)
- Parica (UTP Cat 5e) δ = 4,8ns/m (≈ 69% svetlobne hitrosti)





Strmini in točka meritve

Laboratorijska vaja 8 - LV1

- 8.0: Uvod v meritve prenosnih linij
- 8.1: LV1-1: Meritev dolžine linije (l)
- 8.2: LV1-2: Meritev karakteristične upornosti linije (R_0)

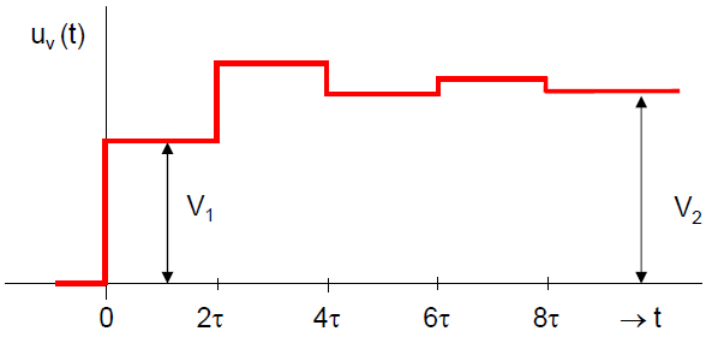
LV1,2 : Izzivi

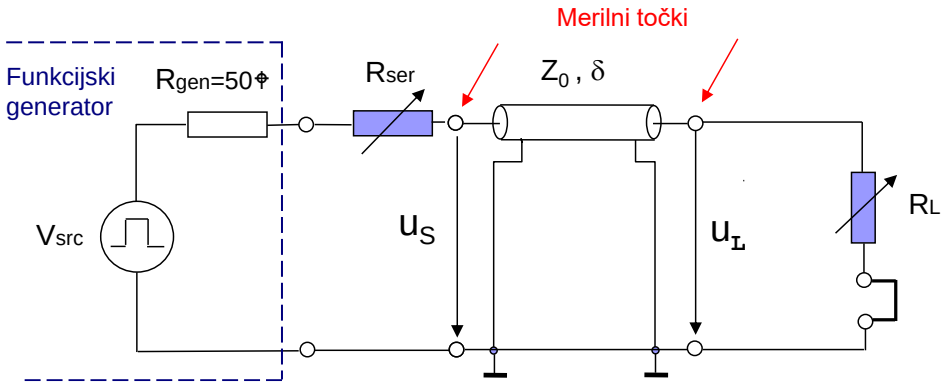
a) Meritev karakteristične upornosti linije z multimetrom (R_0)
b) Preizkusi različnih tipal (IR,UZ razdalja, PIR, Hall, …)
c) Meritve deformacij UTP kabla

LV 1.2: Meritev karakteristične upornosti prenosne linije

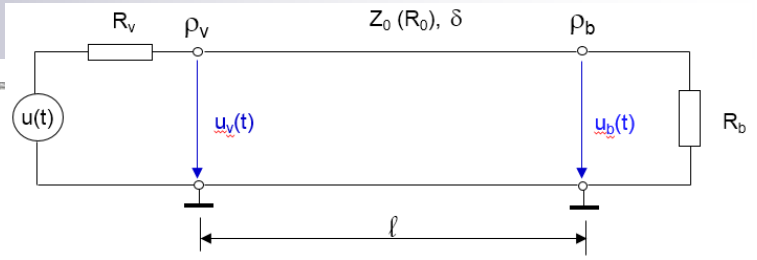
Izhodna upornost funkcijskega generatorja je R_{IZH}=50Ω, na izhodu linije pa pustite odprte sponke Rb= ∞.

S pomočjo osciloskopa izmerite napetost prvega vala V1 = u_V (0+) in napetost v stacionarnem stanju V2 = u_V (t>10 τ) na vhodu linije ter izračunajte karakteristično upornost linije R_0.

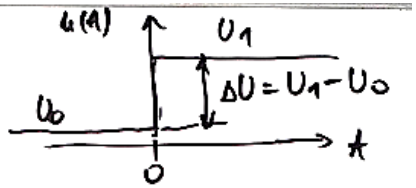




Recept analize odbojev



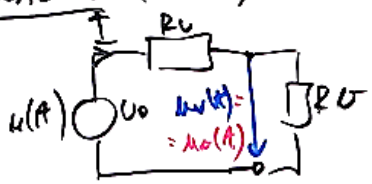
ODBOJI



FAZE:

① STACIONARNO $(t<0^-)$

OHMOV ZAKON



$$u_v(0^-) = u_b(0^-) = \frac{U_0}{R_v + R_b} \cdot R_b$$

② SPREMEMBA ΔU $(t=0)$

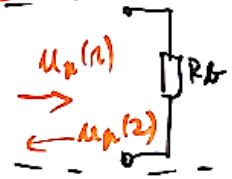
(PREH. POJAVI − ODBOJI) $\Delta U = U_1 - U_0$

$t = 0^+$:

$$u_v(0^+) = u_v(0^-) + \frac{\Delta U}{R_v + R_0} \cdot R_0$$

STAC ↓ ; $u_p(1)$

$t = \tau$:

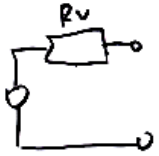


$$u_b(\tau) = u_b(0^-) + u_p(1) + u_p(1) \cdot \delta_b$$

STAC ↓ ; PRIPOTUJE ↓ ; ODBOJ

$u_p(2)$

$t = 2\tau$:



$$u_v(2\tau) = u_v(0^+) + u_p(2) + u_p(2) \cdot \delta_v$$

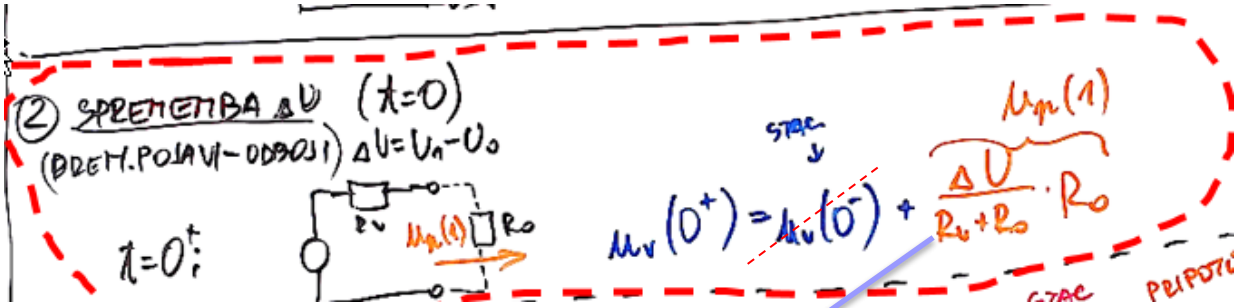
PRIDE ↓ ; ODBOJ ; $u_p(3)$

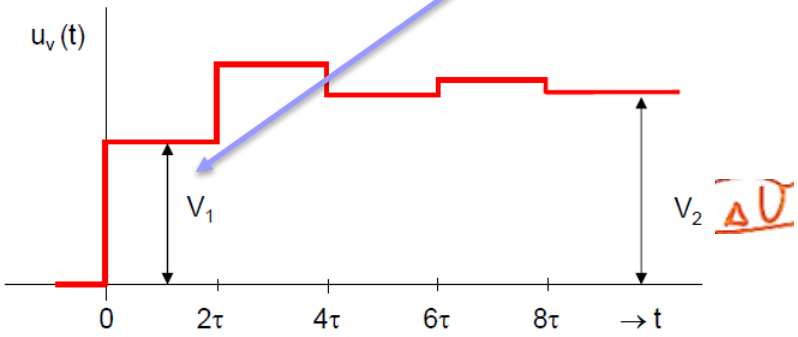
③ STACIONARNO $(t \gtrsim 10\tau)$

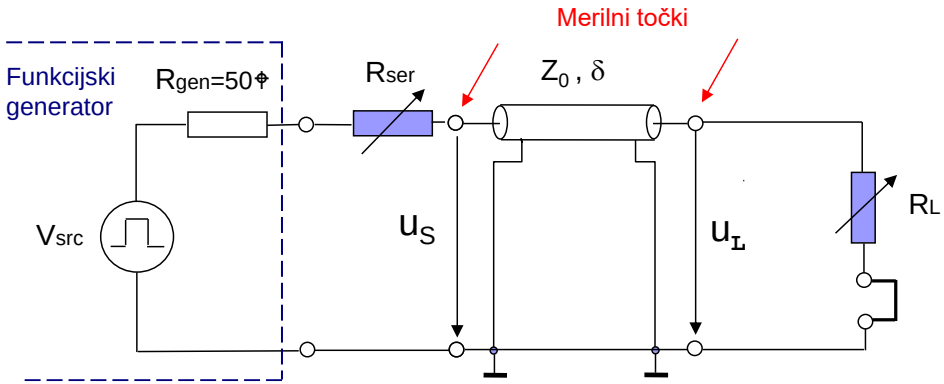
OHMOV ZAKON

$$u_v(10\tau^+) = u_b(10\tau^+) = \frac{U_1}{R_v + R_b} \cdot R_b$$

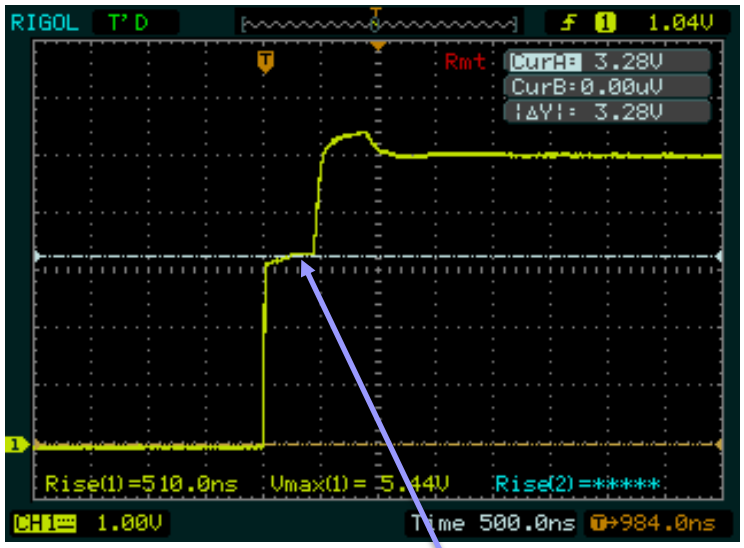
LV 1.2: Meritev karakteristične upornosti prenosne linije

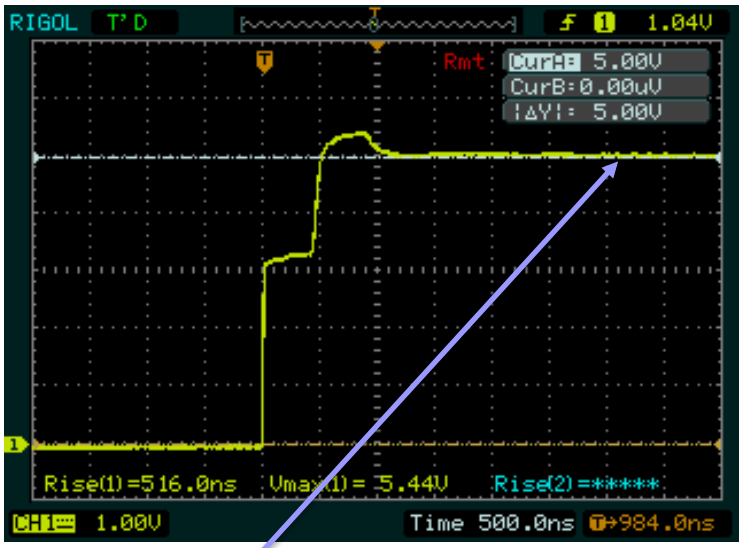


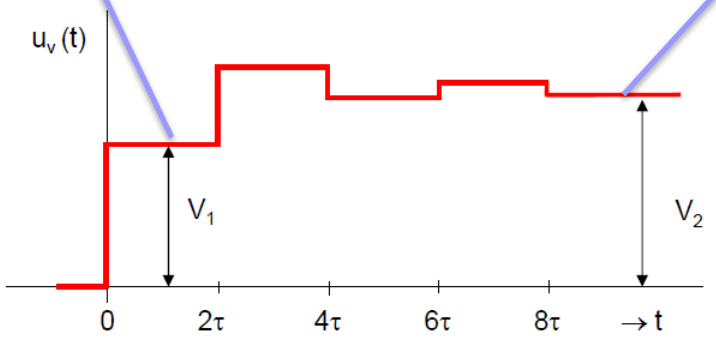




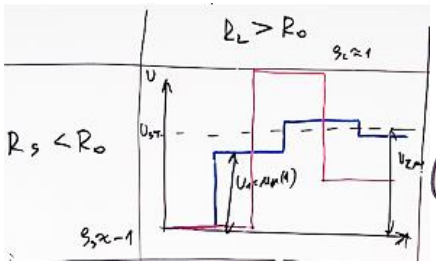
LV 1.2: Meritev karakteristične upornosti prenosne linije

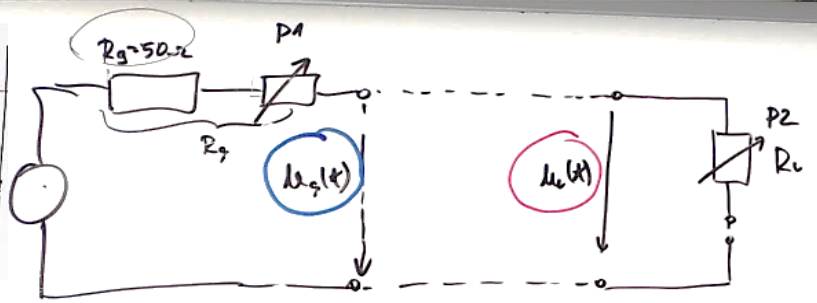


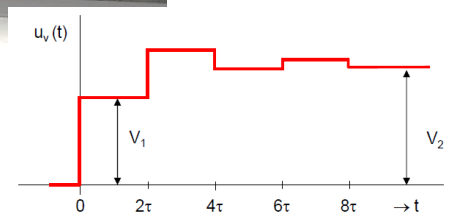


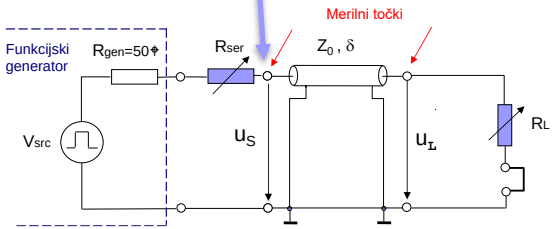


LV 1.2: Meritev karakteristične upornosti prenosne linije









$\Delta U = U_2 - 0V = U_2$

$u_g(1) = \frac{\Delta U}{R_0 + R_S} \cdot R_0$

$U_1 = \frac{\Delta U}{R_0 + R_S} \cdot R_0 \quad / \cdot (R_0 + R_S)$

$u_S(0^-) = 0V$

$u_S(0^+) = u_g(1) = U_1$

$(R_0 + R_S) U_1 = \Delta U \cdot R_0$

$R_0 \cdot U_1 + R_S \cdot U_1 = \Delta U \cdot R_0$

$R_0 (U_1 - \Delta U) = -R_S \cdot U_1$

$R_0 (\Delta U - U_1) = R_S \cdot U_1$

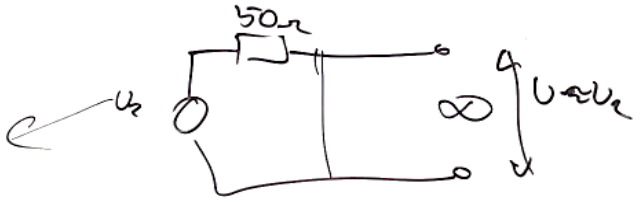
$$R_0 = \frac{U_1 \cdot R_S}{\Delta U - U_1}$$

$\Delta U = ?$

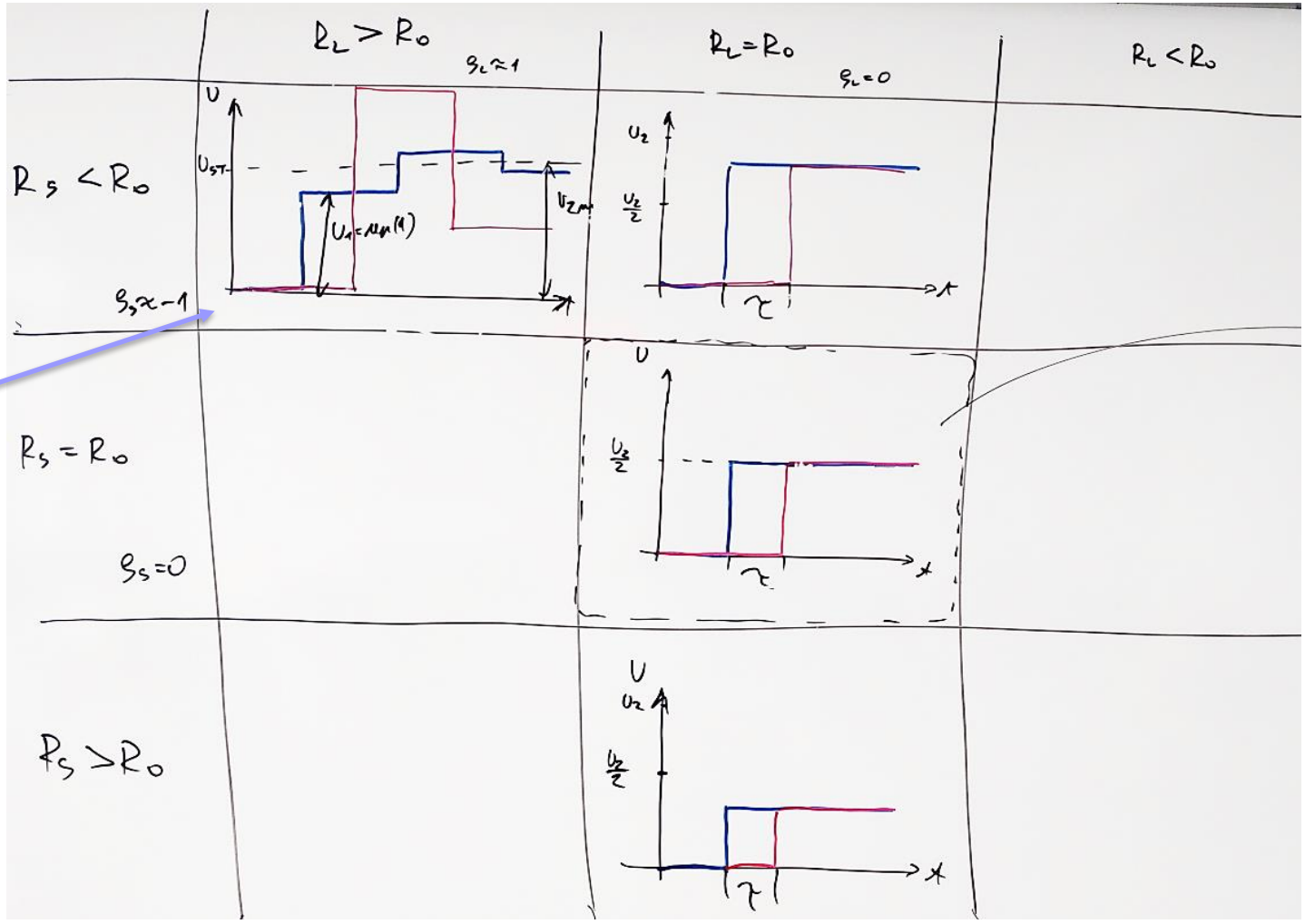
$U_{2m} = U_2$

$R_L = \infty$

$U_{2m} \approx U_2 = \Delta U$



LV 1.2: Meritev karakteristične upornosti prenosne linije



LV 1.2: Meritev karakteristične upornosti prenosne linije

Izhodna upornost funkcijskega generatorja je R_{IZH}=50Ω, na izhodu linije pa pustite odprte sponke Rb= ∞.

Nastavitev generatorja

Agilent 33120A
15 MHz Function /
Arbitrary Waveform Generator

User's Guide

Output Termination

Applies only to output amplitude and offset voltage. The function generator has a fixed output impedance of 50 ohms on the *OUTPUT* terminal. You can specify whether **you** are terminating the output into a 50 ohm load or an open circuit. Incorrect impedance matching between the function generator and your load will result in an amplitude or offset which does not match the specified signal level.

- Output termination: **50**Ω or High impedance. *The default is 50*Ω. See the table on page 59 for a list of amplitude limits for all functions.
- If you specify a 50 ohm termination but are actually terminating into an open circuit, the displayed output will be *twice* the value specified. For example, if you set the offset to 100 mVdc (and specify a 50 ohm termination) but are actually terminating the output into an open circuit, the actual displayed offset will be 200 mVdc.

Shift + Menu On/Off — **1 Turn on the menu.**

```
A: MOD MENU
```

> > > — **2 Move across to the SYS MENU choice on this level.** [1]

```
D: SYS MENU
```

v — **3 Move down a level to the OUT TERM command.**

```
1: OUT TERM
```

v > — **4 Move down a level and then across to the HIGH Z choice.** [1]

With the output termination set to "HIGH Z", the function generator allows you to set the unloaded (open circuit) output voltage.

```
HIGH Z
```

Enter — **5 Save the change and turn off the menu.**

LV 1.2: Meritev karakteristične upornosti prenosne linije

Izhodna upornost funkcijskega generatorja je R_{IZH}=50Ω, na izhodu linije pa pustite odprte sponke Rb= ∞.

Nastavitev generatorja

RIGOL

User's Guide

DG4000 Series

Function/Arbitrary Waveform Generator

5. CH1 Output

BNC connector with 50Ω nominal output impedance.

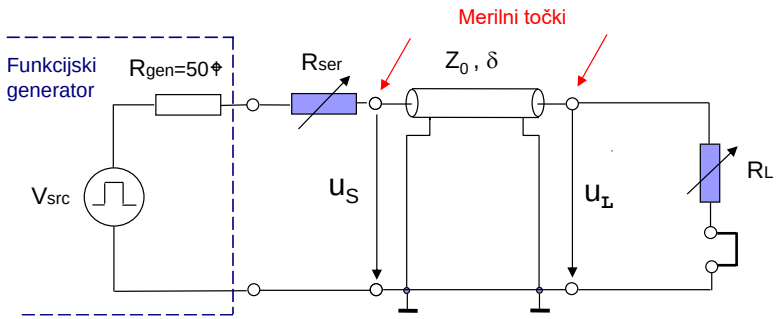
When **Output1** is enabled (the backlight turns on), this connector output waveform according to the current configuration of CH1.

RIGOL DG3000 Series Function/Arbitrary

User's Guide Waveform Generator

1. To Set the Output Load

For the [Output] Connector on the Front panel, the Generator has a built-in 50Ω series impendence. If the actual load does not match the set one, the displayed amplitude and offset are incorrect. This function is used to match the displayed voltage with the expected one.



Laboratorijska vaja 8 - LV1

- 8.0: Uvod v meritve prenosnih linij
- 8.1: LV1-1: Meritev dolžine linije (l)
- 8.2: LV1-2: Meritev karakteristične upornosti linije (R_0)

LV1,2 : Izzivi

a) Meritev karakteristične upornosti linije z multimetrom (R_0)
b) Preizkusi različnih tipal (IR,UZ razdalja, PIR, Hall, …)
c) Meritve deformacij UTP kabla

Laboratorijska vaja 8 - LV1

- 8.0: Uvod v meritve prenosnih linij
- 8.1: LV1-1: Meritev dolžine linije (l)
- 8.2: LV1-2: Meritev karakteristične upornosti linije (R_0)

LV1,2 : Izzivi

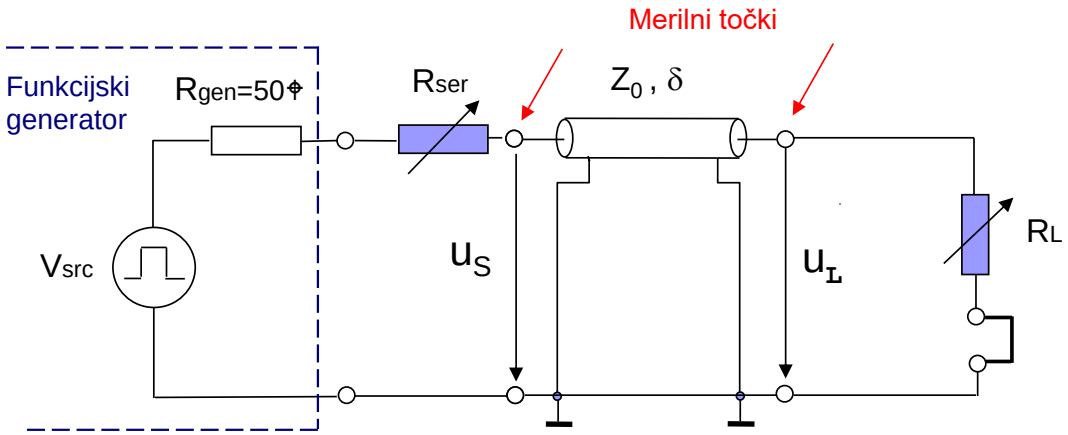
a) Meritev karakteristične upornosti linije z multimetrom (R_0)

b) Preizkusi različnih tipal (IR,UZ razdalja, PIR, Hall, …)

c) Meritve deformacij UTP kabla

LV 1,2a: Meritev karakteristične upornosti prenosne linije

Izziv: ali bi lahko z multimetrom kljub vsemu določili karakteristično upornost linije ?



Laboratorijska vaja 8 - LV1

- 8.0: Uvod v meritve prenosnih linij
- 8.1: LV1-1: Meritev dolžine linije (l)
- 8.2: LV1-2: Meritev karakteristične upornosti linije (R_0)

LV1,2 : Izzivi

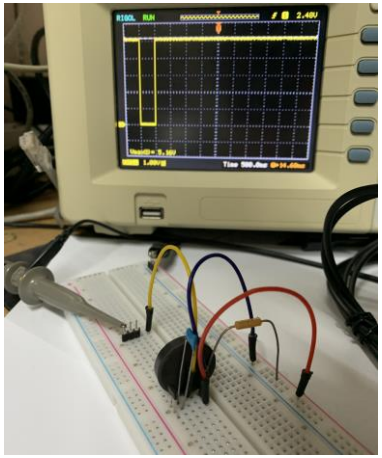
a) Meritev karakteristične upornosti linije z multimetrom (R_0)

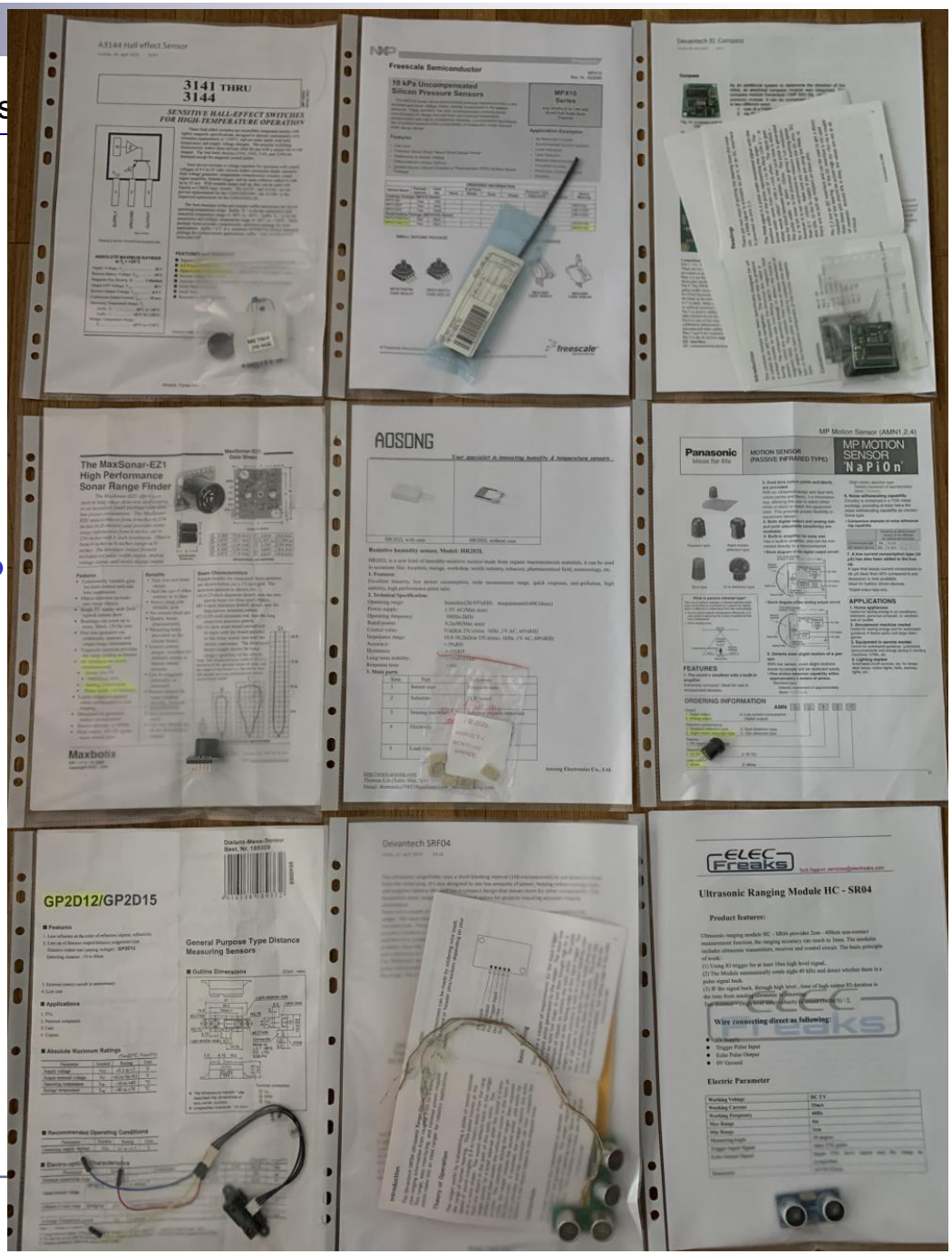
b) Preizkusi različnih tipal (IR,UZ razdalja, PIR, Hall, …)

c) Meritve deformacij UTP kabla

LV 1,2b: Preizkusi različnih tipal (IR,UZ razdalja, PIR, Hall, …)

Izziv: z ustreznimi orodji (osciloskop, generator, …) preizkusite in opišite delovanje različnih vrst tipal (po lastni izbiri) ?





Laboratorijska vaja 8 - LV1

- 8.0: Uvod v meritve prenosnih linij
- 8.1: LV1-1: Meritev dolžine linije (l)
- 8.2: LV1-2: Meritev karakteristične upornosti linije (R_0)

LV1,2 : Izzivi

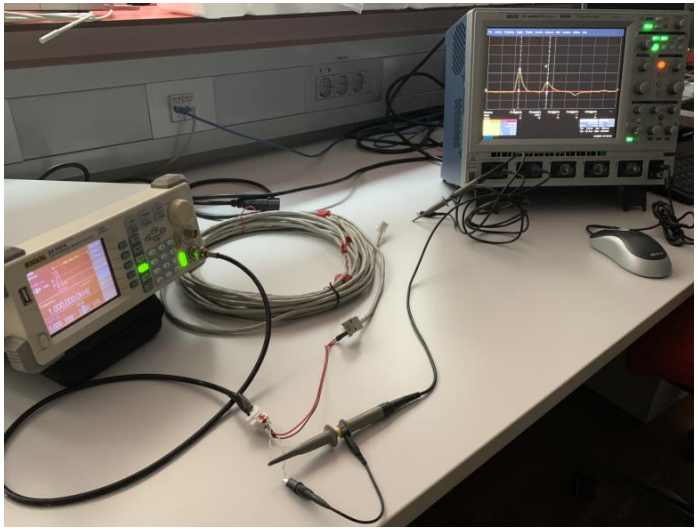
a) Meritev karakteristične upornosti linije z multimetrom (R_0)

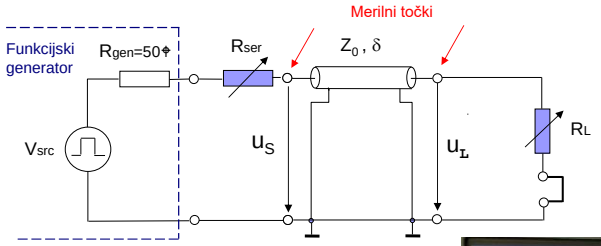
b) Preizkusi različnih tipal (IR,UZ razdalja, PIR, Hall, …)

c) Meritve deformacij UTP kabla

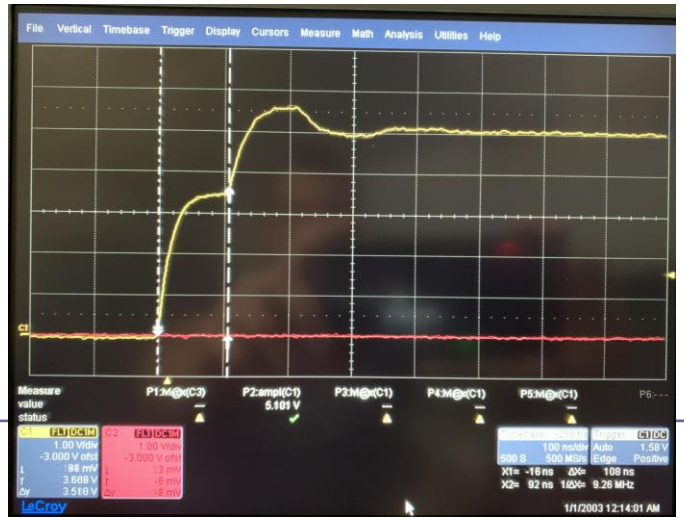
LV 1,2c: Meritve deformacij UTP kabla

Izziv: z ustreznimi orodji (osciloskop, generator, …) določite deformacije (vrsta, razdalja od točke A) na vseh paricah v UTP kablu.

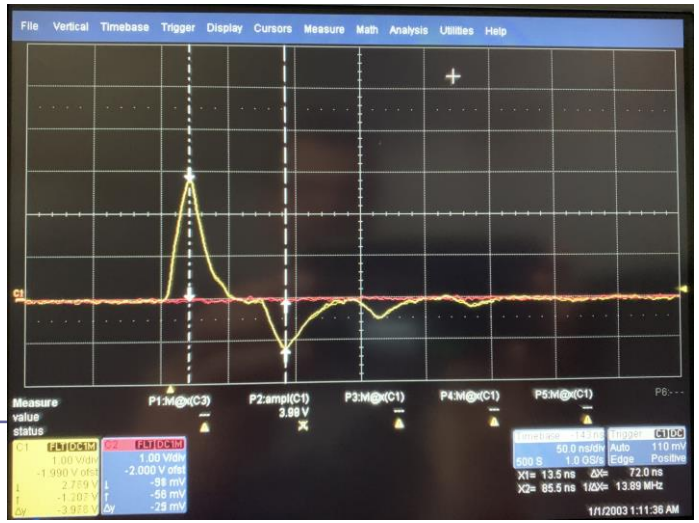




Meritev kot pri R_0:
zakasnitve stopničk = 2 τ



Meritev s kratkim impulzom:
zakasnitev odboja impulza = 2 τ



2. Domača naloga

VHODNO – IZHODNE NAPRAVE

POROČILO Z LABORATORIJSKIH VAJ

LAB. VAJA LV1, LV2
Dolžina linije, karakteristična impedanca, odboji

PRIIMEK IN IME _____

VPISNA ŠTEVILKA _____

SKUPINA ŠT. _____

Vhodno izhodne naprave

Laboratorijski vaja 9 - LV2

Meritve različnih situacij z odboji

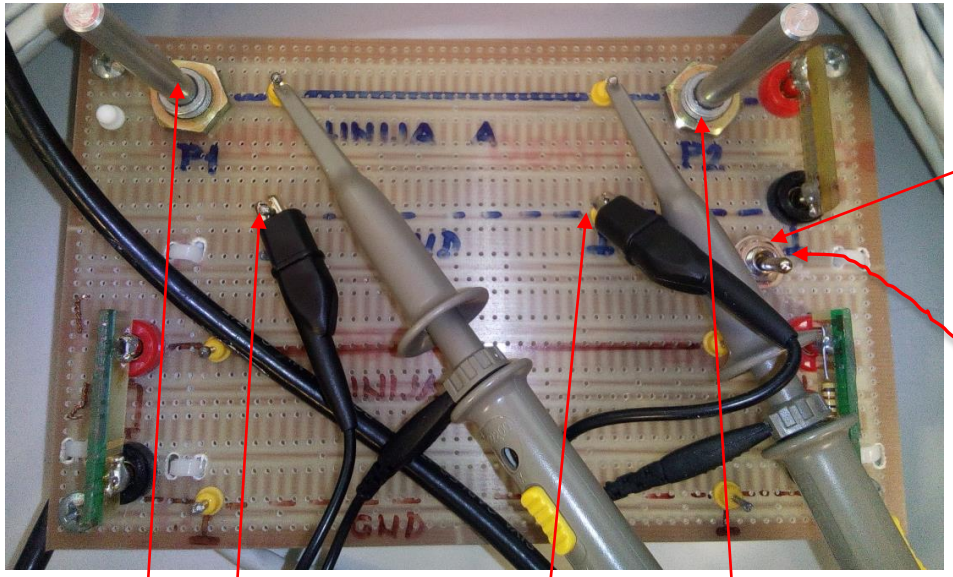
Laboratorijska vaja 9 - LV2

- 9.1: LV2 : Meritve odbojev (razmerja Rv, Rb)
- 9.2: LV2 : Vpliv časa vzpona/padca – omejevanje odbojev

LV1,2 : Izzivi

a) Meritev karakteristične upornosti linije z multimetrom (R_0)
b) Preizkusi različnih tipal (IR,UZ razdalja, PIR, Hall, …)
c) Meritve deformacij UTP kabla

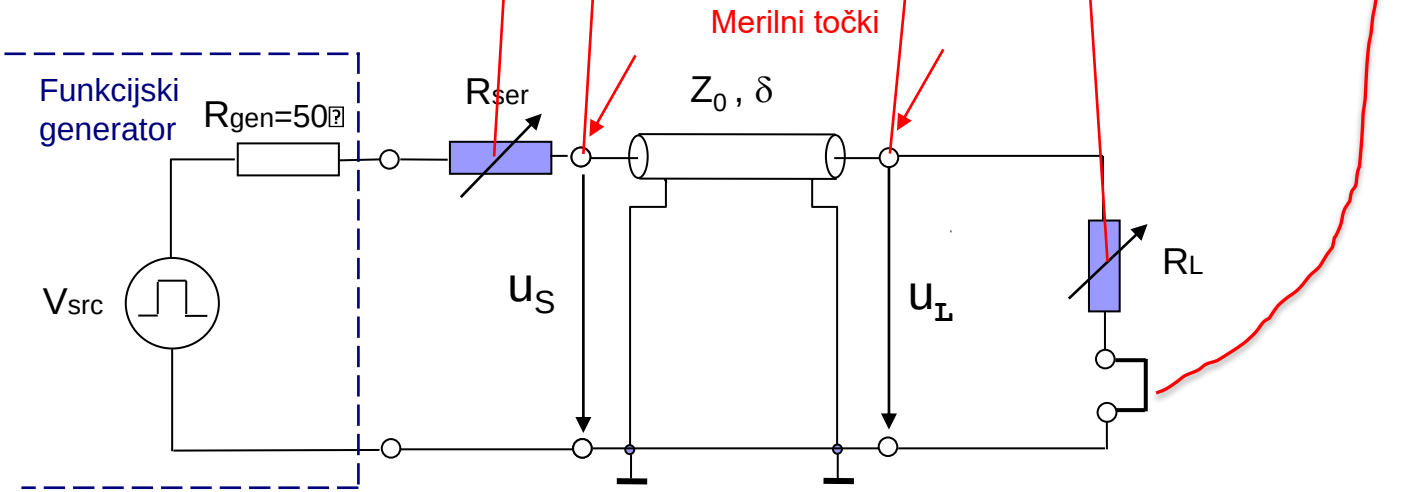
Meritve prenosne linije



Stikala – položaji:
- 0 … RL= R(P2)
- Srednji položaj: odprte sponke (R_L=∞)
- 1 … RL= R(P2) + 22E

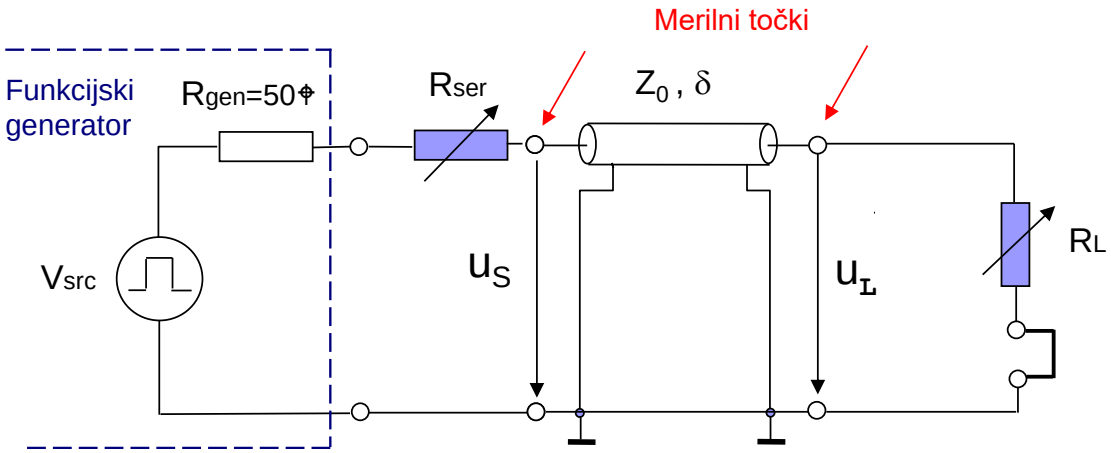
Potenciometri:

R(P1) = 0 … 500E
R(P2) = 0 … 500E



LV 2-1: Merjenje odbojev pri različnih odbojnih koeficientih na vhodu in izhodu linije

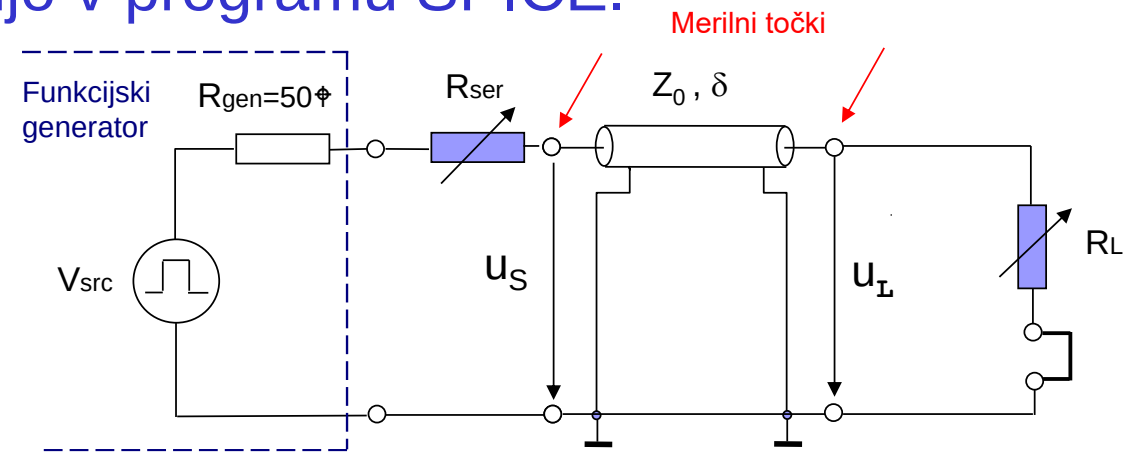
- Impulzni generator uporabite kot izvor signala za napajanje linije, z osciloskopom pa določite potek signala in izmerite napetostne nivoje na vhodu v linijo in na izhodu. Izhodna upornost impulznega generatorja je $R_{gen} = 50\Omega$.

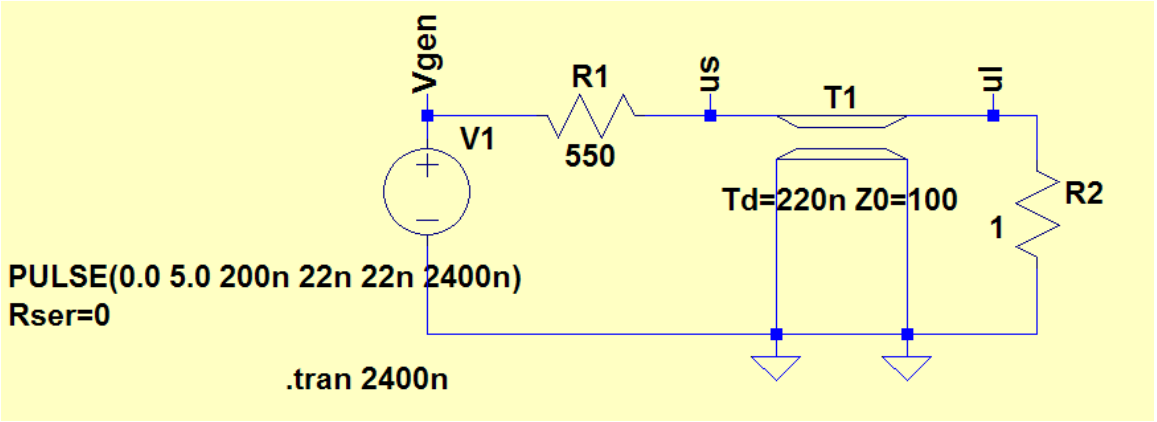


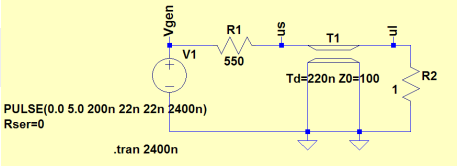
- Izmerite in narišite potek $u_S(t)$ in $u_I(t)$ za vseh devet kombinacij R_S in R_L. Vse to ponovite tudi s simulacijo v programu SPICE.

----	$R_L > R_0$	$R_L = R_0$	$R_L < R_0$
$R_S < R_0$			
$R_S = R_0$			
$R_S > R_0$			

Izmerite in narišite potek $u_S(t)$ in $u_L(t)$ za vseh devet kombinacij R_S in R_L. Vse to ponovite tudi s simulacijo v programu SPICE.



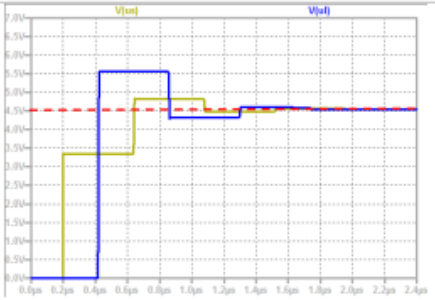
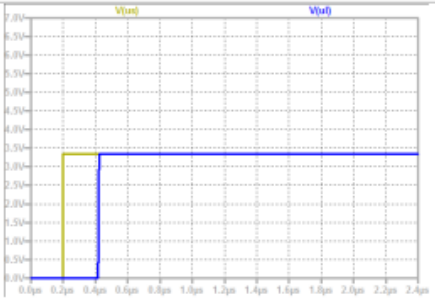
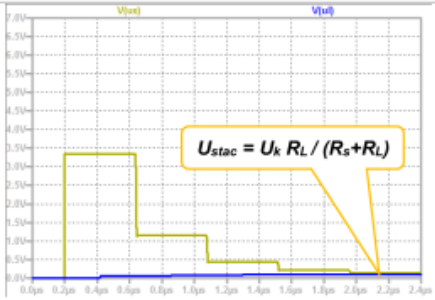
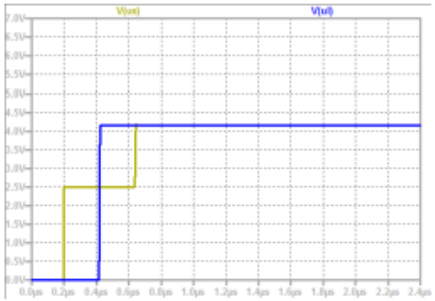
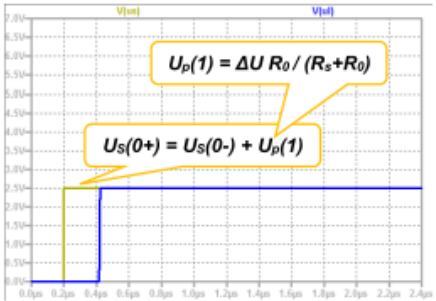
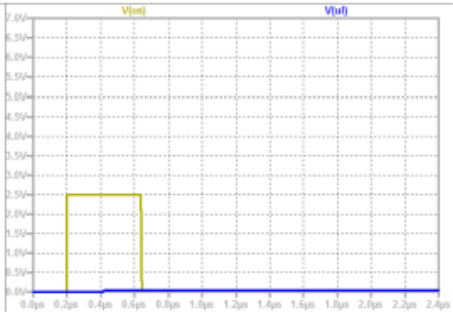
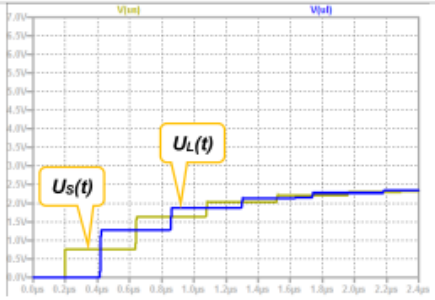
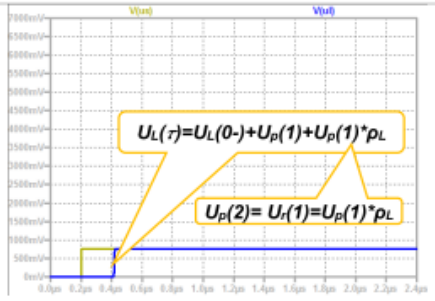
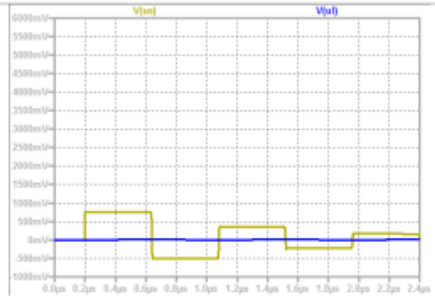




…Vse to ponovite tudi s simulacijo v programu SPICE.

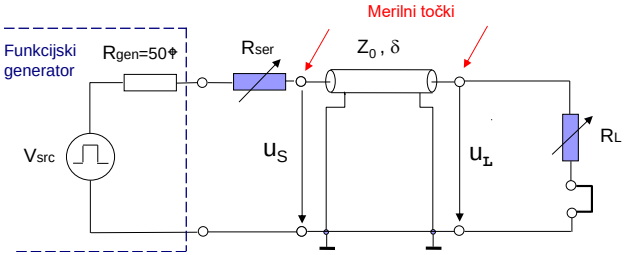
SPICE Simulacije slik iz osciloskopa: UTP kabel, R_S= 50..550 Ω , R_L = 1..500 Ω

Napetost se že pravilno porazdeli, z zakasnitvijo 1τ se pojavi tudi na izhodu.

	R_0=100Ω **R_L,R_S=0,50,500Ω**	**$R_L > R_0$, R_L=500Ω** ρ_L=0.666 (poz. odboj)	**$R_L = R_0$** ρ_L=0 (ni odboja)	**$R_L < R_0$, R_L=1Ω** ρ_L=-0.98 (neg. odboj)
Višje potujoče napetosti	**$R_S < R_0$** **R_S=50 Ω** ρ_S=-0.333 [0.5V/razdelek]			
	$R_S = R_0$ ρ_S=0 [0.5V/razdelek]			
Nizke potujoče napetosti	**$R_S > R_0$** **R_S=550 Ω** ρ_S=0.692 [0.5V/razdelek]			

(LV2) - Merjenje odbojev na liniji

…še s praktičnimi meritvami.



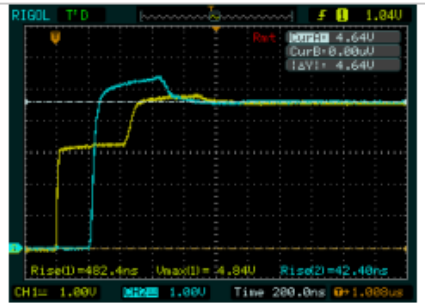
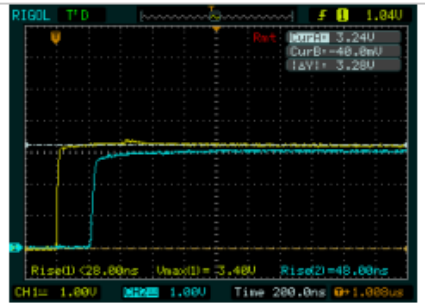
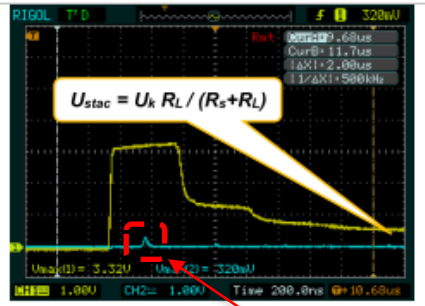
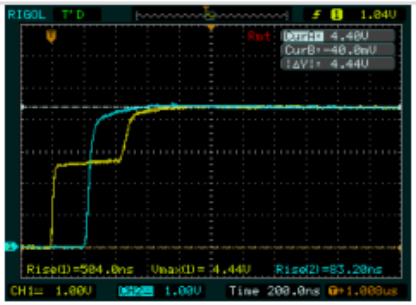
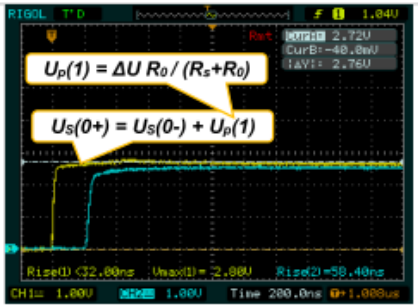
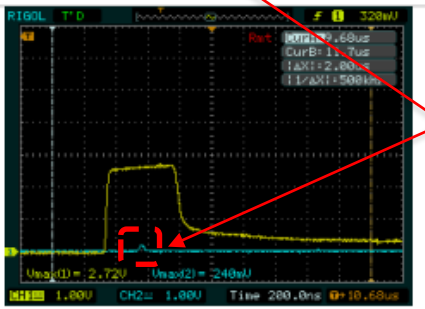
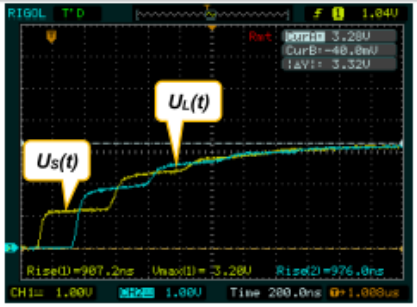
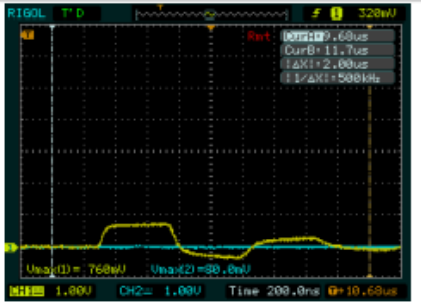
Stikala – položaji:
- 0 … RL= R(P2)
- Srednji položaj: odprte sponke ($R_L=\infty$)
- 1 … RL= R(P2) + 22E

Potenciometri:

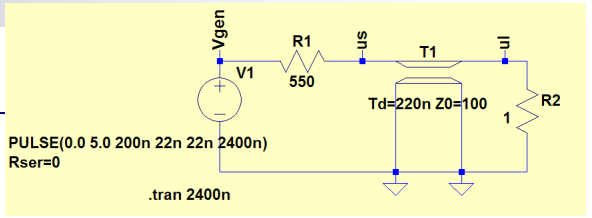
R(P1) = 0 … 500E
R(P2) = 0 … 500E

Slike osciloskopa: UTP kabel, R_S= 50..550 Ω , R_L = 1..500 Ω (R_{gen}=50 Ω) UTP

Napetost se že pravilno porazdeli, z zakasnitvijo 1τ se pojavi tudi na izhodu.

	R_0=100Ω **R_L,R_S=0,50,500Ω**	**$R_L > R_0$, R_L=500Ω** ρ_L=0.666 (poz. odboj)	**$R_L = R_0$** ρ_L=0 (ni odboja)	**$R_L < R_0$, R_L=1Ω** ρ_L=-0.98 (neg. odboj)
Višje potujoče napetosti	**$R_S < R_0$** **R_S=50 Ω** ρ_S=-0.333 [1V/razdelek]			
	$R_S = R_0$ ρ_S=0 [1V/razdelek]			
Nizke potujoče napetosti	**$R_S > R_0$** **R_S=550 Ω** ρ_S=0.692 [1V/razdelek]			

Primerjava: Simulacija - Meritve.



SPICE Simulacije slik iz osciloskopa: UTP kabel, R_S= 50..550 Ω , R_L = 1..500 Ω

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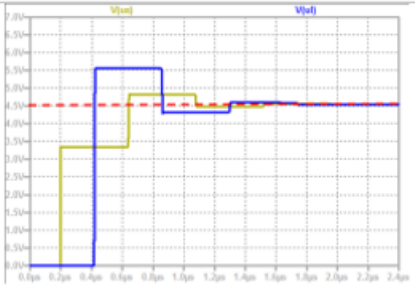
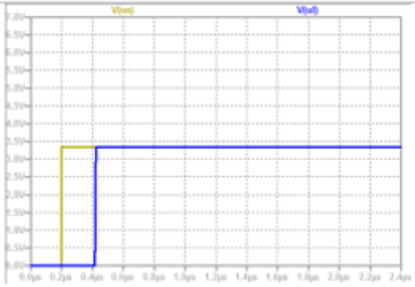
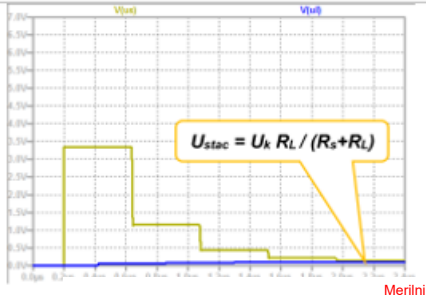
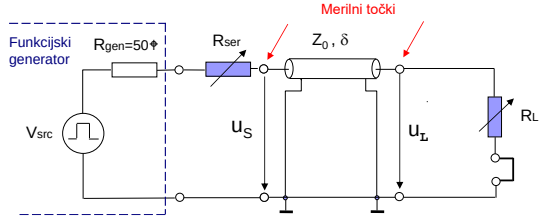
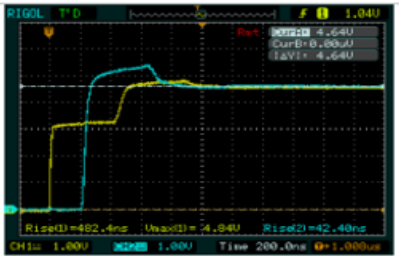
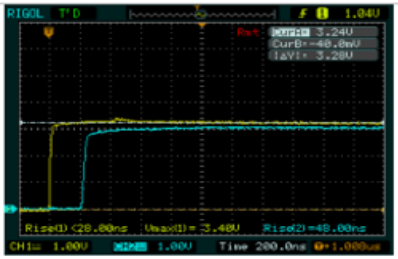
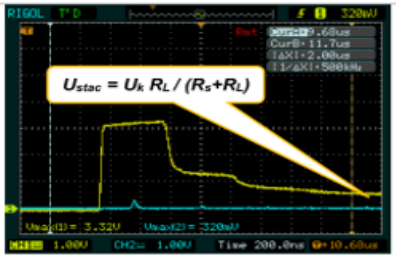
Višje potujoče napetosti	**$R_S < R_0$** **R_S=50 Ω** ρ_S=-0.333 [0.5V/razdelek]			



Slike osciloskopa: UTP kabel, R_S= 50..550 Ω , R_L = 1..500 Ω (R_{gen}=50 Ω) UTP

Napetost se že pravilno porazdeli, z zakasnitvijo 1τ se pojavi tudi na izhodu.

	R_0=100Ω **R_L,R_S=0,50,500Ω**	**$R_L > R_0$, R_L=500Ω** ρ_L=0.666 (poz. odboj)	**$R_L = R_0$** ρ_L=0 (ni odboja)	**$R_L < R_0$, R_L=1Ω** ρ_L=-0.98 (neg. odboj)
Višje potujoče napetosti	**$R_S < R_0$** **R_S=50 Ω** ρ_S=-0.333 [1V/razdelek]			

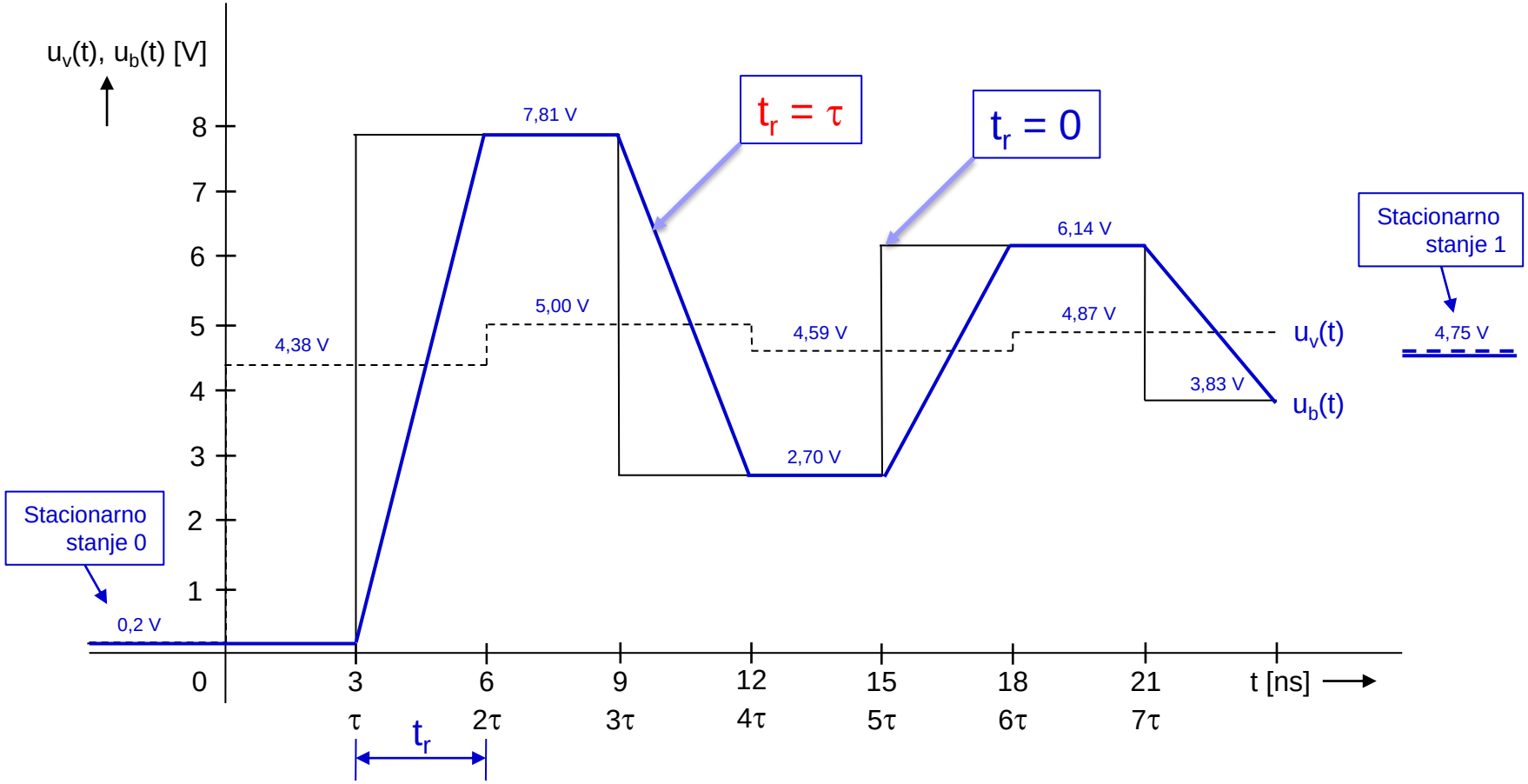
Laboratorijska vaja 9 - LV2

- 9.1: LV2 : Meritve odbojev (razmerja Rv, Rb)
- 9.2: LV2 : Vpliv časa vzpona/padca – omejevanje odbojev

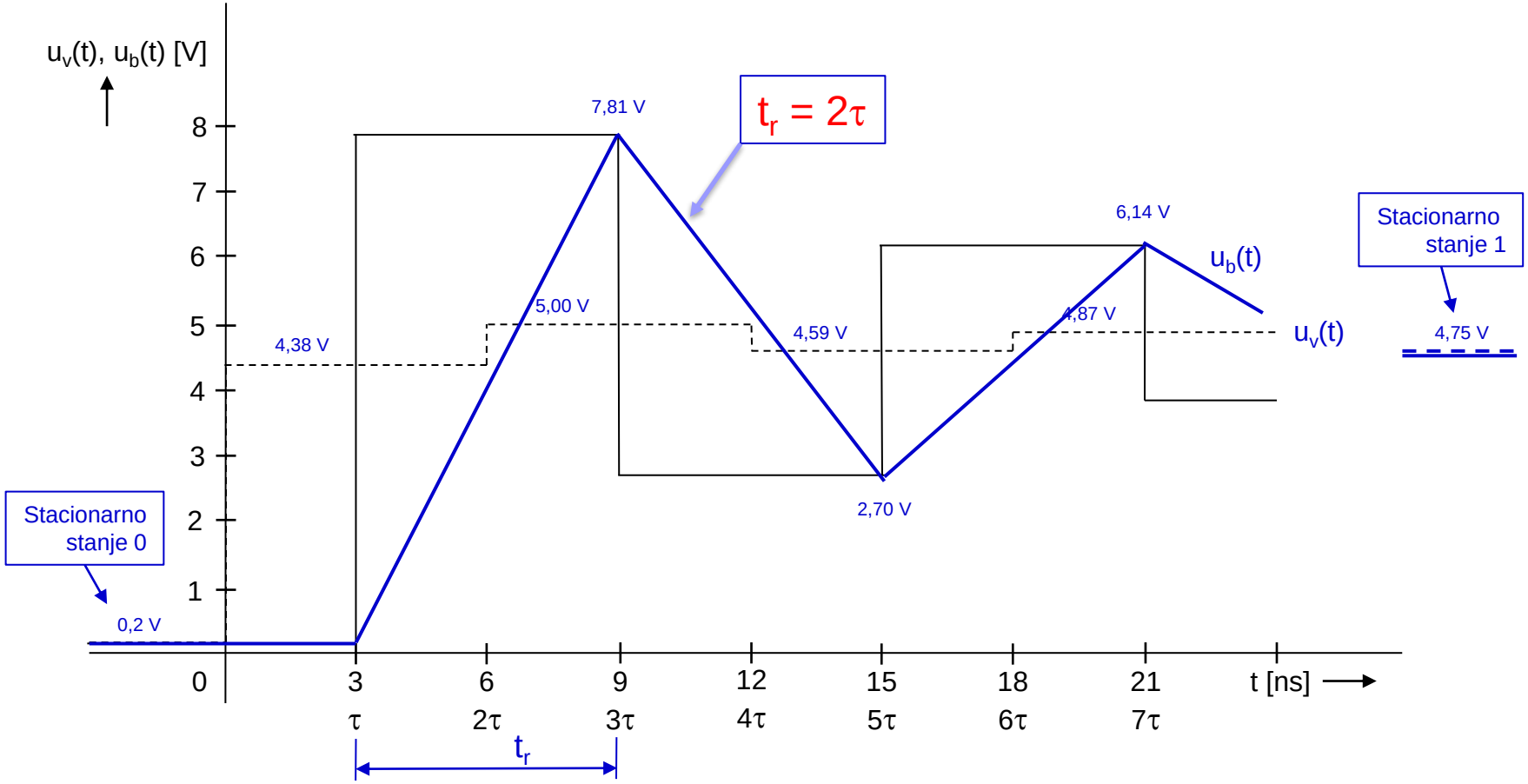
LV1,2 : Izzivi

a) Meritev karakteristične upornosti linije z multimetrom (R_0)
b) Preizkusi različnih tipal (IR,UZ razdalja, PIR, Hall, …)
c) Meritve deformacij UTP kabla

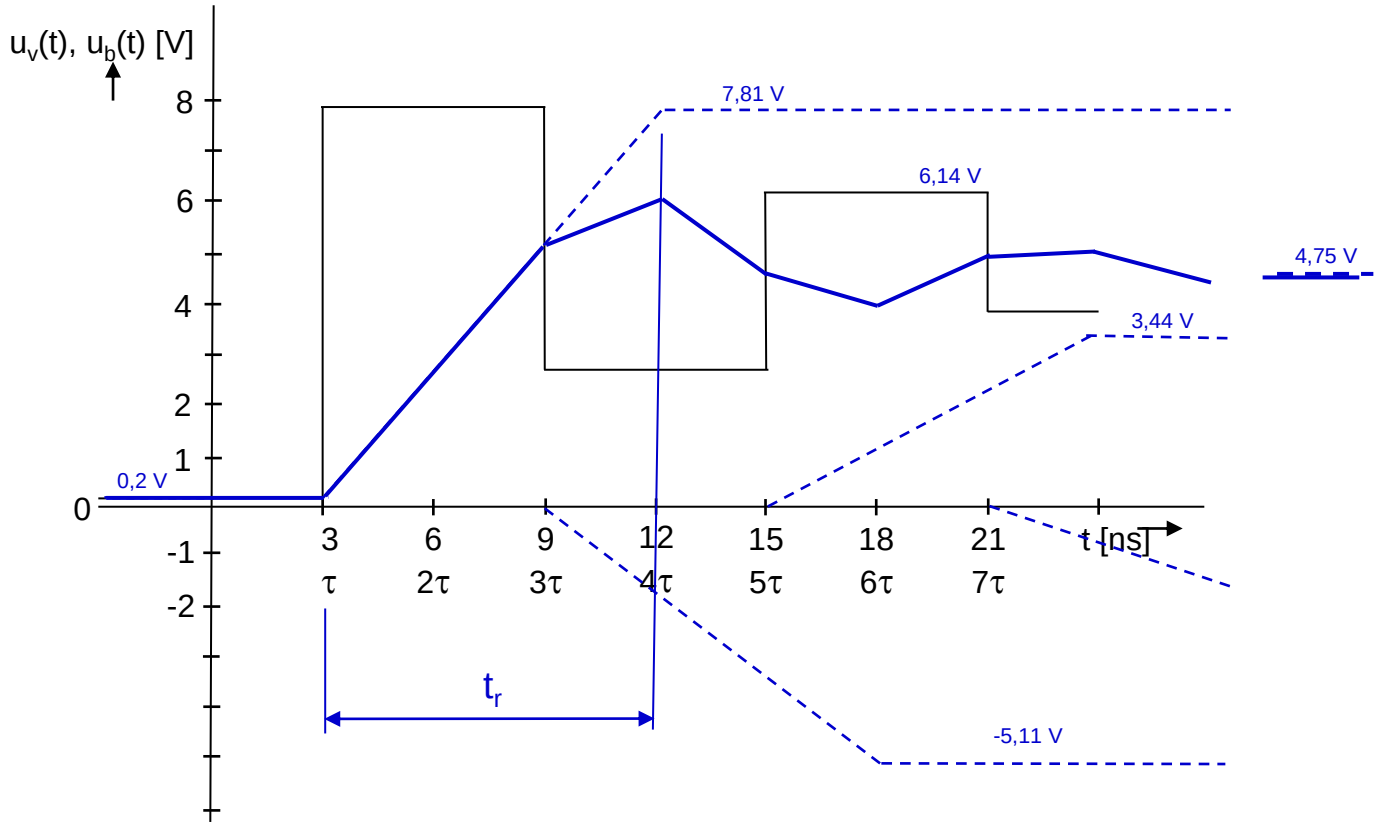
Časovni diagram poteka napetosti na izhodu iz linije do časa t =7τ, če je čas vzpona signala enak času potovanja signala po liniji $t_r = \tau$.



Časovni diagram poteka napetosti izhodu iz linije do časa t =7τ, če je čas vzpona signala enak času potovanja signala po liniji $t_r = 2\tau$



Časovni diagram poteka napetosti izhodu iz linije do časa t =7τ, če je čas vzpona signala enak času potovanja signala po liniji $t_r = 3\tau$ ($t_r > 2\tau$)

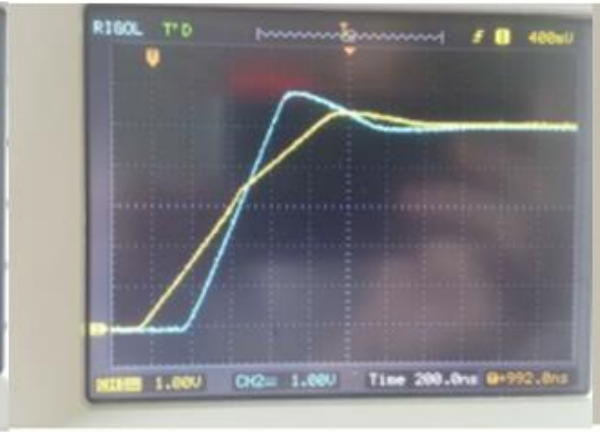


- Na impulznem generatorju spreminjajte čas vzpona signala t_r in opazujte vpliv na odboje.

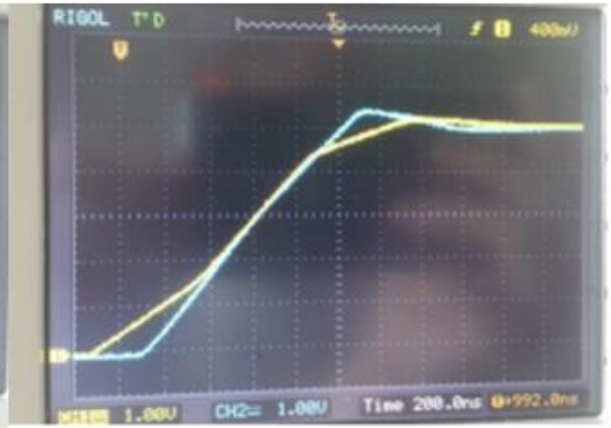
- Pri kateri vrednosti t_r se odboji začnejo manjšati?

- Na impulznem generatorju spreminjajte čas vzpona signala t_r in opazujte vpliv na odboje.
- Pri kateri vrednosti t_r se odboji začnejo manjšati?
- Prikaz meritev :

$0.2\,\tau$



2τ



4τ

Laboratorijska vaja 9 - LV2

- 9.1: LV2 : Meritve odbojev (razmerja Rv, Rb)
- 9.2: LV2 : Vpliv časa vzpona/padca – omejevanje odbojev

LV1,2 : Izzivi

a) Meritev karakteristične upornosti linije z multimetrom (R_0)
b) Preizkusi različnih tipal (IR,UZ razdalja, PIR, Hall, …)
c) Meritve deformacij UTP kabla

Laboratorijska vaja 9 - LV2

- 9.1: LV2 : Meritve odbojev (razmerja Rv, Rb)
- 9.2: LV2 : Vpliv časa vzpona/padca – omejevanje odbojev

LV1,2 : Izzivi

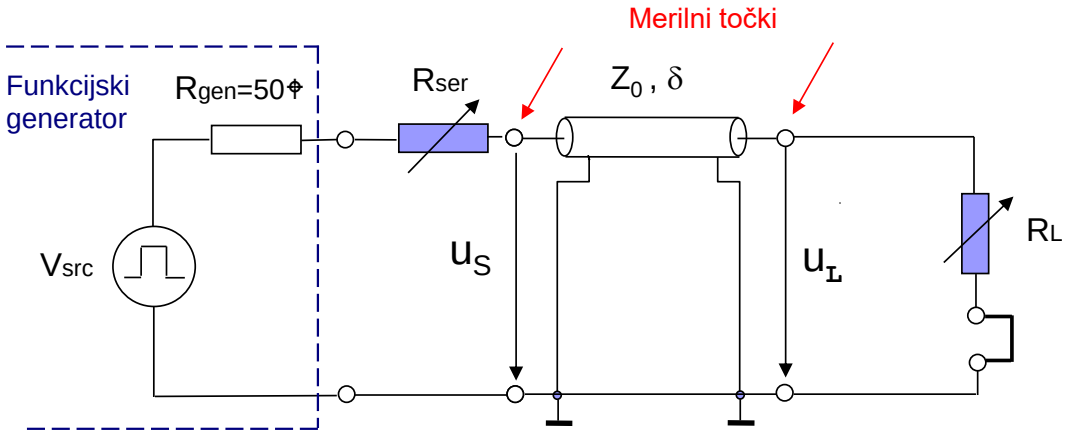
a) Meritev karakteristične upornosti linije z multimetrom (R_0)

b) Preizkusi različnih tipal (IR,UZ razdalja, PIR, Hall, …)

c) Meritve deformacij UTP kabla

LV 1,2a: Meritev karakteristične upornosti prenosne linije

Izziv: ali bi lahko z multimetrom kljub vsemu določili karakteristično upornost linije ?



Laboratorijska vaja 9 - LV2

- 9.1: LV2 : Meritve odbojev (razmerja Rv, Rb)
- 9.2: LV2 : Vpliv časa vzpona/padca – omejevanje odbojev

LV1,2 : Izzivi

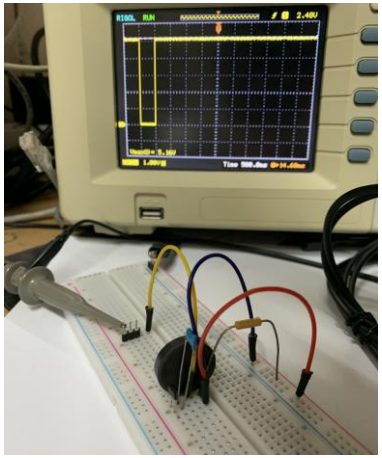
a) Meritev karakteristične upornosti linije z multimetrom (R_0)

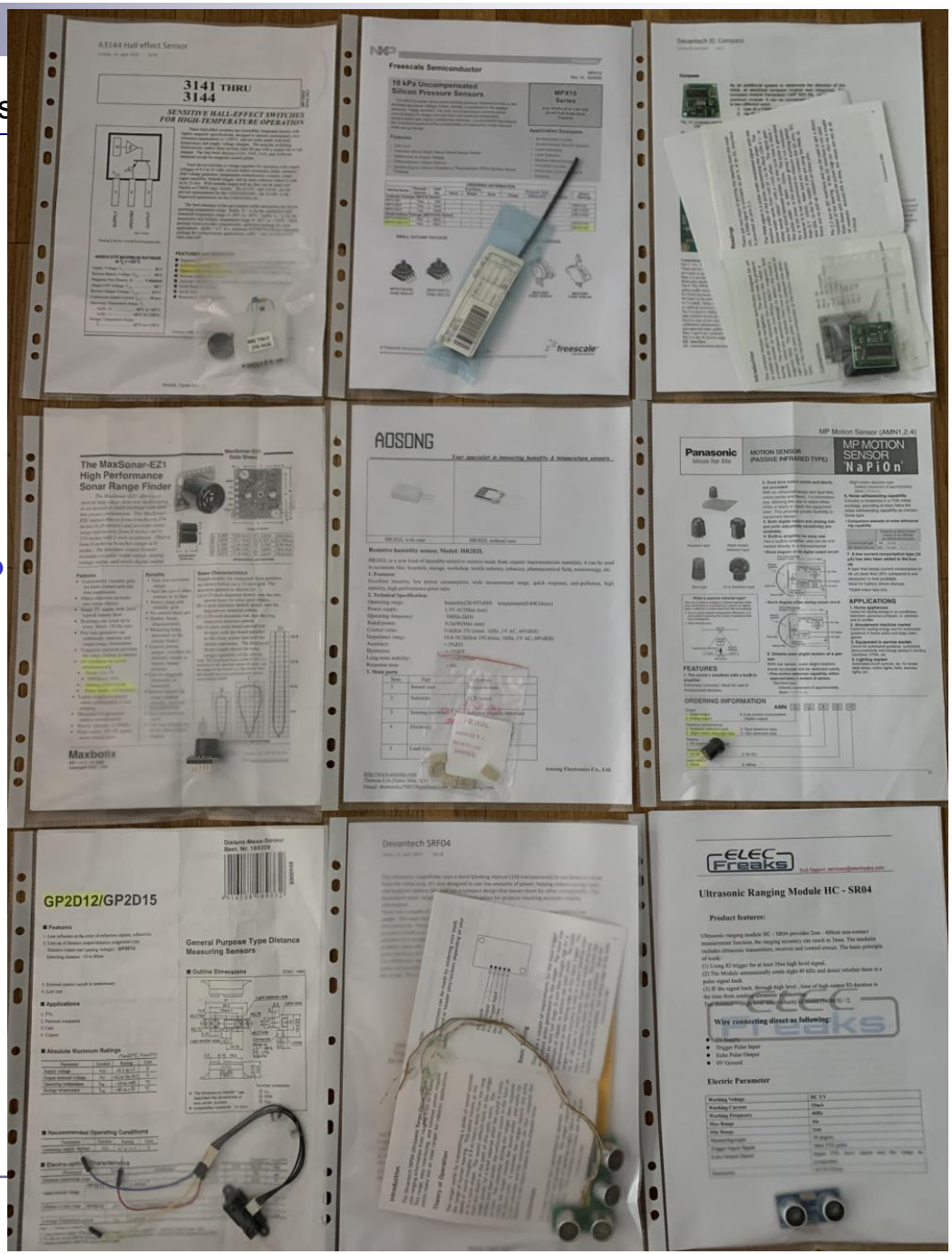
b) Preizkusi različnih tipal (IR,UZ razdalja, PIR, Hall, …)

c) Meritve deformacij UTP kabla

LV 1,2b: Preizkusi različnih tipal (IR,UZ razdalja, PIR, Hall, …)

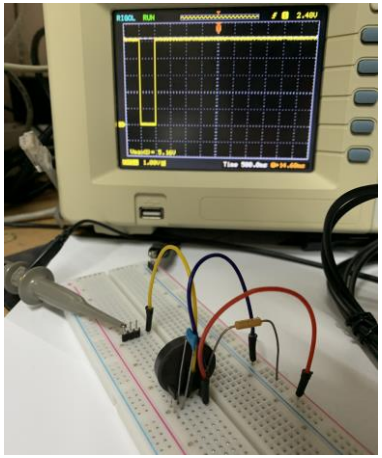
Izziv: z ustreznimi orodji (osciloskop, generator, …) preizkusite in opišite delovanje različnih vrst tipal (po lastni izbiri) ?

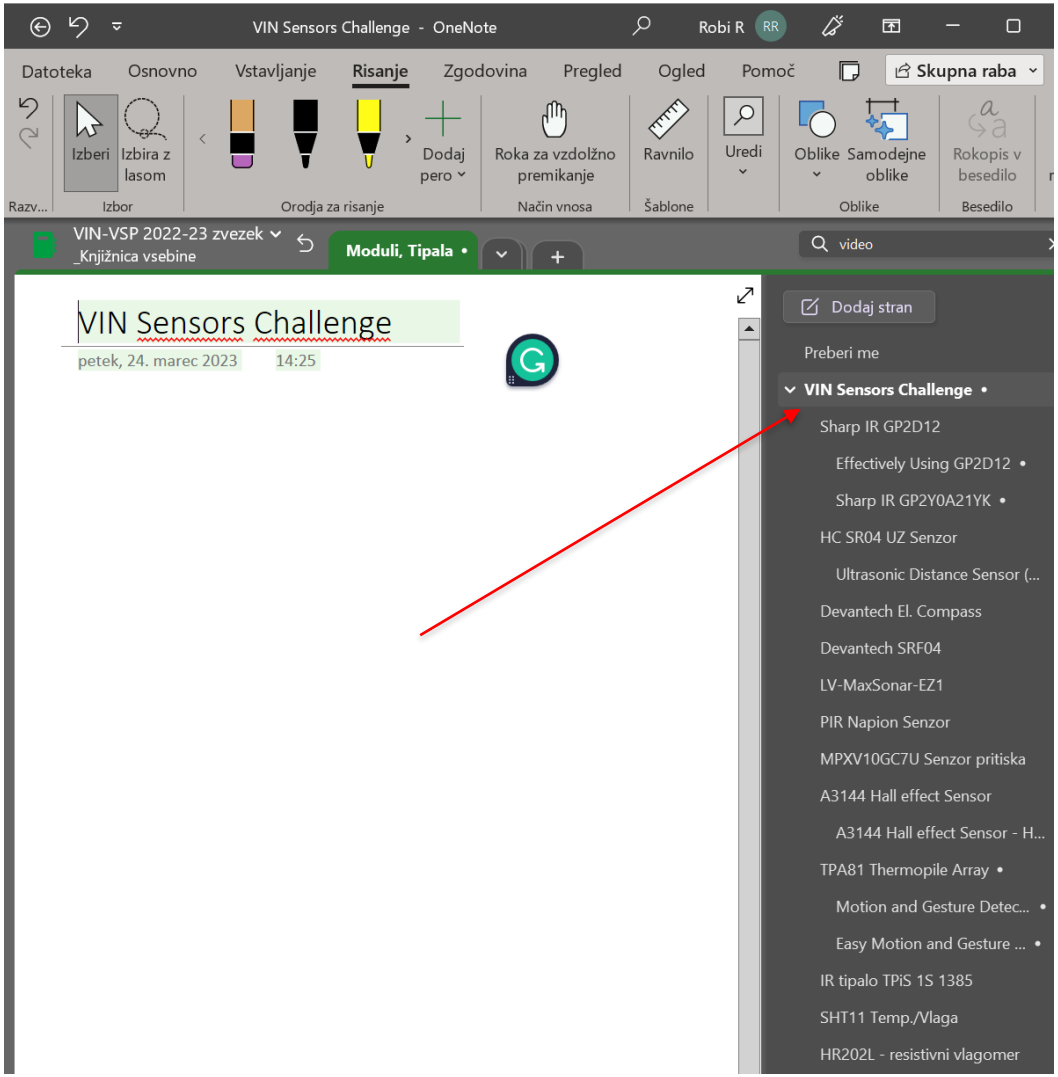




LV 1,2b: Preizkusi različnih tipal (IR,UZ razdalja, PIR, Hall, …)

Izziv: z ustreznimi orodji (osciloskop, generator, …) preizkusite in opišite delovanje različnih vrst tipal (po lastni izbiri) ?





MB1010 LV-MaxSonar-EZ1

MB1010 Datasheet

Ranges from 6 inches to 254 inches with a 20Hz read rate. Wide detection field. Excellent for people detection.

Z naslova <https://maxbotix.com/products/mb1010>

LV-MaxSonar® - EZ™ Series

LV-MaxSonar®-EZ™ Series

High Performance Sonar Range Finder

MB1000, MB1010, MB1020, MB1030, MB1040[2]

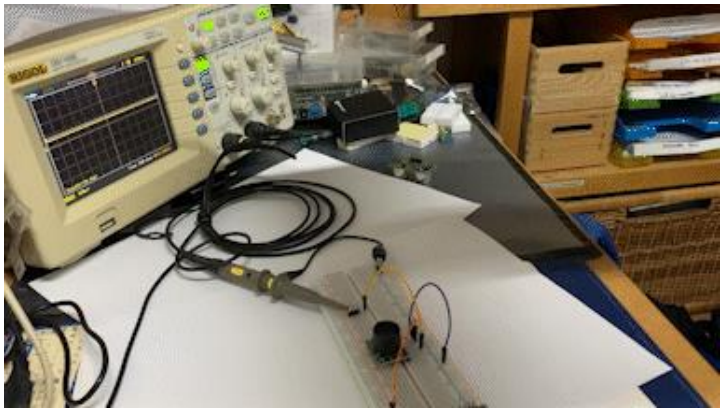
With 2.5V - 5.5V power the LV-MaxSonar-EZ provides very short to long-range detection and ranging in a very small package. The LV-MaxSonar-EZ detects objects from 0-inches to 254-inches (6.45-meters) and provides sonar range information from 6-inches out to 254-inches with 1-inch resolution. Objects from 0-inches to 6-inches typically range as 6-inches[1]. The interface output formats included are pulse width output, analog voltage output, and RS232 serial output. Factory calibration and testing is completed with a flat object. ***[1]See Close Range Operation***

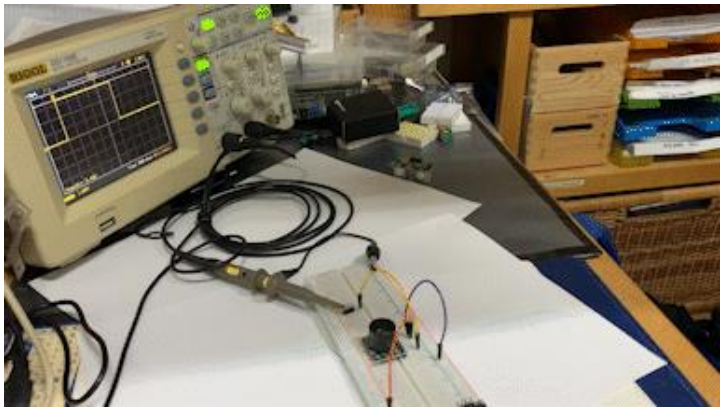
Features

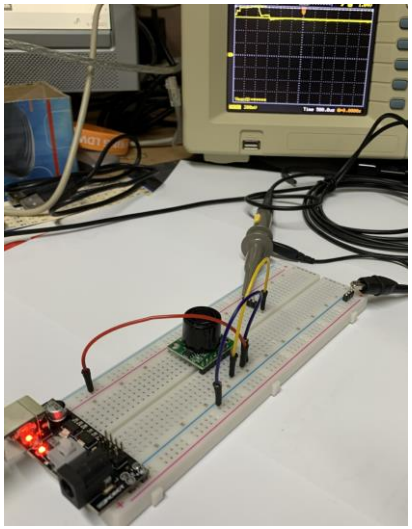
- Continuously variable gain for control and side lobe suppression
- Object detection to zero range objects
- 2.5V to 5.5V supply with 2mA typical current draw
- Readings can occur up to every 50mS, (20-Hz rate)
- Free run operation can continually measure and output range information
- Triggered operation provides the range reading as desired
- Interfaces are active simultaneously
- Serial, 0 to Vcc, 9600 Baud, 8N1
- Analog, (Vcc/512) / inch
- Pulse width, (147uS/inch)

Priklop :

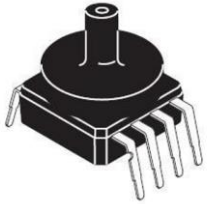
- Napajanje
  - 2.5-5.5V
  - GND
- Izhoda:
  - Analogni
  - PWM







LV 1,2b: Preizkusi različnih tipal (IR,UZ razdalja, PIR, Hall, …)



MPXV10GC7U

Z naslova <https://eu.mouser.com/ProductDetail/NXP-Semiconductors/MPXV10GC7U?qs=N2XN0KY4UWWYdp78g4P8QQ%3D%3D>

6 Pin Information

6.1 MPXV10GC6U

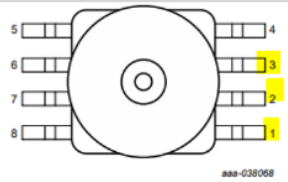


Figure 2. Case 482A-01

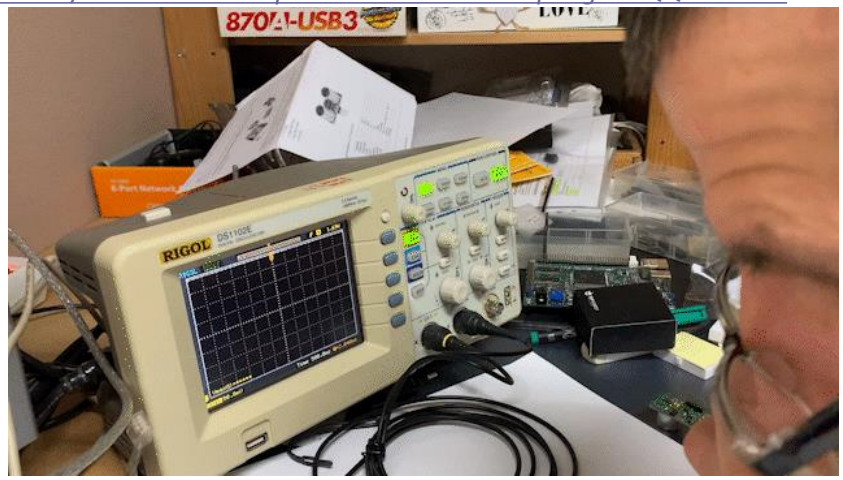
Table 2. Pin definitions - MPXV10GC6U

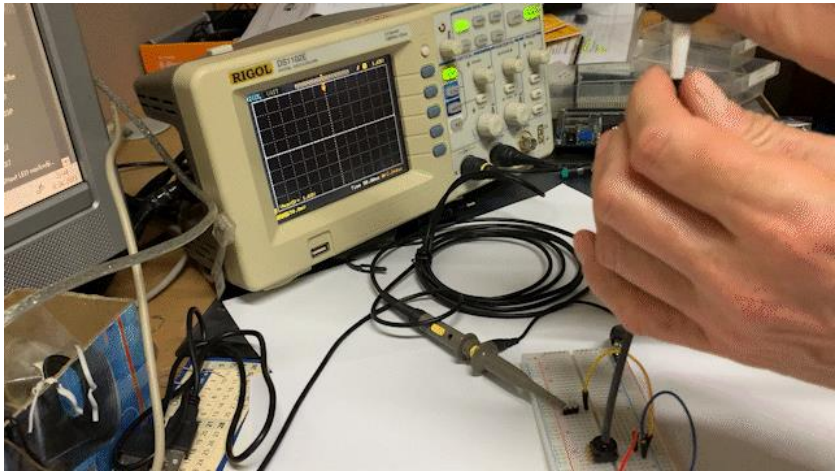
Symbol	Pin	Description
GND	1	Ground
$+V_{OUT}$	2	+Voltage output
V_S	3	Power supply

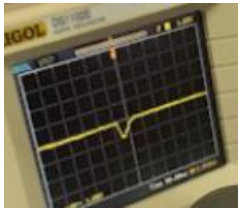
8 Operating Characteristics

Table 7. Operating Characteristics (V_S = 3.0 Vdc, T_A = 25 °C unless otherwise noted, P1 > P2)

Characteristic		Symbol	Min	Typ	Max	Unit
Operating Pressure Range	[1]	P_{OP}	0	—	10	kPa
Supply Voltage	[2]	V_S	—	3.0	6.0	V_{DC}
Supply Current		I_o	—	6.0	—	mAdc
Full Scale Span	[3]	V_{FSS}	20	35	50	mV
Offset	[4]	V_{off}	0	20	35	mV
Sensitivity		ΔV/ΔP	—	3.5	—	mV/kPa





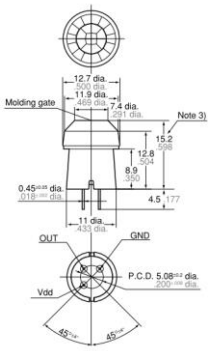


Priklop :

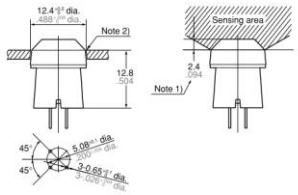
- Napajanje
  - Do 6V
  - GND
- Izhod:
  - Analogni

LV 1,2b: Preizkusi različnih tipal (IR,UZ razdalja, PIR, Hall, …)

2. Slight motion detection type



Recommended PC board pattern (BOTTOM VIEW)



Notes: 1. In order to ensure proper detection, install it with the lens exposed at least 2.4mm .094inch.
2. As for panel mounting hole, tapering or making a large size hole should be done.
3. The height dimension does not include the remaining molding gate.

3. Electrical characteristics (Measuring condition: ambient temp. = 25°C 77°F; operating voltage = 5V) (Common to All types)

1) Digital output

Items			Symbol	Specified value		Measured conditions
				Standard type	Low current consumption type	
Reted operating voltage		Minimum Typical Maximum	Vdd	3.0 V DC — 6.0 V DC	2.2 V DC — 3.0 V DC	
Reted consumption current (Standby) *Remark		Typical Maximum	Iw	170 µA 300 µA	46 µA 60 µA	Iout = 0
Output (when detecting)	Current	Maximum	Iout	100 µA	100 µA	Vout ≧ Vdd–0.5
	Voltage	Minimum Maximum	Vout	Vdd –0.5 —	Vdd –0.5 —	Open when not detecting
Circuit stability time		Typical Maximum	Twu	7 s 30 s	7 s 30 s	

Remark: The current which is consumed during detection consists of the standby consumed current plus the output current.

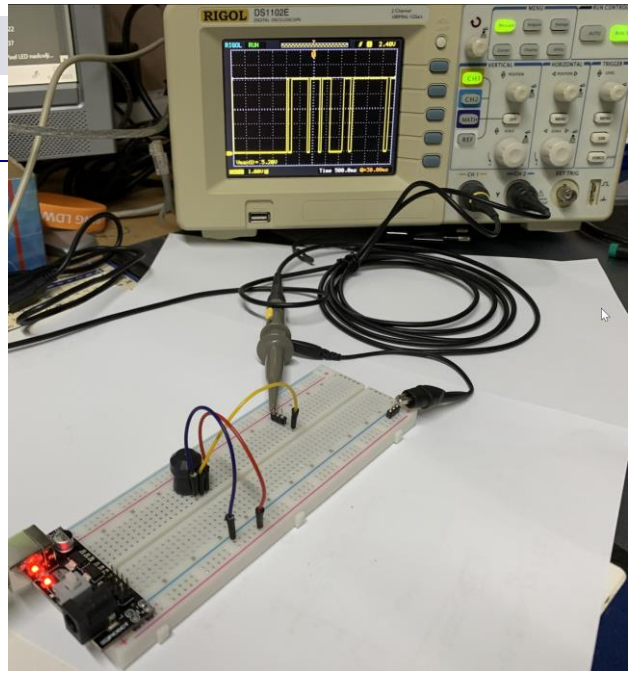
2) Analog output

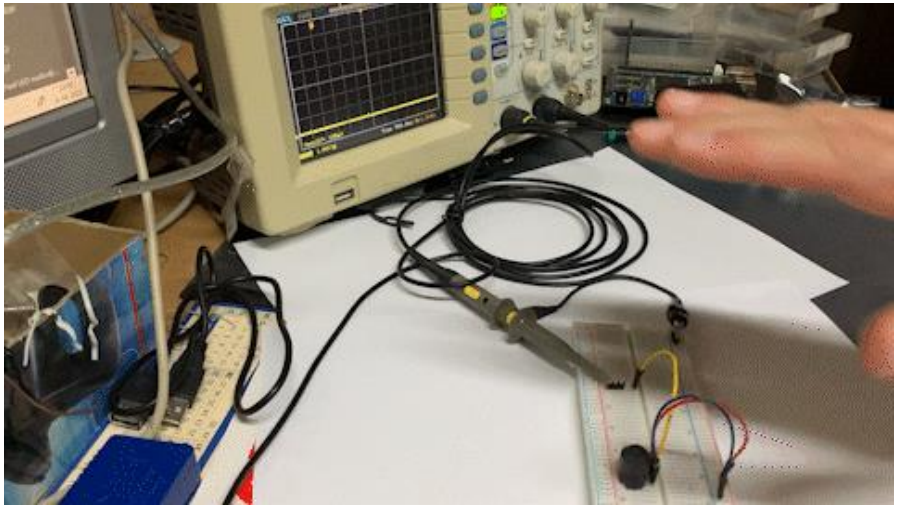
Items		Symbol	Specified value	Measured conditions
Reted operating voltage	Minimum Maximum	Vdd	4.5 V DC 5.5 V DC	
Reted consumption current	Typical Maximum	Iw	0.17 mA 0.3 mA	Iout = 0
Output current	Maximum	Iout	50 µA	
Output voltage	Minimum Typical Maximum	Vout	0 V 2.5 V Vdd	
Output offset average voltage	Minimum Typical Maximum	Voff	2.3 V 2.5 V 2.7 V	Steady-state output voltage when not detecting
Steady-state noise	Typical Maximum	Vn	130 m Vp-p 300 m Vp-p	
Circuit stability time	Maximum	Twu	45 s	

Note: To set to the same detection performance as the digital type, set the output voltage to the offset voltage (2.5V) ±0.45V (i.e. 2.95V or more and 2.05V or less).

Priklop :

- Napajanje
  - 3-6V
  - GND
- Izhod:
  - Digitalni (H/L)





Z naslova <https://eu.mouser.com/ProductDetail/Panasonic-Industrial-Devices/AMN22111?qs=mTeSeKeuVA4zSZ1O6%2F0inQ%3D%3D>

https://eu.mouser.com/datasheet/2/315/panasonic_amn1_2_4-1196943.pdf

Priklop :
- Napajanje
  - 5V Pin1
  - GND Pin9
- Izhod - PWM: Pin4
  - 0-360˚ (1-37ms)

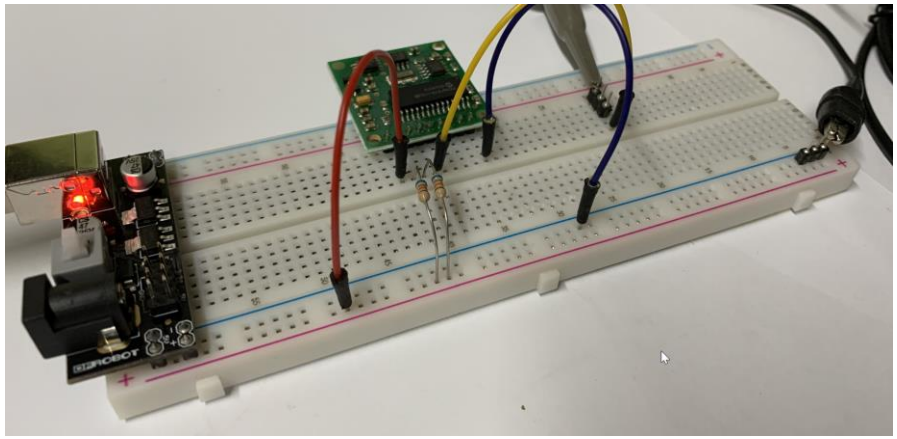
CMPS03 - Compass Module

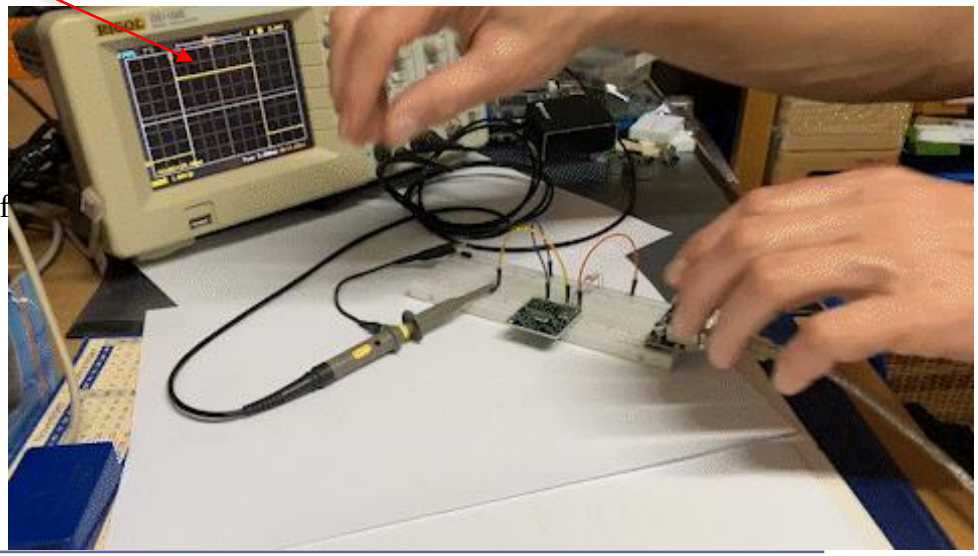
For documentation on CMPS03 revisions prior to Rev14, click here

Earlier versions can be identified by the presence of the silver 8MHz ceramic resonator in the middle of the PCB, this has been removed on new modules.

Rev14 was released March 2007

Z naslova <http://www.robot-electronics.co.uk/htm/cmps3tech.htm>





Connections

Pins 2,3 are the I2C interface and can be used to get a direct readout of the bearing. If the I2C interface is not used then these pins should be pulled high (to +5v) via a couple of resistors. Around 47k is ok, the values are not at all critical.

Pin 4. The PWM signal is a pulse width modulated signal with the positive width of the pulse representing the angle. The pulse width varies from 1mS (0˚) to 36.99mS (359.9˚) – in other words 100uS/˚ with a +1mS offset.

LV 1,2b: Preizkusi različnih tipal (IR,UZ razdalja, PIR, Hall, …)

SHARP

GP2D12

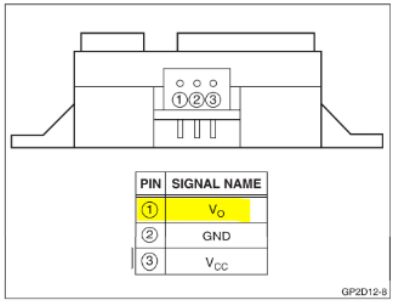
Optoelectronic Device

FEATURES

- Analog output
- Effective Range: 10 to 80 cm
- LED pulse cycle duration: 32 ms
- Typical response time: 39 ms
- Typical start up delay: 44 ms
- Average current consumption: 33 mA
- Detection area diameter @ 80 cm: 6 cm

DESCRIPTION

The GP2D12 is a distance measuring sensor with integrated signal processing and analog voltage output.



PIN	SIGNAL NAME
①	V_O
②	GND
③	V_{CC}

Figure 1. Pinout

SHARP GP2

ELECTRICAL SPECIFICATIONS

Absolute Maximum Ratings

Ta = 25°C, V_{CC} = 5 VDC

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	V_{CC}	-0.3 to +7.0	V
Output Terminal Voltage	V_O	-0.3 to (V_{CC} + 0.3)	V
Operating Temperature	Topr	-10 to +60	°C
Storage Temperature	Tstg	-40 to +70	°C

Operating Supply Voltage

PARAMETER	SYMBOL	RATING	UNIT
Operating Supply Voltage	V_{CC}	4.5 to 5.5	V

Electro-optical Characteristics

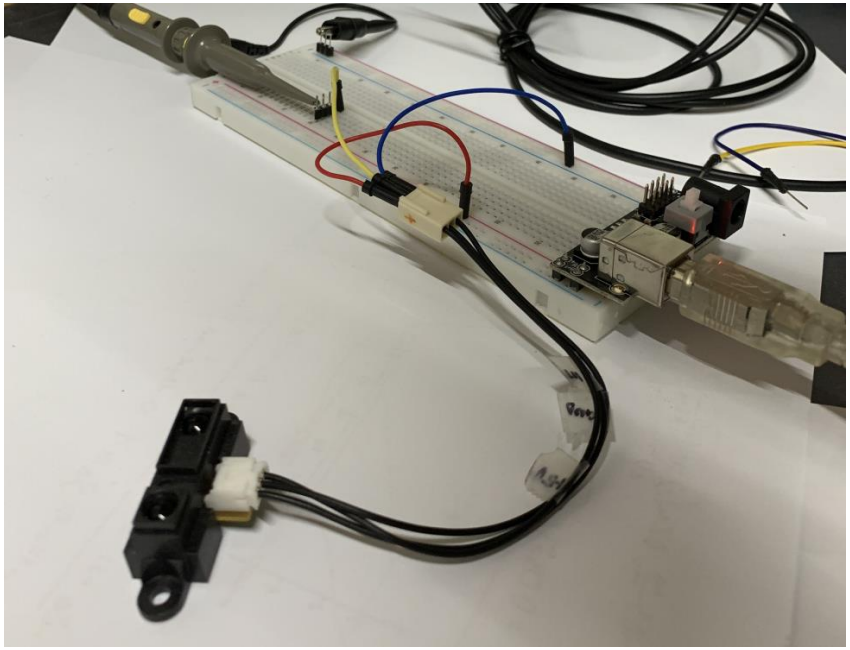
Ta = 25°C, V_{CC} = 5 VDC

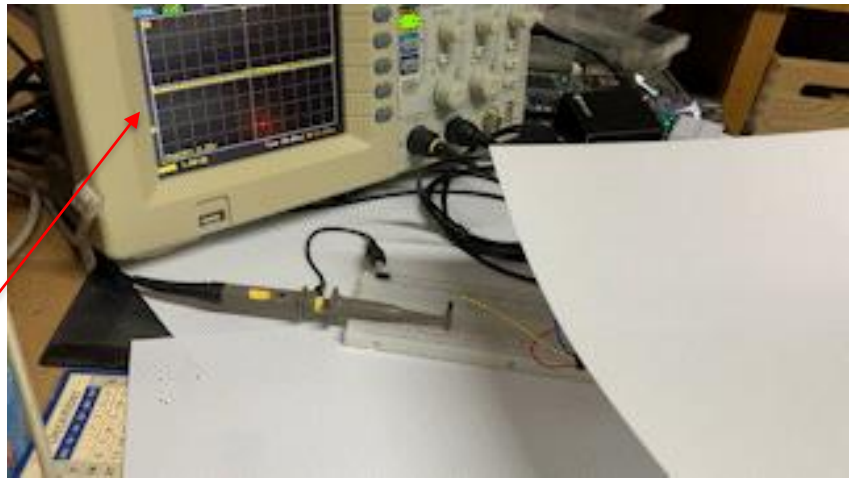
PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT	NOTES
Measuring Distance Range	ΔL		10	-	80	cm	1, 2
Output Voltage	V_O	L = 80 cm	0.25	0.4	0.55	V	1, 2
Output Voltage Difference	ΔV_O	Output change at L change (80 cm - 10 cm)	1.75	2.0	2.25	V	1, 2
Average Supply Current	I_{CC}	L = 80 cm	-	33	50	mA	1, 2

NOTES:
1. Measurements made with Kodak R-27 Gray Card, using the white side, (90% reflectivity).
2. L = Distance to reflective object.

Priklop :

- Napajanje
  - Do 7V
  - GND
- Izhod:
  - Analogni



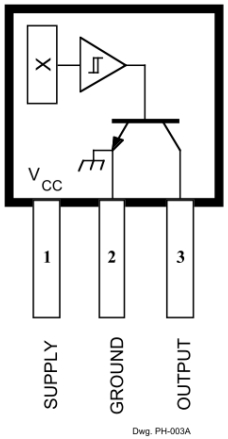


Priklop :
- Napajanje
  - 4.5-24V
  - GND
- Izhod OC – „Open Collector“:
  - Digitalni (OC)
    (10k Pull-up upor)

3141 THRU 3144

Data Sheet 27621.6B*

SENSITIVE HALL-EFFECT SWITCHES FOR HIGH-TEMPERATURE OPERATION



Pinning is shown viewed from branded side.

ABSOLUTE MAXIMUM RATINGS at T_A = +25°C

Supply Voltage, V_{CC}	28 V
Reverse Battery Voltage, V_{RCC}	-35 V
Magnetic Flux Density, B	Unlimited
Output OFF Voltage, V_{OUT}	28 V
Reverse Output Voltage, V_{OUT}	-0.5 V
Continuous Output Current, I_{OUT}	25 mA
Operating Temperature Range, T_A	
Suffix 'E–'	-40°C to +85°C
Suffix 'L–'	-40°C to +150°C
Storage Temperature Range, T_S	-65°C to +170°C

These Hall-effect switches are monolithic integrated circuits with tighter magnetic specifications, designed to operate continuously over extended temperatures to +150°C, and are more stable with both temperature and supply voltage changes. The unipolar switching characteristic makes these devices ideal for use with a simple bar or rod magnet. The four basic devices (3141, 3142, 3143, and 3144) are identical except for magnetic switch points.

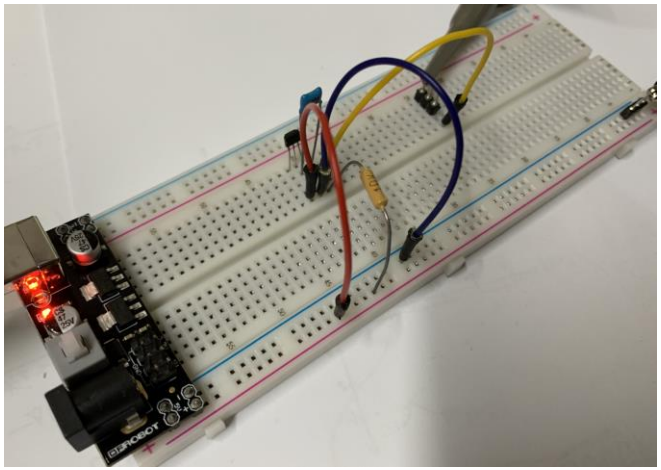
Each device includes a voltage regulator for operation with supply voltages of 4.5 to 24 volts, reverse battery protection diode, quadratic Hall-voltage generator, temperature compensation circuitry, small-signal amplifier, Schmitt trigger, and an open-collector output to sink up to 25 mA. With suitable output pull up, they can be used with bipolar or CMOS logic circuits. The A3141– and A3142– are improved replacements for the UGN/UGS3140–; the A3144– is the improved replacement for the UGN/UGS3120–.

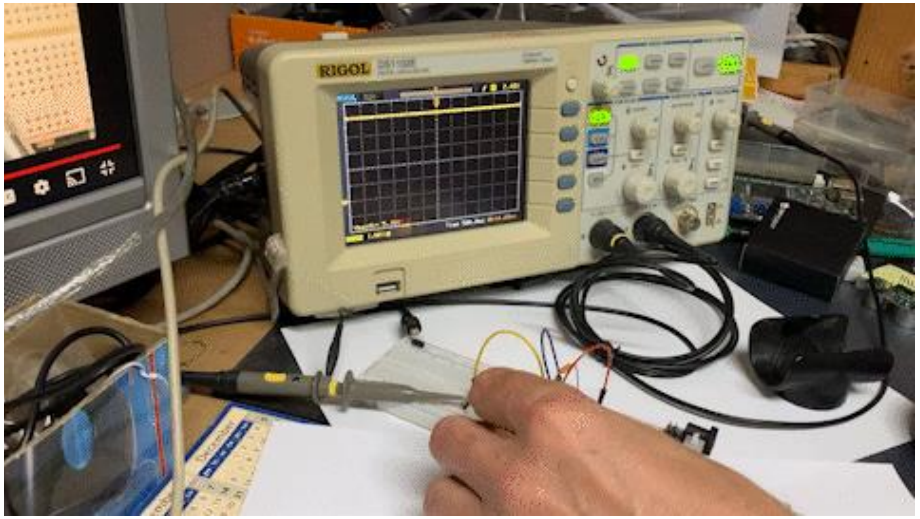
The first character of the part number suffix determines the device operating temperature range. Suffix 'E–' is for the automotive and industrial temperature range of -40°C to +85°C. Suffix 'L–' is for the automotive and military temperature range of -40°C to +150°C. Three package styles provide a magnetically optimized package for most applications. Suffix '–LT' is a miniature SOT89/TO-243AA transistor package for surface-mount applications; suffix '–UA' is a three-lead ultra-mini-SIP.

FEATURES and BENEFITS

- Superior Temp. Stability for Automotive or Industrial Applications
- 4.5 V to 24 V Operation … Needs Only An Unregulated Supply
- Open-Collector 25 mA Output … Compatible with Digital Logic
- Reverse Battery Protection
- Activate with Small, Commercially Available Permanent Magnets
- Solid-State Reliability
- Small Size
- Resistant to Physical Stress

Always order by complete part number, e.g., **A3141ELT** .





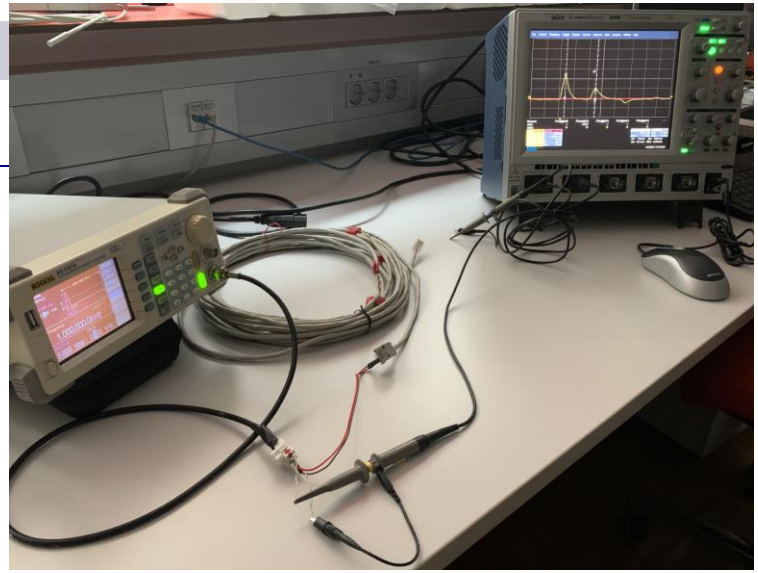
Laboratorijska vaja 9 - LV2

- 9.1: LV2 : Meritve odbojev (razmerja Rv, Rb)
- 9.2: LV2 : Vpliv časa vzpona/padca – omejevanje odbojev

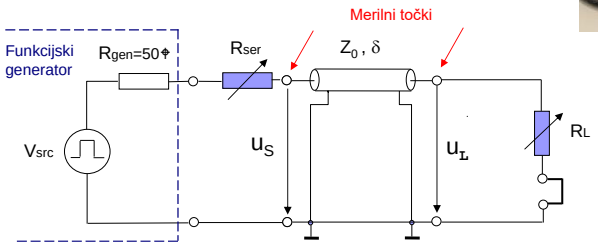
LV1,2 : Izzivi

a) Meritev karakteristične upornosti linije z multimetrom (R_0)
b) Preizkusi različnih tipal (IR,UZ razdalja, PIR, Hall, …)
c) Meritve deformacij UTP kabla

LV 1,2c: Meritve deformacij UTP kabla



Izziv: z ustreznimi orodji (osciloskop, generator, …) določite deformacije (vrsta, razdalja od točke A) na vseh paricah v UTP kablu.



Meritev s pravokotnim signalom, kot pri R_0:
trajanje stopničk = 2 τ

Meritev s kratkim impulzom:
zakasnitev odboja impulza = 2 τ

odboj v - … kratki stik

odboj v + … prekinitev