

Automatizace měřicího pracoviště

Tragédie o N dějstvích, kde $N \in \mathbb{N}$

Petr Polášek

7.11.2023

WTFPL2 licence



bastlíři SH
MacGyver
macgyver.siliconhill.cz

Co je měřicí pracoviště?

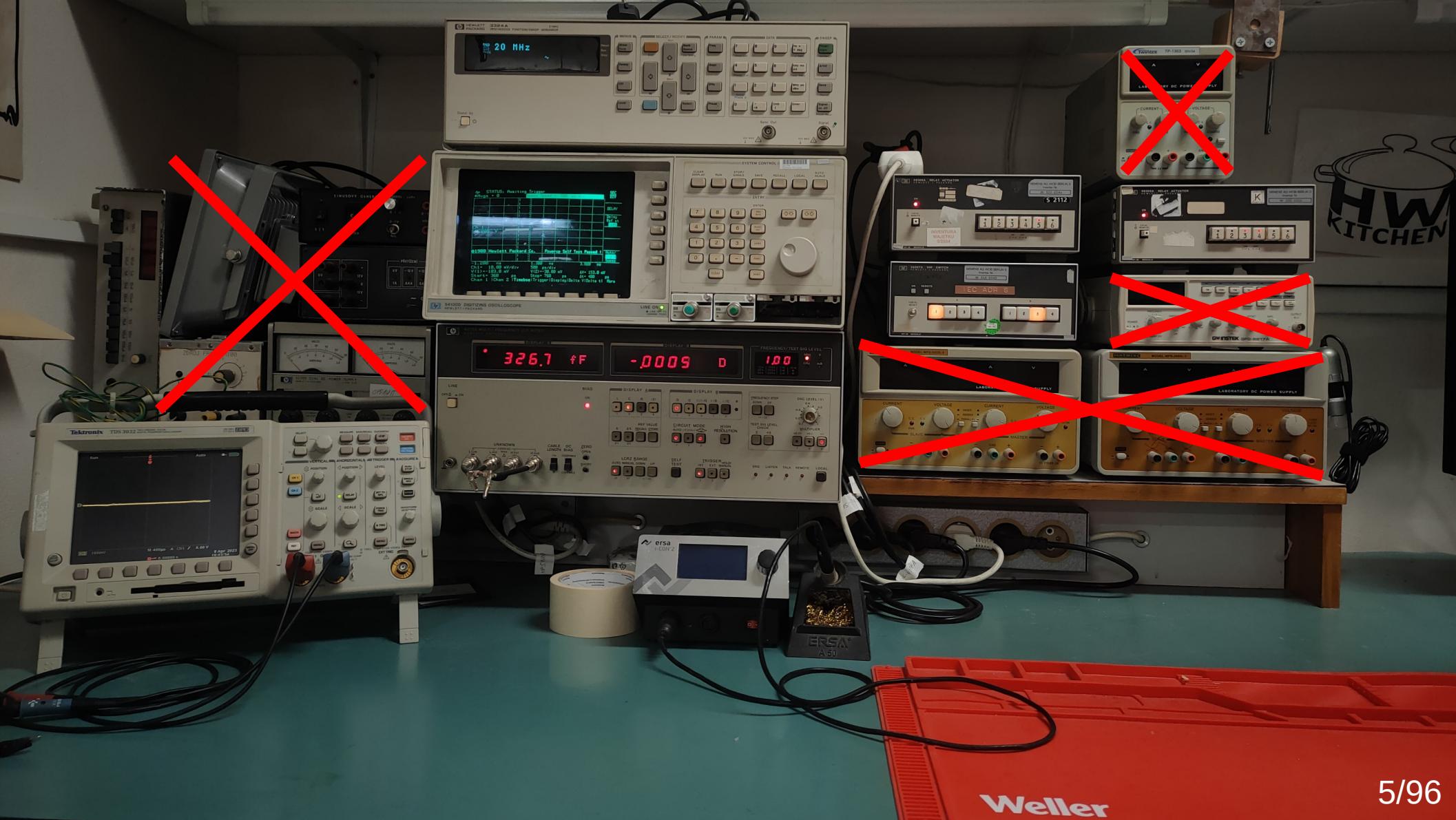
Tedy alespoň pro tuto přednášku



bastlíři SH
MacGyver
macgyver.siliconhill.cz







Proč automatizovat?



bastlíři SH
MacGyver
macgyver.siliconhill.cz

Proč automatizovat?

Sběr dat počítačem

Řízení kroků testů

Žádné přepojování

Více testů s jednou sestavou

Sériové testování



bastlíři SH
MacGyver
macgyver.siliconhill.cz

Co potřebujeme k automatizaci?



bastlíři SH
MacGyver
macgyver.siliconhill.cz

Krok 1

Měřicí zařízení



bastlíři SH
MacGyver
macgyver.siliconhill.cz

WARNING: HAZARDOUS VOLTAGE INSIDE, DO NOT REMOVE THE COVER UNLESS BY SPECIFIED PERSONNEL.

10 MHz In
±5V

10 MHz Out
0dBm

LAN
百兆



42V_{pk}
Modulation In
±5V

Ext Trig/
FSK/Burst
TTL

DIGITAL OUTPUT



00041454

GPIB

100-127V 45-440Hz
100-240V 45-65Hz

Fuse
AC 250V , T2A



SN: DG2A121100050

RS-232

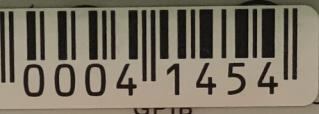


65W Max



WARNING: MAINTAIN GROUND TO AVOID ELECTRIC SHOCK.

WARNING: HAZARDOUS VOLTAGE INSIDE, DO NOT REMOVE THE COVER UNLESS BY SPECIFIED PERSONNEL.



GPIB

100-127V 45-440Hz
100-240V 45-65Hz

10 MHz In ±5V

10 MHz Out 0dBm

42V_{pk} Modulation In ±5V

Ext Trig/
FSK/Burst TTL

DIGITAL OUTPUT



RS-232

Fuse
AC 250V , T2A

SN: DG2A121100050

65W Max



WARNING: MAINTAIN GROUND TO AVOID ELECTRIC SHOCK.

WARNING: HAZARDOUS VOLTAGE INSIDE, DO NOT REMOVE THE COVER UNLESS BY SPECIFIED PERSONNEL.



00041454
GPIB

100-127V 45-440Hz
100-240V 45-65Hz

10 MHz In ±5V

10 MHz Out 0dBm

42V_{pk}
Modulation In ±5V

Ext Trig/
FSK/Burst TTL

DIGITAL OUTPUT

LAN



Fuse
AC 250V , T2A

SN: DG2A121100050

RS-232

65W Max



WARNING: MAINTAIN GROUND TO AVOID ELECTRIC SHOCK.

WARNING: HAZARDOUS VOLTAGE INSIDE, DO NOT REMOVE THE COVER UNLESS BY SPECIFIED PERSONNEL.



GPIB

100-127V 45-440Hz
100-240V 45-65Hz

10 MHz In

$\pm 5V$

10 MHz Out

0dBm

LAN



$42V_{pk}$
 \pm

Modulation In

$\pm 5V$

Ext Trig/
FSK/Burst

TTL

DIGITAL OUTPUT



RS-232



Fuse

AC 250V , T2A

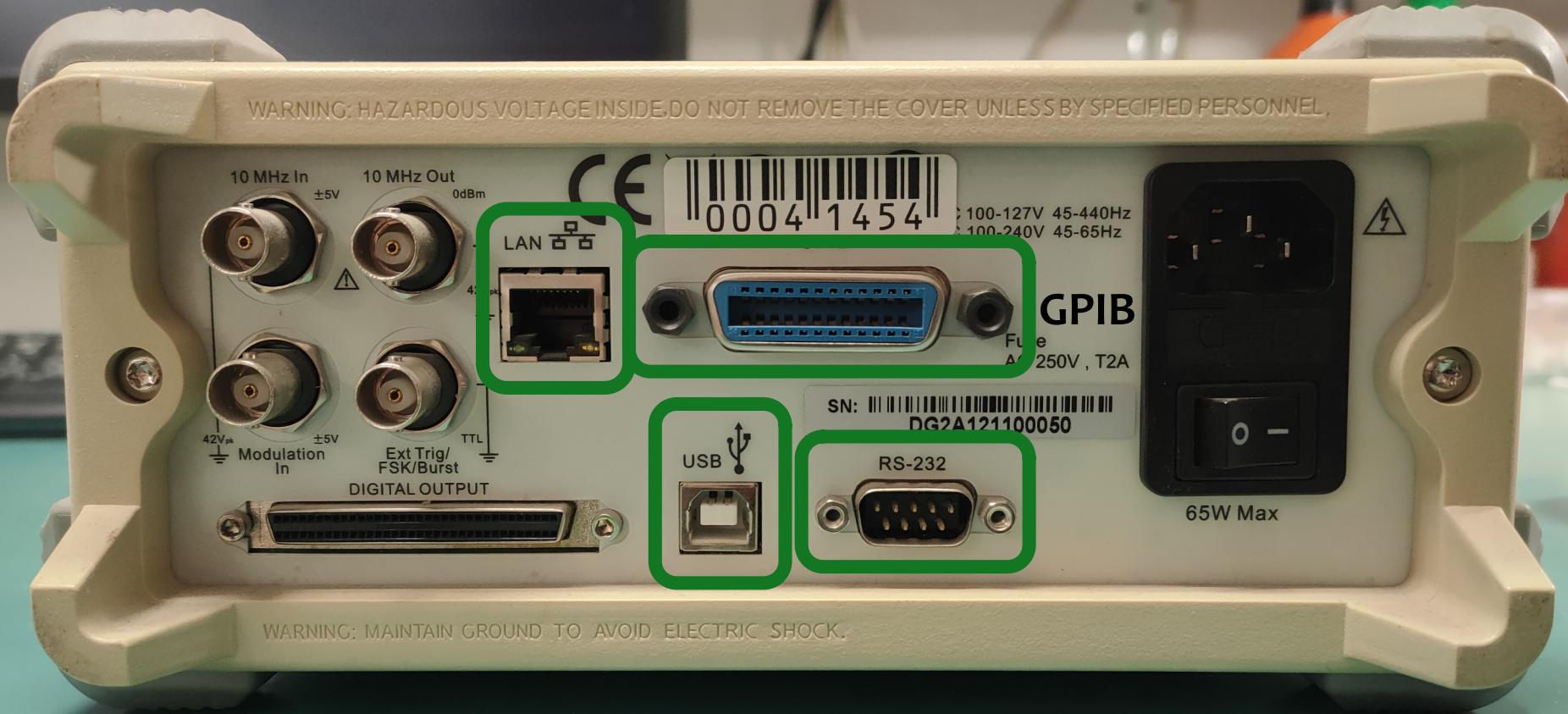
SN:

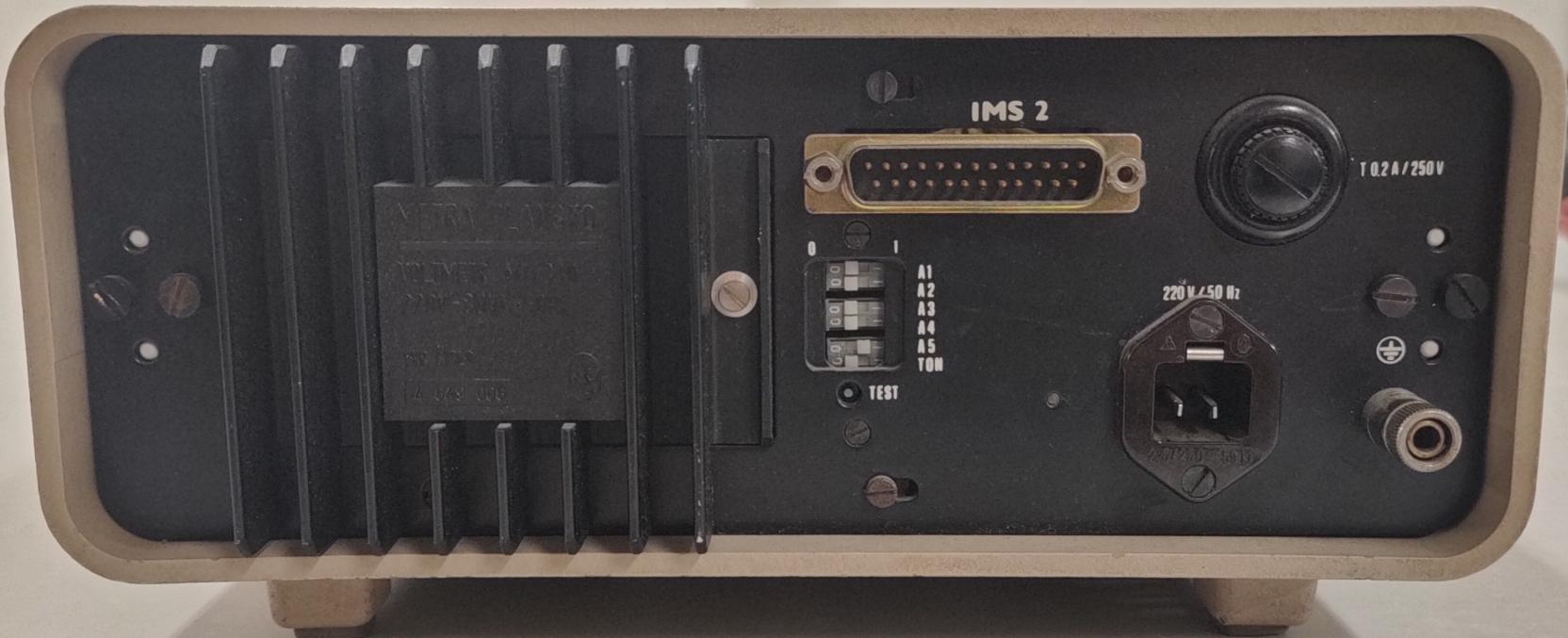
DG2A121100050

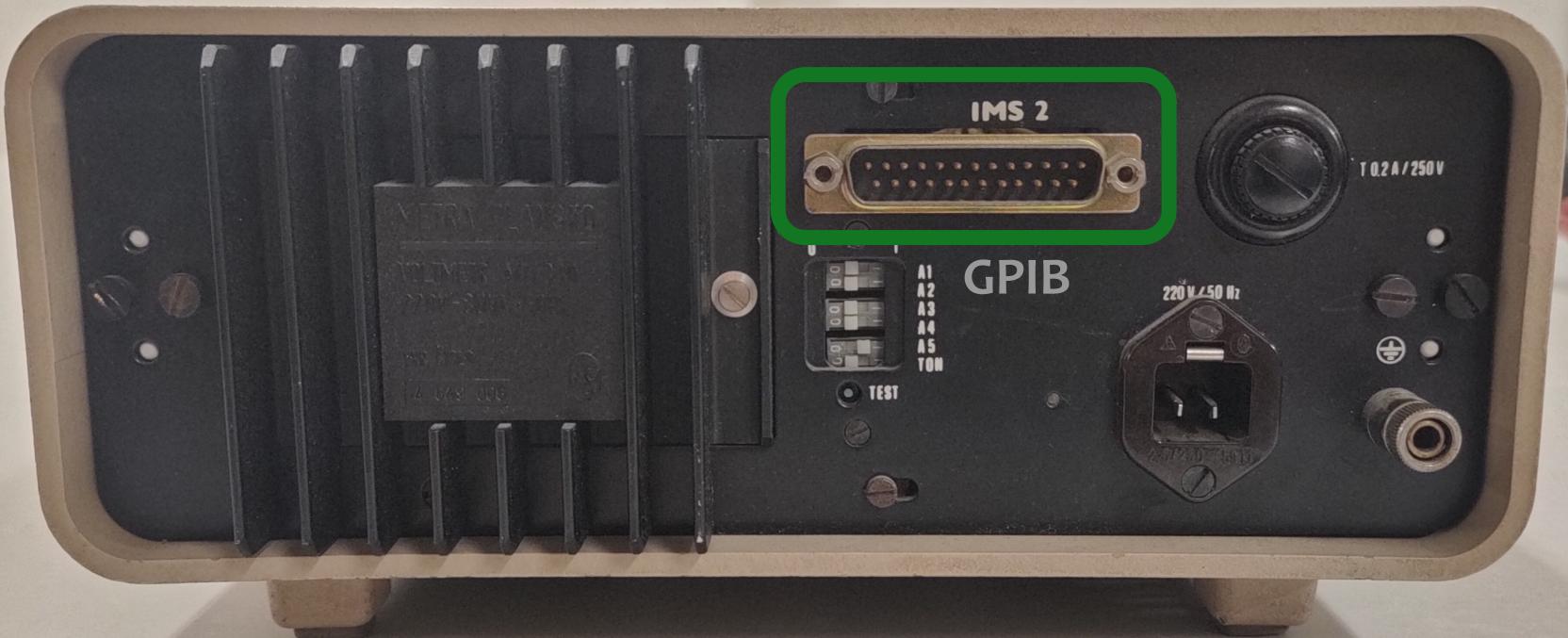
65W Max

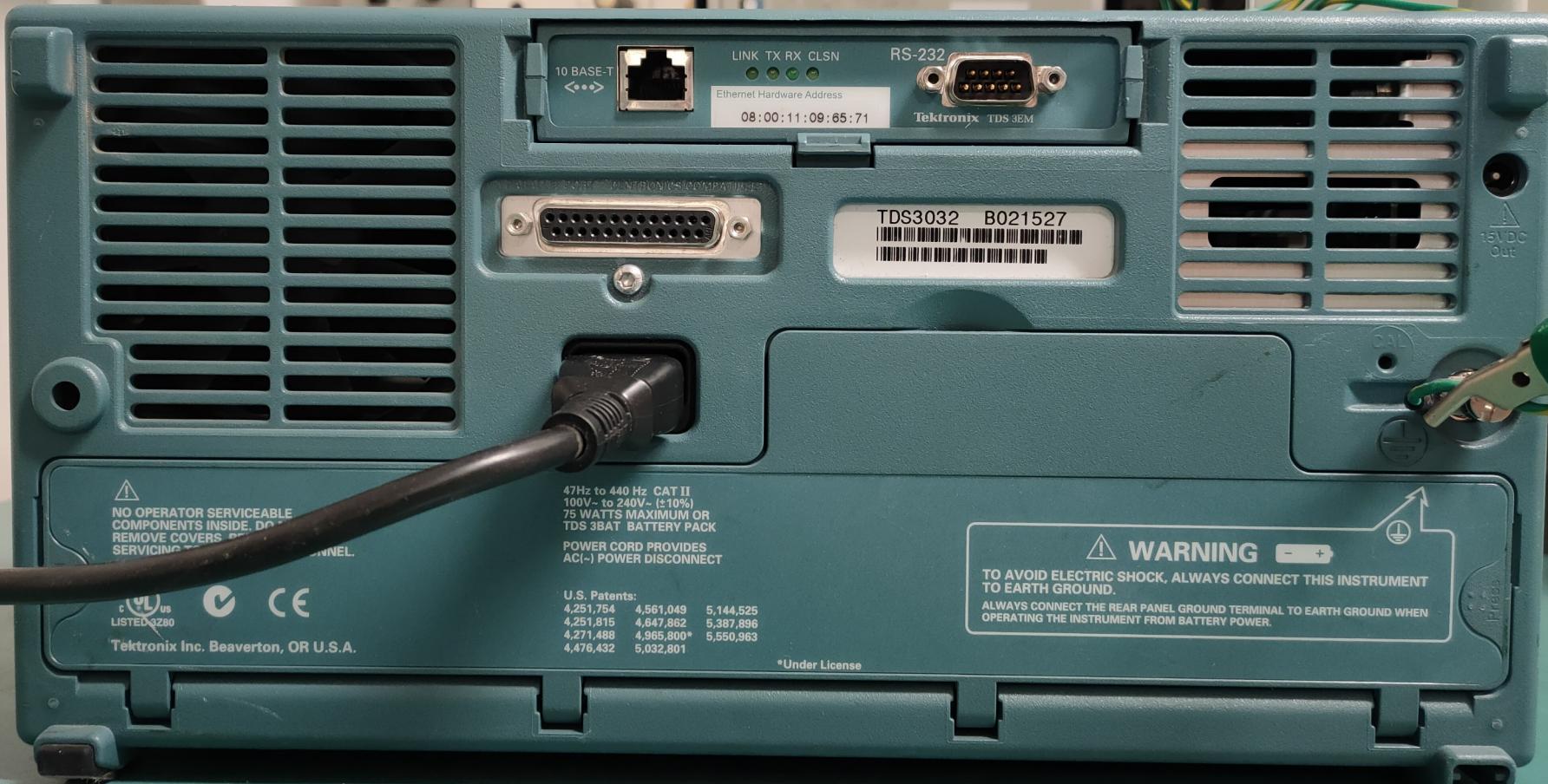


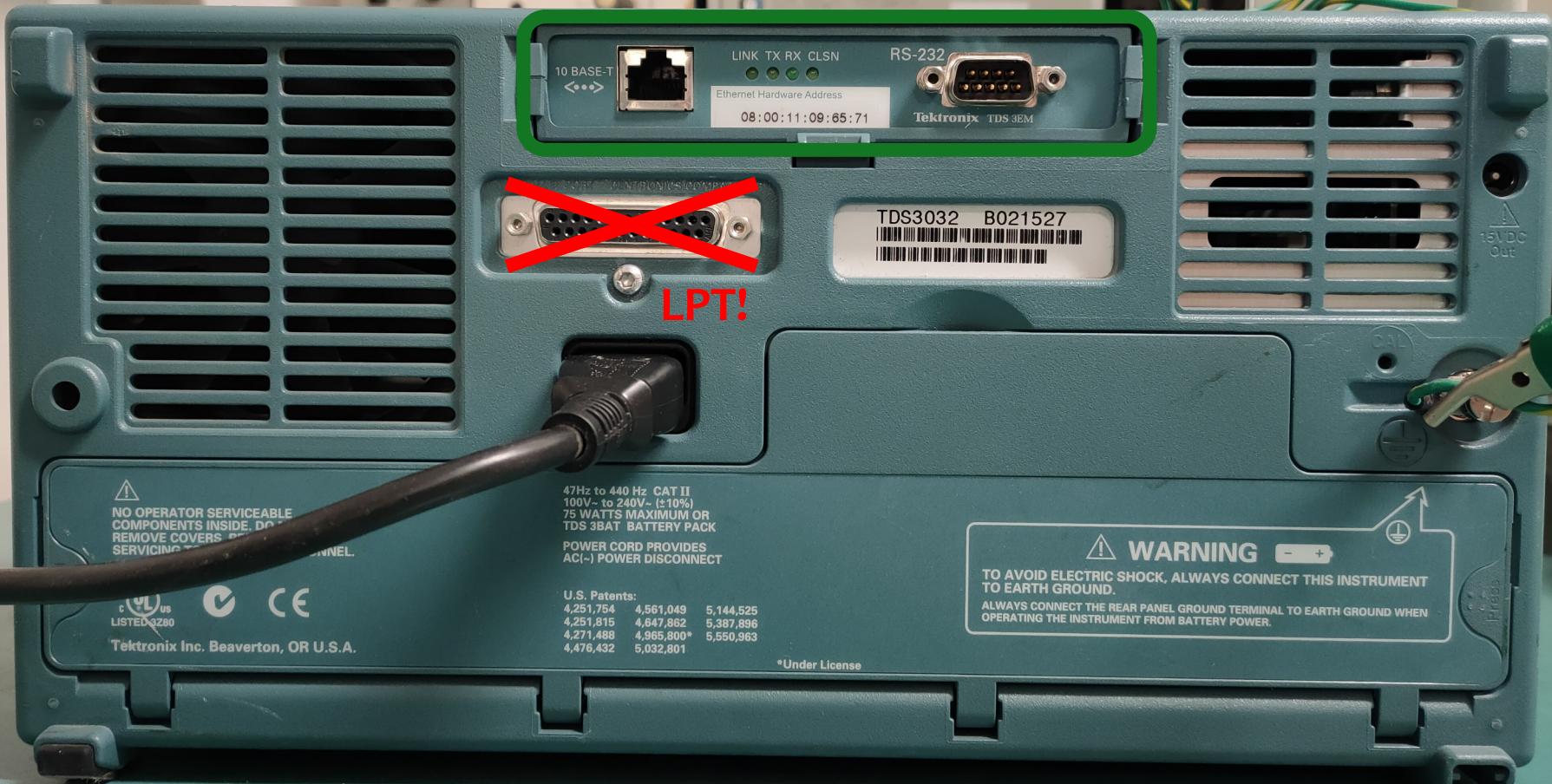
WARNING: MAINTAIN GROUND TO AVOID ELECTRIC SHOCK.











Krok 2

Adaptér pro daný interface

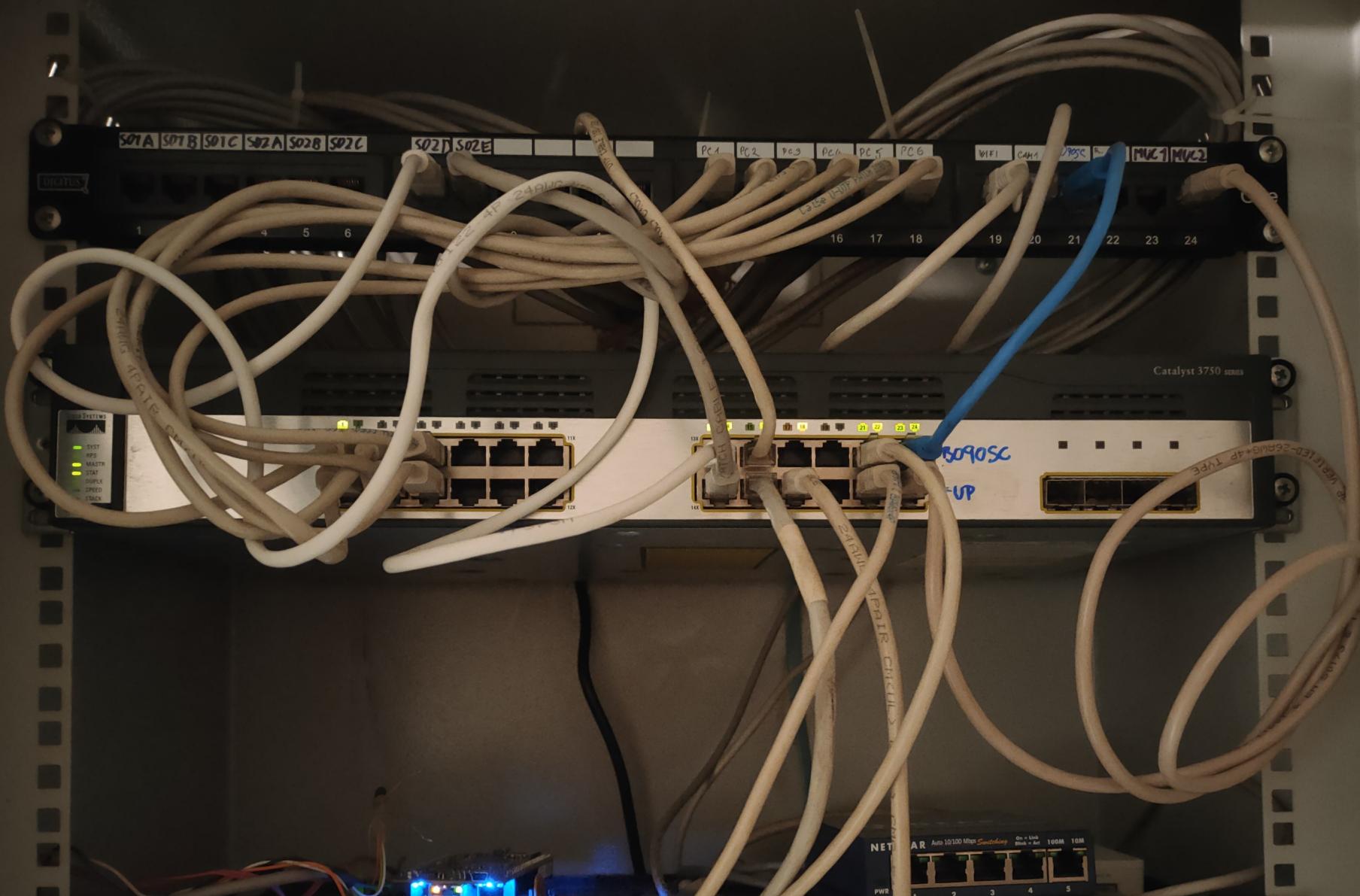


bastlíři SH
MacGyver
macgyver.siliconhill.cz

Ethernet



bastlíři SH
MacGyver
macgyver.siliconhill.cz



USB



bastlíři SH
MacGyver
macgyver.siliconhill.cz





bastlíři SH
MacGyver
macgyver.siliconhill.cz

RS-232

< 200 Kč na Alze :-)





bastlíři SH
MacGyver
macgyver.siliconhill.cz

GPIB

HP-IB, IEEE-488, IEC 60488, IMS-2



USB, Analyzer Software Included, IEEE 488 GPIB Instrument Control Device

The GPIB-USB-HS+ is an IEEE 488 controller and portable analyzer device.

GPIB-USB-HS+

FROM €1.120,00

 Price may vary with addition of accessories and services.

Model Overview

Bus Connector: **USB 2.0**

Low Profile: **No**

Onboard GPIB Analyzer: **Yes**

Supported Power Input: --

[See more ▾](#)

Specifications

 **Supported Operating System**

Windows

Quantity

1

Select

[Contact sales ▶](#)

Oficiální e-shop
National
Instruments





USB, IEEE 488 GPIB Instrument Control Device

The GPIB-USB-HS is an IEEE 488 controller device for computers with USB slots. The GPIB-USB-HS achieves maximum IEEE 488.2 performance. With

GPIB-USB-HS

FROM € 1.650,00

 Price may vary with addition of accessories and services.

Model Overview

Life Cycle Status: **Mature**

Bus Connector: USB 2.0

Low Profile: No

Onboard GPIB Analyzer: No

[See more ▾](#)

Specifications

Supported Operating System

Windows

Quantity

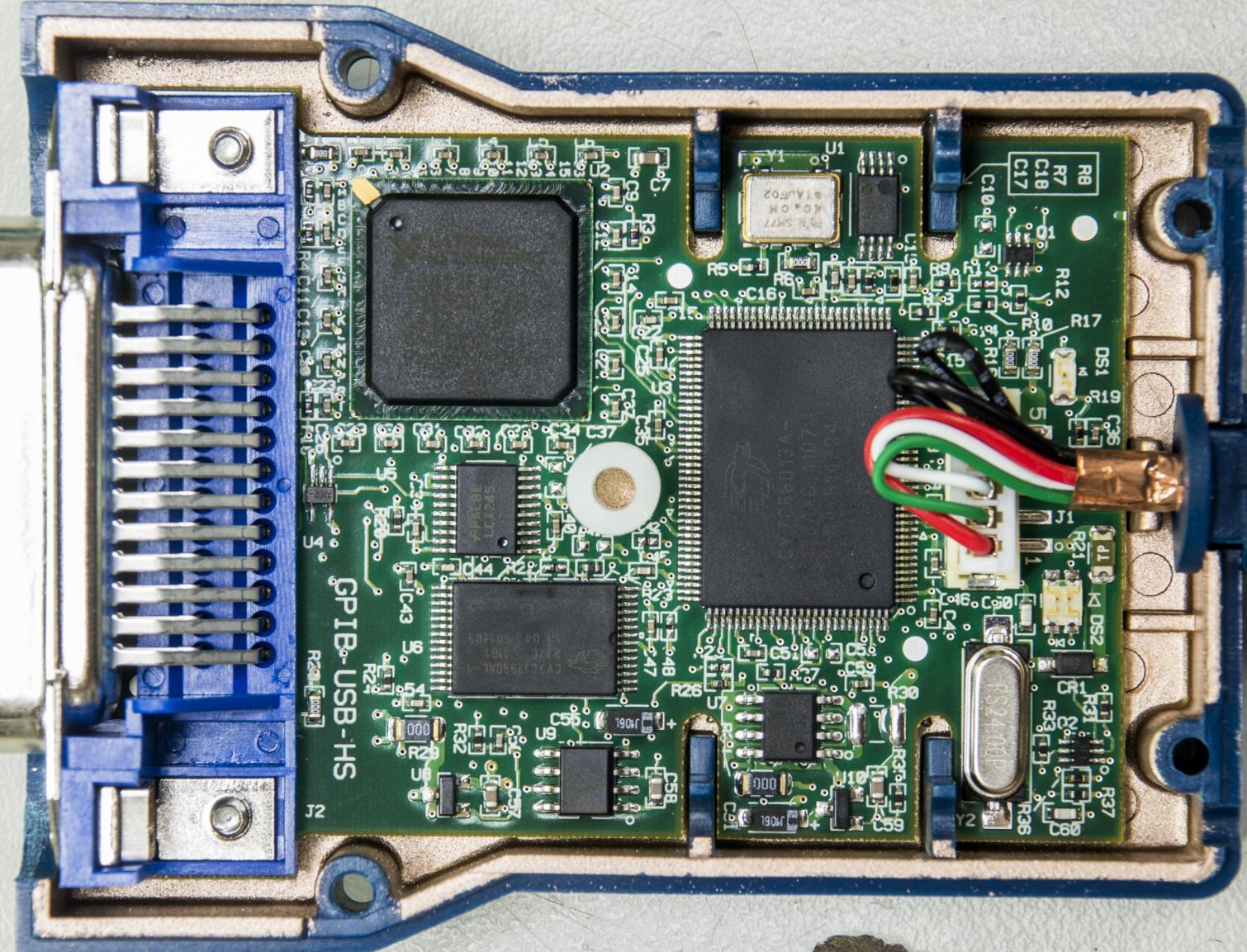
1

Select

[Contact sales ▶](#)

Oficiální e-shop
National
Instruments





xDevs.com



82357B USB/GPIB Interface High-Speed USB 2.0



Easily connect to GPIB instruments from a USB port; no switches, no PC cards, and no external power supplies required

Sold by: Keysight Online Sales

82357B USB/GPIB interface

[+ Show Details](#)

US\$ 737

 2 Day Delivery – [Included](#)

After order processing 

[Other Delivery Options](#) 

 Add to Cart

Also Sold By :

- Authorized Sales Partners
- Keysight Direct Sales

[See Buy or Rent Options](#)

Starting from US\$ 737

[Get Quote](#)

 [View Options and Upgrades](#)

 [Visit Technical Support](#)

Oficiální e-shop
Keysightu



GPIB-ETHERNET Controller 1.2

\$499.95 [Buy Now](#)

Prologix GPIB-ETHERNET (GPIB-LAN) controller converts any computer with a network port into a GPIB Controller or Device. This controller can operate in controller or device mode.

- [Manual](#)
- [Frequently Asked Questions](#)
- [Firmware Update](#)



GPIB-USB Controller 6.0

\$299.95 [Buy Now](#)

Prologix GPIB-USB (HPIB-USB) controller converts any computer with an USB port into a GPIB (HPIB) Controller or Device. This controller can operate in listener, talker, or controller mode.

- [Manual](#)
- [USB Driver \(Microsoft Windows versions\)](#)
- [USB Driver \(Linux and Mac OS X\)](#)
- [Frequently Asked Questions](#)
- [Firmware Update](#)

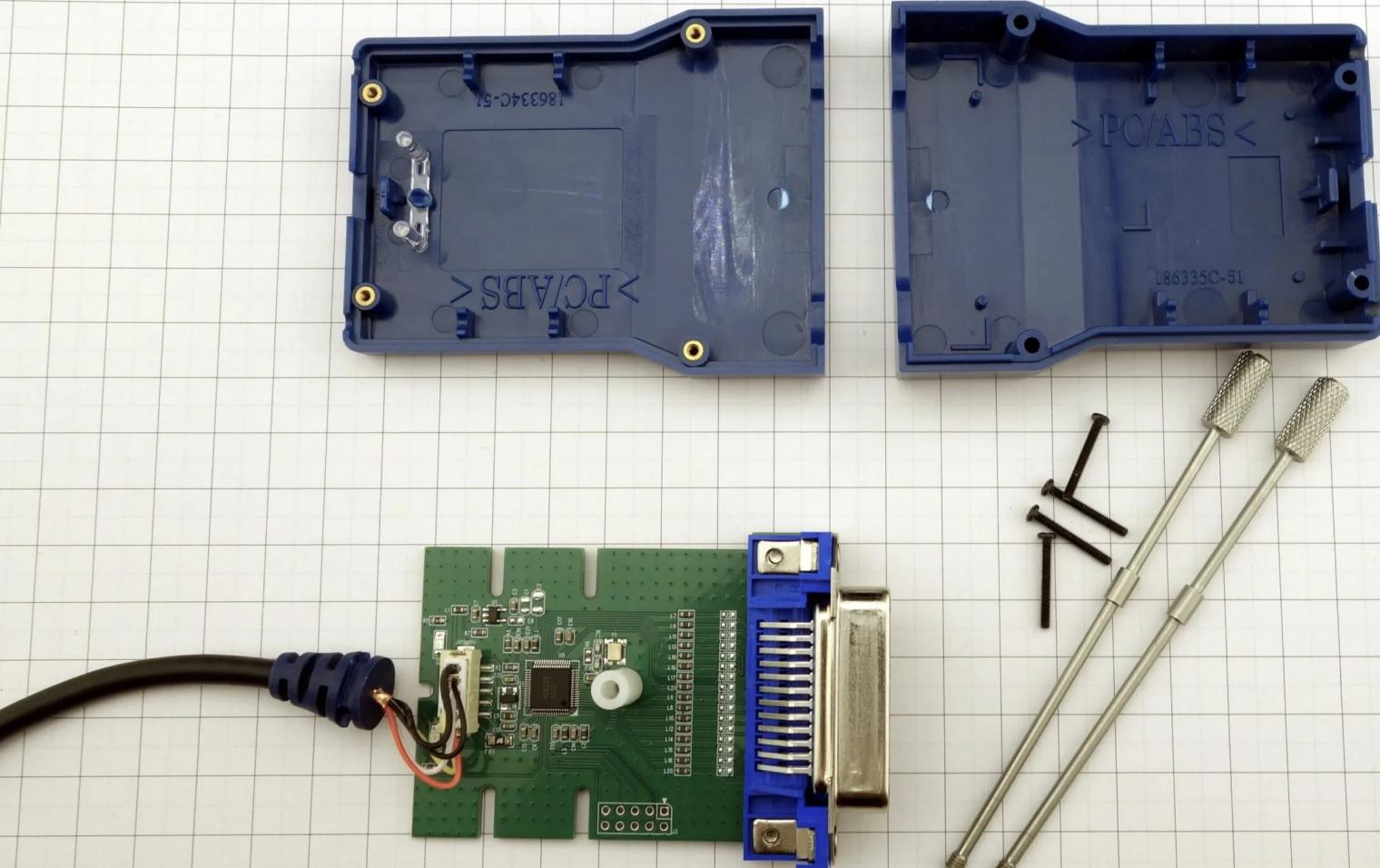


Oficiální e-shop
Prologixu



\$80 na
AliExpressu

Wan Hung Lo
Electronics





1629 Kč + doprava
na Aukru od MkiiT

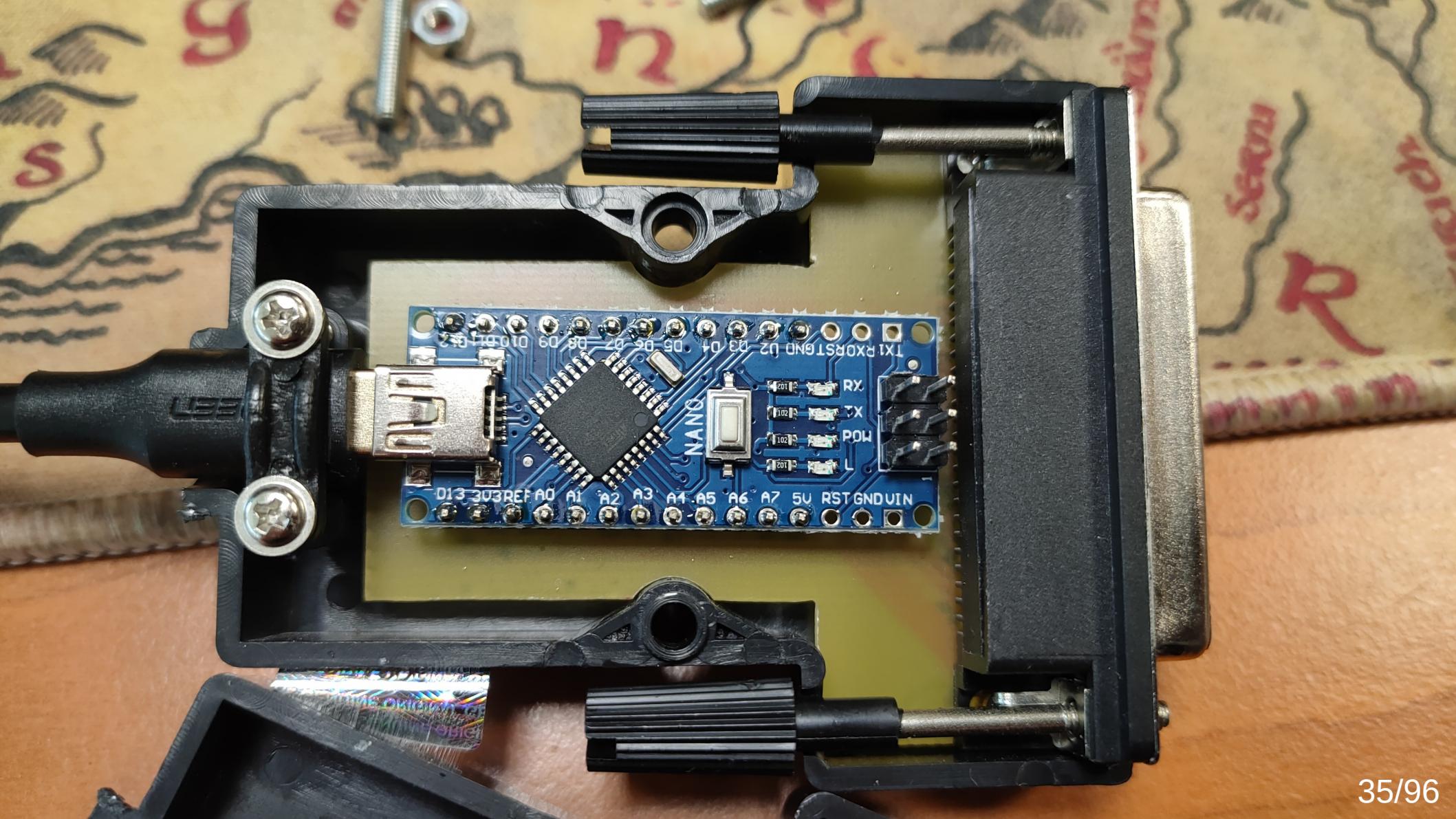


Úkrok stranou

Vyrobme si GPIB adaptér



bastlíři SH
MacGyver
macgyver.siliconhill.cz



M1T380 IMS2-USB v1.1

BOM

Arduino Nano:	\$3
GPIB konektor:	\$2
USB kabel:	<\$3
Univerzální plošňák:	<\$2
Cín, drát, izolačka:	z šuplete
AR488:	GPL 3.0



Co bylo opomenuto

RS-485/ModBus (průmysl, Riden, ...)

IMS-1 (pfuj)

Optická sériovka (ruční multometry)

VME/VXI

Wi-Fi, Bluetooth, ZigBee, ...



bastlíři SH
MacGyver
macgyver.siliconhill.cz

Krok 3

Jak to funguje?



bastlíři SH
MacGyver
macgyver.siliconhill.cz



bastlíři SH
MacGyver
macgyver.siliconhill.cz

RS-232

RS-232

- L1: Nejčastěji 9600 Bd, 8N1
- L2: Textový přenos
- L3: SCPI
- L4: VISA



bastlíři SH
MacGyver
macgyver.siliconhill.cz

Co je SCPI?



bastlíři SH
MacGyver
macgyver.siliconhill.cz

SCPI

- :PŘÍKAZ** (nic nevrací)
- :DOTAZ?** (vrací data)
- :PŘÍKAZ** parametr
- :CESTA:STROMEM:PŘÍKAZ/DOTAZ?**
- *OBECNÝ_PŘÍKAZ/DOTAZ?**

SCPI Basics,
Keysight



bastlíři SH
MacGyver
macgyver.siliconhill.cz

:ACQuire:TYPE

Syntax :ACQuire:TYPE <type>

:ACQuire:TYPE?

Description Sets or queries the acquisition mode of the oscilloscope.

Parameter	Name	Type	Range	Default
	<type>	Discrete	{NORMAL AVERages PEAK HRESolution}	NORMAL

- Remarks**
- NORMAL: In this mode, the oscilloscope samples the signal at a specified fixed time interval to rebuild the waveform. For most of the waveforms, using this mode can produce the optimal display effects.
 - AVERages: In this mode, the oscilloscope averages the waveforms from multiple samples to reduce the random noise of the input signal and improve the vertical resolution. Greater number of averages can lower the noise and increase the vertical resolution; while at the same time, it will slow the response of the displayed waveform to the waveform changes.
 - PEAK: indicates the peak detection. In this mode, the oscilloscope samples the maximum and minimum value of the signal at the fixed sampling interval to acquire the signal envelope or the narrow pulses that might be lost. In this mode, signal aliasing can be prevented, but the noise displayed would be larger.
 - HRESolution: the oscilloscope averages the neighbouring points of the sampled waveform to reduce the random noise on the input signal and display smoother waveform on the screen. This mode is usually used when the sample rate of the digital converter is greater than the storage rate of the sample storage.

Return Format The query returns NORM, AVER, PEAK or HRES.

Example :ACQuire:TYPE AVERages /*Sets the acquisition mode to AVERages.*/
:ACQuire:TYPE? /*The query returns AVER.*/

MSO5000
Programming
manual, Rigol



07/04/2023 14:30:44

*IDN?

07/04/2023 14:30:44

OWON,ODP6033,2211231,FV:V3.1.0

07/04/2023 14:36:18

SYSTem:REMote

07/04/2023 14:37:10

APP:VOLT 1,2,3

07/04/2023 14:37:52

MEAS:VOLT?

07/04/2023 14:37:52

0.998

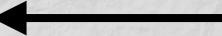


bastlíři SH

MacGyver

macgyver.siliconhill.cz

07/04/2023 14:30:44
*IDN?



07/04/2023 14:30:44
OWON,ODP6033,2211231,FV:V3.1.0

07/04/2023 14:36:18
SYSTem:REMote

07/04/2023 14:37:10
APP:VOLT 1,2,3

07/04/2023 14:37:52
MEAS:VOLT?

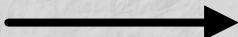
07/04/2023 14:37:52
0.998



bastlíři SH
MacGyver
macgyver.siliconhill.cz

07/04/2023 14:30:44

*IDN?



07/04/2023 14:30:44

OWON,ODP6033,2211231,FV:V3.1.0

07/04/2023 14:36:18

SYSTem:REMote

07/04/2023 14:37:10

APP:VOLT 1,2,3

07/04/2023 14:37:52

MEAS:VOLT?

07/04/2023 14:37:52

0.998



bastlíři SH

MacGyver

macgyver.siliconhill.cz

07/04/2023 14:30:44

*IDN?

07/04/2023 14:30:44

OWON,ODP6033,2211231,FV:V3.1.0

07/04/2023 14:36:18

SYSTem:REMote



07/04/2023 14:37:10

APP:VOLT 1,2,3

07/04/2023 14:37:52

MEAS:VOLT?

07/04/2023 14:37:52

0.998



bastlíři SH

MacGyver

macgyver.siliconhill.cz

07/04/2023 14:30:44

*IDN?

07/04/2023 14:30:44

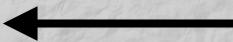
OWON,ODP6033,2211231,FV:V3.1.0

07/04/2023 14:36:18

SYSTem:REMote

07/04/2023 14:37:10

APP:VOLT 1,2,3



07/04/2023 14:37:52

MEAS:VOLT?

07/04/2023 14:37:52

0.998



bastlíři SH

MacGyver

macgyver.siliconhill.cz

07/04/2023 14:30:44

*IDN?

07/04/2023 14:30:44

OWON,ODP6033,2211231,FV:V3.1.0

07/04/2023 14:36:18

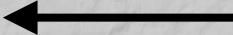
SYSTem:REMote

07/04/2023 14:37:10

APP:VOLT 1,2,3

07/04/2023 14:37:52

MEAS:VOLT?



07/04/2023 14:37:52

0.998



bastlíři SH

MacGyver

macgyver.siliconhill.cz

07/04/2023 14:30:44

*IDN?

07/04/2023 14:30:44

OWON,ODP6033,2211231,FV:V3.1.0

07/04/2023 14:36:18

SYSTem:REMote

07/04/2023 14:37:10

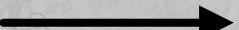
APP:VOLT 1,2,3

07/04/2023 14:37:52

MEAS:VOLT?

07/04/2023 14:37:52

0.998



bastlíři SH

MacGyver

macgyver.siliconhill.cz

08/04/2023 14:20:50

*IDN?

08/04/2023 14:20:50

Rigol Technologies,DS1302CA,DS1AA120300007,03.09.00



08/04/2023 14:22:46

Name Waveform data

Type JavaScript

Result: Success



08/04/2023 14:22:46

application/eez-raw, 5 KB

Channel: 1, Sampling rate: 20000, Timebase: 0.005s, Vertical scale: 10 V, Offset: 0 V



08/04/2023 14:27:28

:MEASure:FREQuency?

USB



bastlíři SH
MacGyver
macgyver.siliconhill.cz

USB

L1: USB 2.0

L2: RAW / VCP / USB-TMC

L3: VISA (mimo RAW)

L4: SCPI (mimo RAW)



bastlíři SH
MacGyver
macgyver.siliconhill.cz

Ethernet



bastlíři SH
MacGyver
macgyver.siliconhill.cz

Ethernet

L1: Ethernet

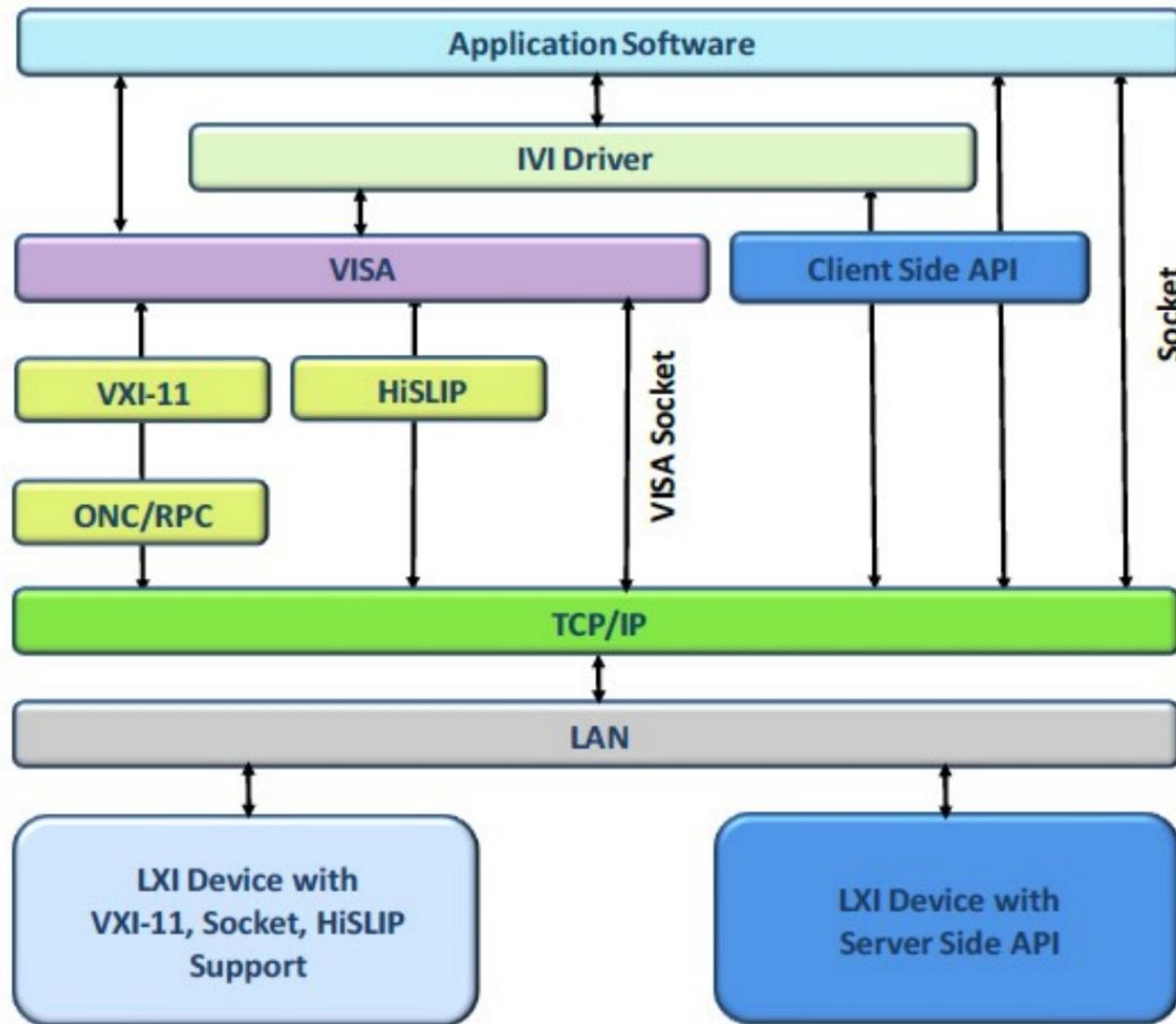
L2+: TCP

Ln: VISA Socket / ONC/RPC+VXI-11 / HiSLIP

Ln+1: VISA, LXI + mDNS

Ln+2: SCPI



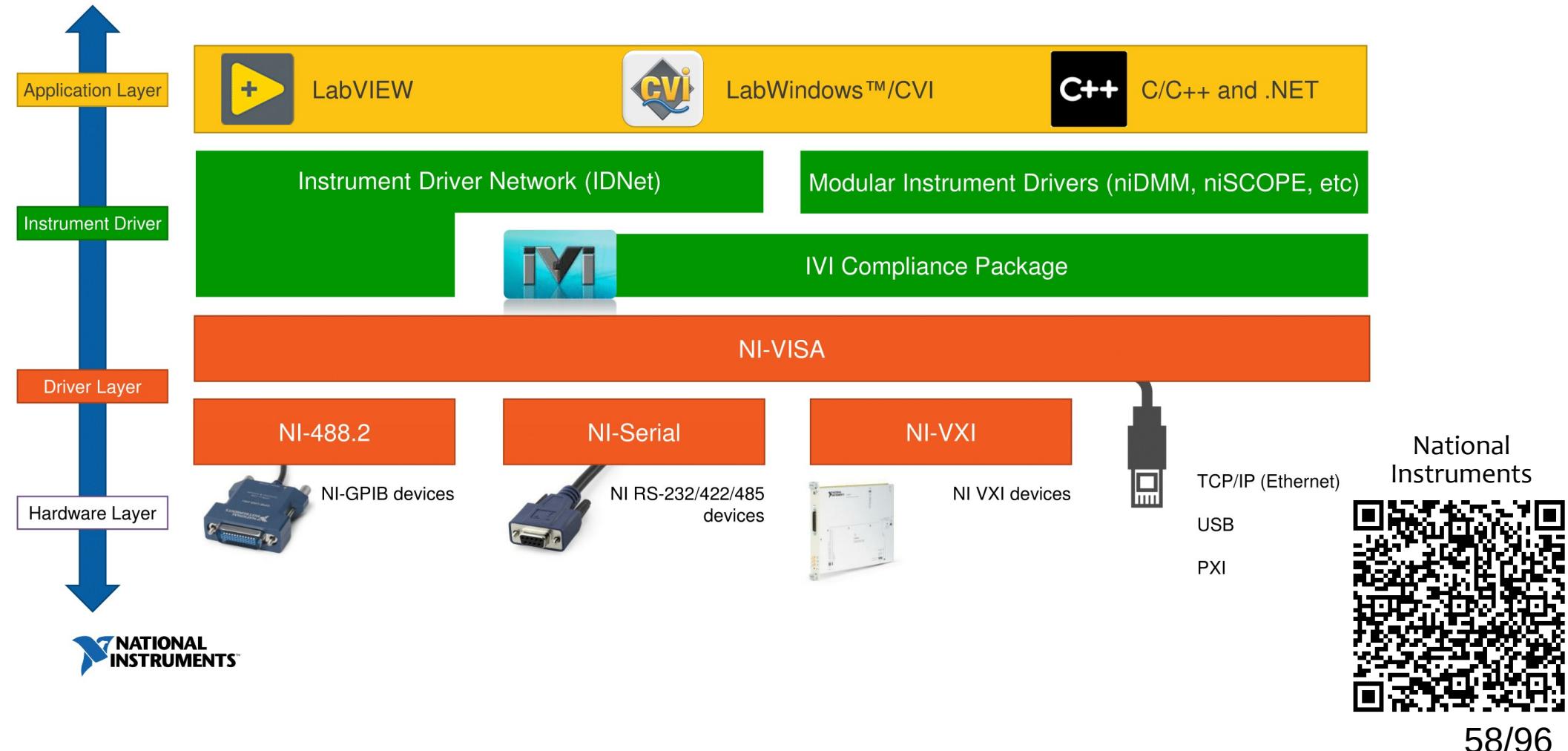


LXI Consortium



Figure 1. Communication Interfaces to LXI Devices

Instrument Control Layers



VISA

API, abstraktní interface

Autodetekce (mDNS)

Unikátní identifikace

Interface::Address::Format

TCPIPo::192.168.1.110::INSTR

USBn::VID::PID::S/N::INSTR



bastlíři SH
MacGyver
macgyver.siliconhill.cz

VISA knihovny

Rohde Schwarz
National Instruments
Keysight
OpenVISA
PyVISA-Py



bastlíři SH
MacGyver
macgyver.siliconhill.cz

GPIB



bastlíři SH
MacGyver
macgyver.siliconhill.cz

GPIB

Paralelní, 8b, handshaking, řízení toku
31 zařízení

Controller, talker, listener

Příkazy pro zařízení + sběrnici

SCPI



bastlíři SH
MacGyver
macgyver.siliconhill.cz

Příkazy pro ovládání/konfiguraci rozhraní

Nastavení adresy

`++addr [1-29]`, kde hodnota 1 až 29 je IMS-2 adresa připojeného přístroje. Po připojení rozhraní do USB portu počítače je hodnota adresy nastavena na „1“.

Příklady:

`++addr 1` ... nastaví adresu „1“ pro komunikaci s multimetrem
`++addr` ... vrací aktuálně nastavenou hodnotu adresy

Spouštění přístroje (Device Trigger - DT)

`++trg` ... vyšle přístroji signál Device Trigger (informaci o reakci přístroje na signál poskytne manuál přístroje, většinou se jedná o spuštění měření)

Čtení zpráv z multimetru

`++read` ... přečtení informace vyslané přístrojem

Obsluha funkce service request (SRQ)

`++srq` ... příkaz vrací aktuální stav signálu SRQ, který nabývá hodnot „0“ nebo „1“. Pokud je stav signálu SRQ roven hodnotě „1“, přístroj žádá o obsluhu. Konkrétní význam signálu SRQ pro daný přístroj viz. návod k jeho obsluze.

Stavové slovo přístroje (Serial Pool)

Poskytuje informaci o aktuálním stavu přístroje. K tomuto účelu slouží funkce `++spoll`:

`++spoll` ... žádost pro přístroj, aby vyslal stavové slovo; příkaz vrací 8-bitové číslo v dekadické reprezentaci (informaci o významu stavového slova poskytne manuál přístroje)

Přechod do místního ovládání (GTL – Go To Local)

`++loc` ... přepne přístroj do lokálního ovládání

Uzamknutí dálkového ovládání (LLO)

`++llo` ... adresuje přístroj v režimu zamknutého lokálního ovládání (tj. přístroj nelze ovládat z přístrojového panelu)

Vynulování přístroje (DC – Device Clear)

`++clr` ... vyšle přístroji signál Device Clear (informaci o reakci přístroje na signál poskytne manuál přístroje)

Nulování stykových funkcí (IFC – Interface Clear)

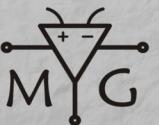
`++ifc` ... vyšle přístroji signál Interface Clear (informaci o reakci přístroje na signál poskytne manuál přístroje)

Informace o verzi rozhraní

`++ver` ... vrátí informaci o verzi rozhraní ve tvaru „IMS-2 <-> USB interface, ver. X.Y.Z“

Krok 4

Jak na automatizaci?



bastlíři SH
MacGyver
macgyver.siliconhill.cz

Automatizační software

LabView (520+€/rok)

MATLAB (154+€) / Octave

LXI Tools (jen LXI)

PyVISA + PyVISA-Py

EEZ Studio

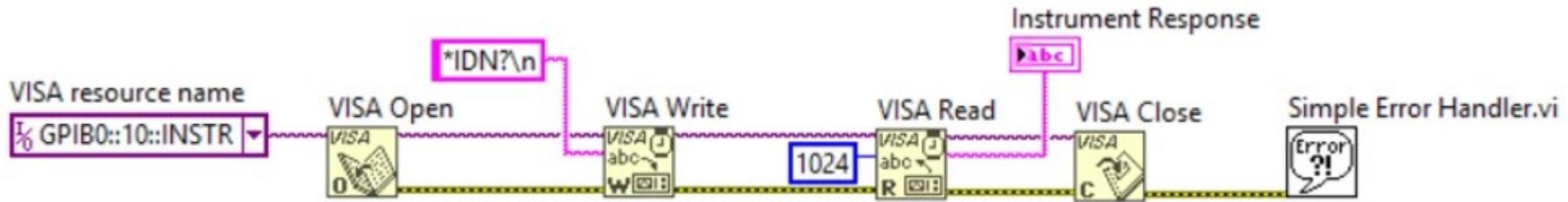


bastlíři SH
MacGyver
macgyver.siliconhill.cz

LabView

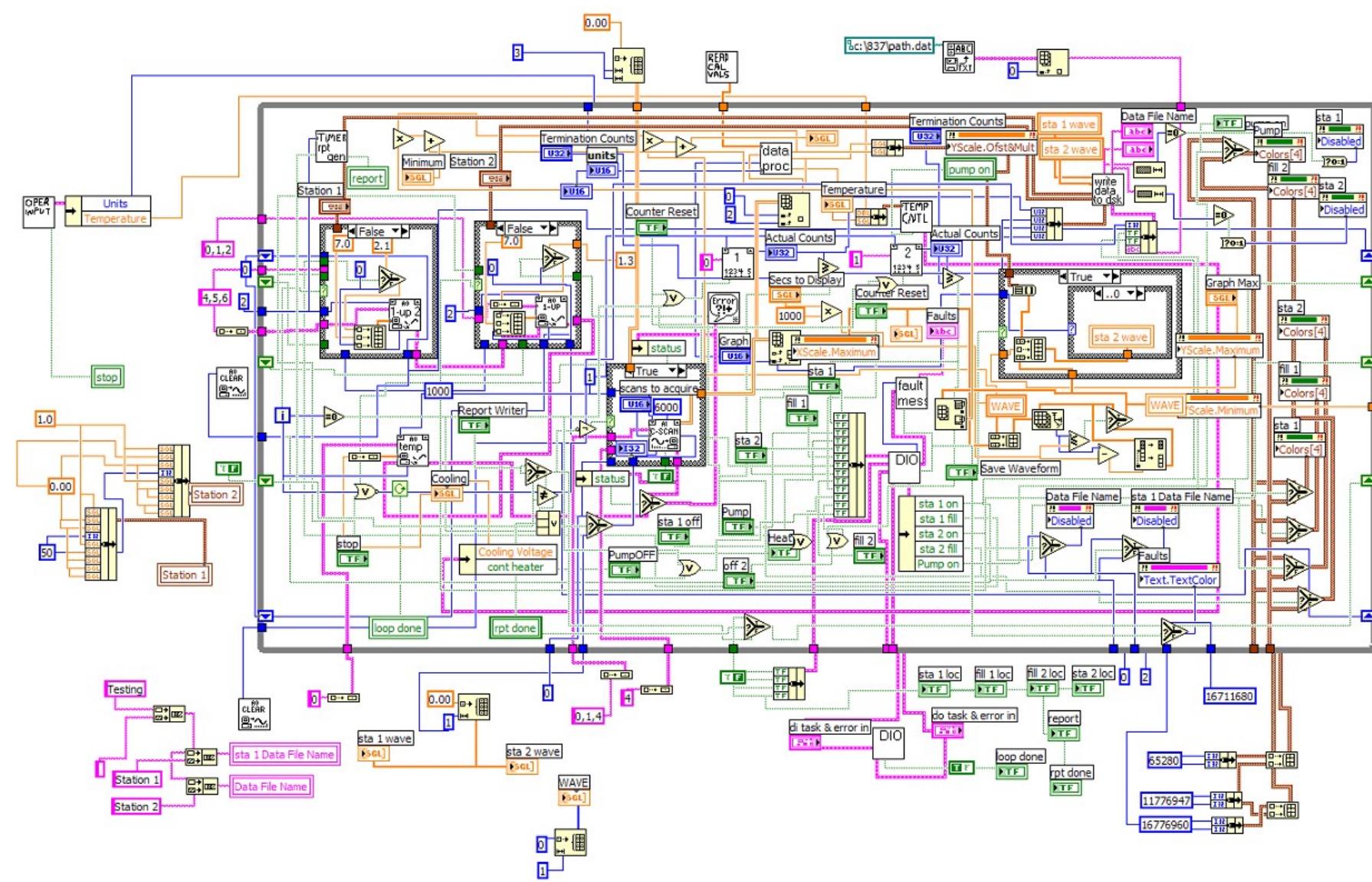


bastlíři SH
MacGyver
macgyver.siliconhill.cz



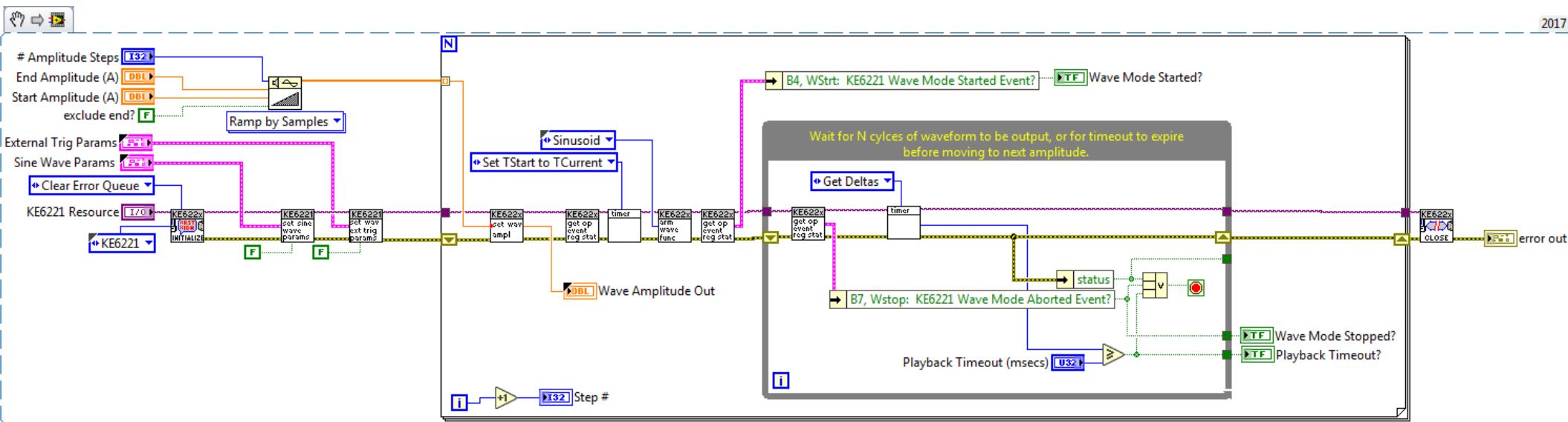
National
Instruments





NI forum





NI fórum



MATLAB / Octave



bastlíři SH
MacGyver
macgyver.siliconhill.cz

MATLAB

```
%Create VISA instrument object for the instrument by specifying its VISA address
instrObject = visa('AGILENT', 'USB0::2391::6407::MY50002735::0::INSTR');

% Configure instrument object
set(instrObject, 'InputBufferSize', 100000);
set(instrObject, 'OutputBufferSize', 512);

% Open session to the instrument
fopen(instrObject);

% Communicate with the instrument. Use fprintf, fscanf or query functions
data1 = query(instrObject, '*IDN?');
disp(data1);

%close the session
fclose(instrObject);
```

NAVJODH



Octave

Neumí VISA :-/

GNU mailinglist



bastlíři SH
MacGyver
macgyver.siliconhill.cz

Code: USBTMC example

```
# Open interface to USB instrument
t0 = usbtmc('/dev/usbtmc0')
# write to listener
usbtmc_write(t0, '*IDN?')
# Blocking read call, returns uint8 array
data = usbtmc_read(t0, 10000)
# Convert uint8 array to string,
char(data)
# close usbtmc session
usbtmc_close(t0)
```

Code: VXI11 example

```
# Open VXI11 connection to 192.168.100.100
t0 = vxi11('192.168.100.100')
# write to listener
vxi11_write(t0, '*IDN?')
# read from instrument, returns uint8 array
data = vxi11_read(t0, 10000)
# Convert uint8 array to string,
char(data)
# close VXI11 session
vxi11_close(t0)
```

Octave Wiki



LXI-tools



bastlíři SH
MacGyver
macgyver.siliconhill.cz

LXI-tools

Jen LXI (VXI-11 / RAW, ne HiSLIP)
Nepozná spoustu zařízení
Nestačí mDNS
Výpadky spojení
Jen Linux / MacOS

GNU mailinglist



bastlíři SH
MacGyver
macgyver.siliconhill.cz

Search

SCPI



Screenshot



Benchmark



Script



```
[192.168.0.107] *IDN?  
[192.168.0.107] Rohde&Schwarz,NGM202,3638.4472k03/101403,03.068 00A8F863604  
[192.168.0.107] :SYSTem:VERSion?  
[192.168.0.107] 1999.0  
[192.168.0.107] *STB?  
[192.168.0.107] 0  
[192.168.0.107] :voltage?  
[192.168.0.107] 5.000000E+00
```

IEEE 488.2 Common Commands

*AAD

*DMC

*IDN?

*PCB

*PUD?

*SDS

*CAL

*EMC

IST?

*PMC

*RCL

*SRE

*CLS

*EMC?

*LMC?

*PRE

*RDT

*SRE?

*DDT

*ESE

*LRN?

*PRE?

*RDT?

*STB?

*DDT?

*ESE?

*OPC

*PSC

*RMC

*TRG

*DLF

*ESR?

*OPC?

*PSC?

*RST

*TST?

Clear

*GMC?

*OPT?

*PUD

*SAV

*WAI

Mandatory SCPI 1999.0 Commands

:SYSTem:ERRor?

:SYSTem:ERRor:NEXT?

Send

:STATus:OPERation?

:STATus:OPERation:CONDITION?

:STATus:OPERation:ENABLE

:STATus:OPERation:ENABLE?

:STATus:OPERation:EVENT?

:STATus:PRESet

:STATus:QUESTIONable?

:STATus:QUESTIONable:CONDITION?

:STATus:QUESTIONable:ENABLE

:STATus:QUESTIONable:ENABLE?

:STATus:QUESTIONable:EVENT?

:SYSTem:VERSion?

LXI-tool readme



Search +

SCPI Screenshot Benchmark Script

Broadcasting on interface lxcbr0

10.0.0.121 Remote PSU
10.0.0.76 Remote Datalogger
192.168.0.117 KIKUSUI,PMX35-3A,XL000024,IFC01.52.0011 IO C01.10.0069
192.168.0.107 Rohde&Schwarz,NGM202,3638.4472k-03/101403,03.068 00A8F863604
192.168.0.166 Rigol Technologies,DM3058,DM3L22 1400032,01.01.00.02.03.01
192.168.0.157 Rohde&Schwarz,RTB2004,1333.1005 k04/113192,02.400

*CLS	*DDT	*DDT?	*DLF	Clear
*EMC?	*ESE	*ESE?	*ESR?	*GMC?
*LMC?	*LRN?	*OPC	*OPC?	*OPT?
*PRE	*PRE?	*PSC	*PSC?	*PUD
*RDT	*RDT?	*RMC	*RST	*SAV
*SRE?	*STB?	*TRG	*TST?	*WAI

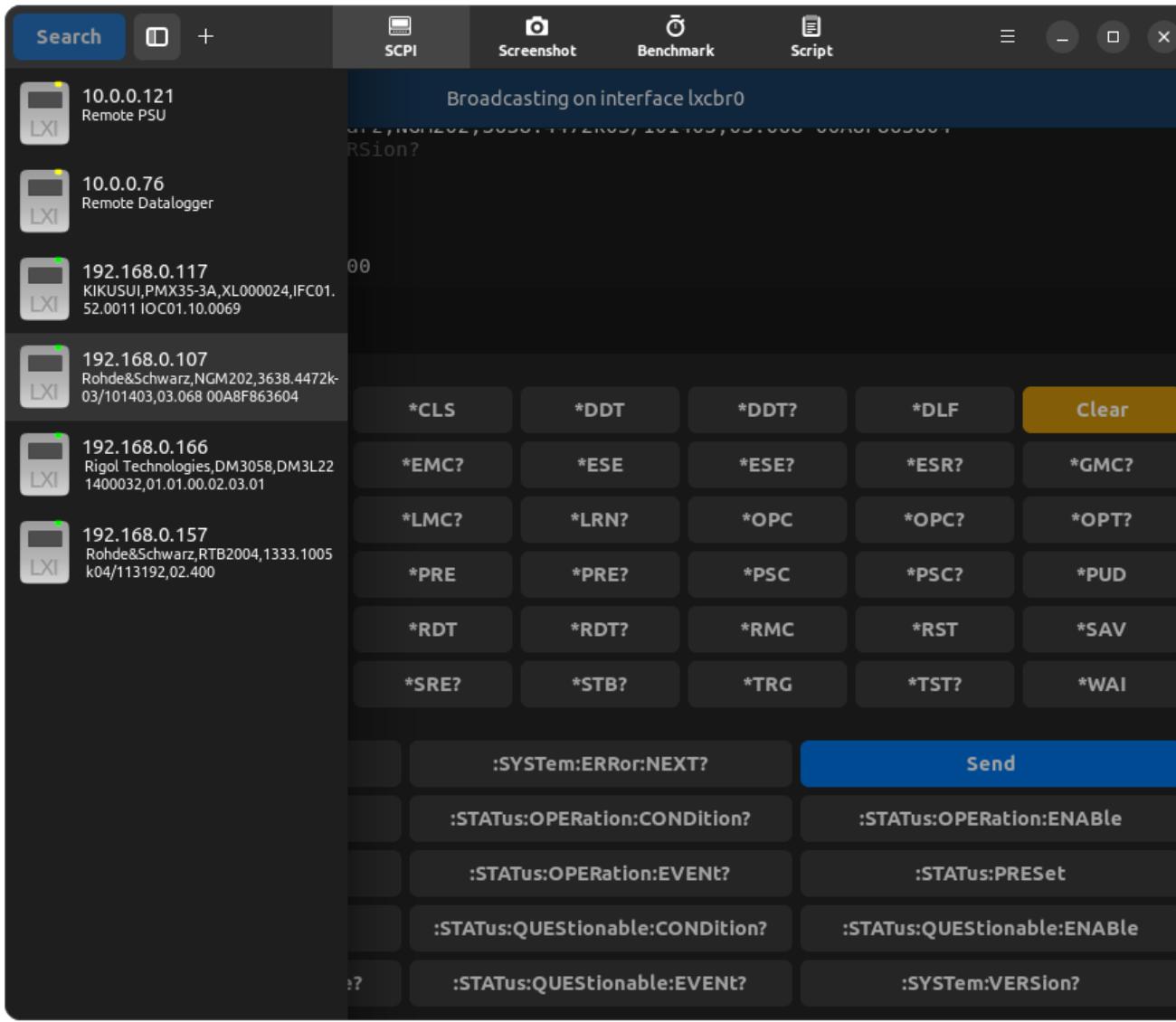
:SYSTem:ERRor:NEXT? Send

:STATus:OPERation:CONDITION? :STATus:OPERation:ENABLE

:STATus:OPERation:EVENT? :STATus:PRESet

:STATus:QUESTIONable:CONDITION? :STATus:QUESTIONable:ENABLE

? :STATus:QUESTIONable:EVENT? :SYSTem:VERSion?



LXI-tool readme

Search SCPI Screenshot Benchmark Script

```

1 ...
2 -- lxi-tools
3 -- https://lxi-tools.github.io --
4 ...
5
6 -- Example: Data logging from a NGM202 PSU for 100 seconds at 10 Hz
7
8 -- Connect to power supply
9 psu = connect("192.168.0.107", nil, nil, 2000, "VXI11")
10 print("Power Supply ID = " .. scpi(psu, "*IDN?"))
11
12 -- Set power supply voltage on channel 1 to 5V
13 scpi(psu, "voltage 5.0, (@1)")
14
15 -- Turn on power supply
16 scpi(psu, "output on")
17
18 -- Wait for voltage to stabilize
19 msleep(1000)
20
21 -- Setup line chart and clock
22 chart0 = chart_new("line-chart",           -- chart type
23                      "PSU Channel 1 Data Log", -- title
24                      "Time [ s ]",          -- x-axis label
25                      "Volt [ V ]",          -- y-axis label
26                      100, 10, 800)           -- x max, y max, window width
27 clock0 = clock_new()
28
29 -- Capture and plot samples at 10 Hz for 100 seconds
30 clock = 0
31 while (clock < 100)
32 do
33   voltage = scpi(psu, "voltage? (@1)")
34   voltage = tonumber(voltage)
35   clock = clock_read(clock0)
36   chart_plot(chart0, clock, voltage)
37   msleep(100)
38 end
39
40 -- Save data
41 chart_save_csv(chart, "chart0.csv")
42 chart_save_png(chart, "chart0.png")
43
44 -- Cleanup
45 clock_free(clock0)
46 chart_close(chart0)
47
48 -- Turn off power supply
49 scpi(psu, "output off")
50
51 -- Finish
52 print("Done")
53

```

Power Supply ID = Rohde&Schwarz,NGM202,3638.4472k03/101403,03.068 00A8F863604
Saving chart0.csv
Saving chart0.png
Done

Run Stop

Line Chart

PSU Channel 1 Data Log

Time [s]	Volt [V]
0.0	5.0
5.0	7.5
10.0	9.0
15.0	7.5
20.0	5.0
25.0	5.0
30.0	7.5
35.0	7.5
40.0	5.0
45.0	5.0
50.0	3.5
55.0	3.5
60.0	5.0
65.0	5.0
70.0	7.5
75.0	7.5
80.0	5.0
85.0	5.0
90.0	3.5
95.0	3.5
100.0	3.5

LXI-tool readme



PyVISA + PyVISA-Py



bastlíři SH
MacGyver
macgyver.siliconhill.cz

```
>>> import pyvisa  
>>> rm = pyvisa.ResourceManager()  
>>> rm.list_resources()  
('ASRL1::INSTR', 'ASRL2::INSTR', 'GPIB0::12::INSTR')  
>>> inst = rm.open_resource('GPIB0::12::INSTR')  
>>> print(inst.query("*IDN?"))
```

(That's the whole program; really!) It works on Windows, Linux and Mac; with arbitrary adapters (e.g. National Instruments, Agilent, Tektronix, Stanford Research Systems).

Web PyVISA



```
>>> import pyvisa
>>> rm = pyvisa.ResourceManager('@py')
>>> rm.list_resources()
('USB0::0x1AB1::0x0588::DS1K00005888::INSTR')
>>> inst = rm.open_resource('USB0::0x1AB1::0x0588::DS1K00005888::INSTR')
>>> print(inst.query("*IDN?"))
```

That's all! Except for @py, the code is exactly what you would write to using the NI-VISA backend for PyVISA.

Web PyVISA



LibreVISA



bastlíři SH
MacGyver
macgyver.siliconhill.cz

[8 captures](#)

4 Jul 2016 - 5 Sep 2016

Index of /git/librevisa.git

	Name	Last modified	Size	Description
	Parent Directory		-	
	HEAD	2012-12-07 20:26	23	
	ORIG_HEAD	2013-02-25 17:34	41	
	branches/	2012-12-07 20:26	-	
	config	2012-12-07 20:26	66	
	description	2012-12-07 20:26	73	
	hooks/	2012-12-07 21:11	-	
	info/	2015-04-20 12:19	-	
	objects/	2015-04-20 12:19	-	
	packed-refs	2014-02-05 11:29	635	
	refs/	2012-12-07 20:26	-	



EEZ Studio



bastlíři SH
MacGyver
macgyver.siliconhill.cz

EEZ Studio

Skriptování (μ Python, JS, SCPI)
Logy, Notebook / zápisník, experimenty
Grafické skriptování
Podpora všech interfaců
Export dashboardů pro LVGL

GNU mailinglist



bastlíři SH
MacGyver
macgyver.siliconhill.cz

Home

Bastlirna RIGOL oscilo

test_osc_gen

x

x

x

Shortcuts and Groups

x

Settings

ODP6033

x

History

Shortcuts and Groups

Notebooks

Extension Manager

Settings

Start Session

Recent projects

New Project

Open Project

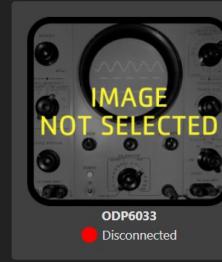
Add Instrument

Deleted Instruments

Instruments

 test_osc_gen.eez-project
C:\Users\polasekp\eez-projects\test_osc_gen Test.eez-project
C:\Users\polasekp\Downloads VA-char.eez-project
C:\Users\polasekp\eez-projects\VA-char dashboard.eez-project
C:\Users\polasekp\AppData\Local\Programs\eezstudio\resources\project-templates

Bastlirna RIGOL oscilo
Disconnected



ODP6033
Disconnected



Rigol DS1052E
Newly added



TEKTRONIX,TDS 3032,0,CF:91.1.CT
FV:v3.41 TDS3EM:v1.00
TDS3FFT:v1.00 TDS3TRG:v1.00
Disconnected

Properties

Instrument Generic SCPI

ID 1

Label ODP6033

IDN OWON,ODP6033,2211231,FV:V3.1.0

Auto connect

Connection

Interface **VISA**

Ethernet
Serial
R&S® USBTMC
Install R&S VISA

Connect

History

07/04/2023 15:10:03
APP:VOLT 0.1,0.1,0.1
APP:CURR 0.001,0.001,0.001
MEAS:VOLT:ALL?

07/04/2023 15:10:03
0.000, 0.000, 0.000

07/04/2023 15:10:49
OUTP:ALL 1,0,0

07/04/2023 15:11:04
OUTP:ALL 0,1,0

07/04/2023 15:11:16
CHAN:OUTP:ALL 0,1,0

07/04/2023 15:11:29
MEAS:VOLT:ALL?
0.000, 0.101, 0.000

07/04/2023 15:12:41
*ESR?

07/04/2023 15:12:56
*LRN?

07/04/2023 15:13:50
*SRE?

Home

Bastlírna ... X

test_osc_g... X

Test X

Shortcuts ... X

Settings X

ODP6033 X



[3] Bastlírna RIGOL oscilo



Connect

Show Terminal

>
Terminal

Edit Shortcut

Search and replace

1 JS Run
2 SCPI Run2

JS Run

SCPI Run2

SCPI Screenshot

JS Single

JS Stop

SCPI Stop2

JS Trigger auto

SCPI Unlock

JS Waveform data

Scripts

Shortcuts

Bastlina RIGOL oscilo - Instrument - EZ Studio

File Edit View Help

Bastlina RIGOL oscilo test_osc_gen Test Shortcuts and Groups Settings ODP6033

Connect Show Terminal

Terminal

Scripts

Shortcuts

JS Run
SCPI Run2
SCPI Screenshot
JS Single
JS Stop
SCPI Stop2
JS Trigger auto
SCPI Unlock
JS Waveform data

Edit Shortcut

```
1 const NUM_CHANNELS = instrument.properties.channels.length;
2
3 connection.acquire();
4
5 var displayedChannels = [];
6
7 connection.command(`:KEY:LOCK ENABLE`);
8
9 for (var iChannel = 1; iChannel <= NUM_CHANNELS; ++iChannel) { //figure out active channels (MATH, DIGI and FFT not supported yet)
10    var displayed = await connection.query(`:CHANnel${iChannel}:DISPlay?`);
11    if (displayed) {
12        displayedChannels.push(iChannel);
13    }
14 }
15
16 if (displayedChannels.length > 0) {
17    connection.command(`:STOP`); //measurement has to be stopped, otherwise only contents of screen can be read
18    //connection.command(`:WAVEform:POINTS:MODE NORMAL`); //read only contents of screen (600 points)
19    connection.command(`:WAVEform:POINTS:MODE MAXimum`); //read whole memory (5k/10K)
20
21    var timeScale = parseFloat(await connection.query(`:TIMEbase:SCALe?`));
22
23    for (var iDisplayedChannel = 0; iDisplayedChannel < displayedChannels.length; ++iDisplayedChannel) {
24        var iChannel = displayedChannels[iDisplayedChannel];
25        var samplingRate = await connection.query(`:ACQuire:SAMPlingrate? CHANnel${iChannel}`);
26
27        var channelScale = parseFloat(await connection.query(`:CHANnel${iChannel}:SCALE?`));
28        var channelOffset = parseFloat(await connection.query(`:CHANnel${iChannel}:OFFSet?`));
29
30        var color = instrument.properties.channels[iChannel - 1].color;
31        var colorInverse = instrument.properties.channels[iChannel - 1].colorInverse;
32        var label = `Channel ${iChannel}`;
33
34        var description = `Channel: ${iChannel}, Sampling rate: ${samplingRate}, Timebase: ${timeScale}s, Vertical scale: ${channelScale} V, Offset: ${channelOffset} V`;
35        notify.info(description);
36
37        var data = [];
38        //var waveform = await connection.query(`:WAVEform:DATA? CHANnel${iChannel}`); //reads contents of screen
39        var waveform = await connection.query(`:WAVEform:MEMORYDATA? CHANnel${iChannel}`); //reads contents of screen/memory, undocumented in prog. manual
40        data.push(waveform.data);
41        waveform.deleteLog();
42
43        channelScaleResized=10*channelScale/250; //data mangling for proper display of data - oscilloscope provides data in very strange format 0-199, inverted
44        pixelHalfWidth=8*channelScale/250/2;
45        channelOffsetResized=-4*channelScale*channelOffset;//+pixelHalfWidth;
46        samplingRateResized=samplingRate/2;
47        for (var i=0; i < data[0].length; ++i) {
48            for (var j=0; j < data[0][i].length; ++j) {
49                data[0][i][j]=199-data[0][i][j]; //invert data
50            }
51        }
52        session.addChart({
53            description,
54            data,
55            samplingRate: samplingRateResized,
56            offset: channelOffsetResized,
57            scale: channelScaleResized,
58            format: 2,
59            unit: "Voltage",
60            color,
61            colorInverse,
62            label
63        });
64    }
65
66    connection.command(`:RUN`);
67 }
68
69 connection.command(`:KEY:LOCK DISable`);
70 connection.release();
```



[3] Bastlírna RIGOL oscilo

Connect



08/04/2023 14:20:50 CONNECTED to VISA

08/04/2023 14:20:50

*IDN?

08/04/2023 14:20:50

Rigol Technologies,DS1302CA,DS1AA120300007,03.09.00



08/04/2023 14:22:46

Name Waveform data

Type JavaScript

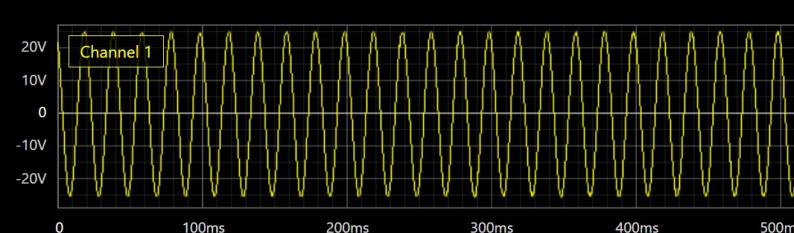
Result: Success



08/04/2023 14:22:46

application/eez-raw, 5 KB

Channel: 1, Sampling rate: 20000, Timebase: 0.005s, Vertical scale: 10 V, Offset: 0 V



08/04/2023 14:27:28

:MEASure:FREQuency?

08/04/2023 14:27:28



Unlock

Run

Stop

Waveform data

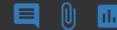
Single

Trigger auto

Add Shortcut

Show Groups

◆	◆ Name	◆ Group / Extension	◆ Keybinding	◆ Action	◆ Confirmation	◆ Toolbar	◆ Toolbar position
■	Abort	EEZ BB3 STM32 EEZ H24005 r3B4	F9	SCPI	✓	✓	9
■	Clear protections	EEZ BB3 STM32	F10	SCPI	✓	✓	10
■	Clear protections	EEZ H24005 r3B4	F10	SCPI	✓	✓	10
■	Coupling	EEZ BB3 STM32	F5	JavaScript	✓	✓	5
■	Dlog abort	EEZ BB3 STM32 EEZ H24005 r3B4	—	SCPI	✓	✓	15
■	Dlog start	EEZ BB3 STM32	—	JavaScript	✓	✓	13
■	Dlog start	EEZ H24005 r3B4	—	JavaScript	✓	✓	13
■	Dlog upload	EEZ BB3 STM32	—	JavaScript	✓	✓	14
■	Dlog upload	EEZ H24005 r3B4	—	JavaScript	✓	✓	14
■	Init	EEZ BB3 STM32 EEZ H24005 r3B4	F8	SCPI	✓	✓	8
■	Outputs OFF	EEZ BB3 STM32	F1	SCPI	✓	✓	1
■	Outputs OFF	EEZ H24005 r3B4	F1	SCPI	✓	✓	1
■	Outputs ON	EEZ BB3 STM32	F2	SCPI	✓	✓	2
■	Outputs ON	EEZ H24005 r3B4	F2	SCPI	✓	✓	2
■	Parallel	EEZ H24005 r3B4	F6	SCPI	✓	✓	6
■	Power on	EEZ BB3 STM32 EEZ H24005 r3B4	—	SCPI	✓	✓	11
■	Run	Rigol DS1052E	F4	SCPI	✓	✓	3

[Home](#)[Bastlírna RIGOL oscilo](#)[test_osc_gen](#)[Test](#)[Shortcuts and Groups](#)[History](#)

07/04/2023 18:39:24

Name Waveform data

Type JavaScript

Result: t.unit.toLowerCase is not a function

07/04/2023 18:42:50

Name Waveform data

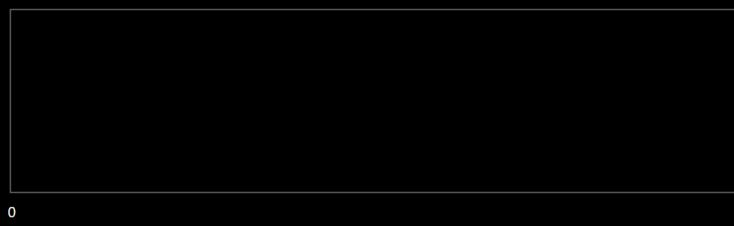
Type JavaScript

Result: Success

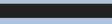
07/04/2023 18:42:50

application/eez-raw, 600 Bytes

Channel: 1, Sampling rate: 250000000



0



07/04/2023 18:43:24

application/octet-stream, 600 Bytes

[Calendar](#)[Sessions](#)[Filters](#)[Scrapbook](#)

2023 April

Mo	Tu	We	Th	Fr	Sa	Su
				1	2	13.
3	4	5	6	7	8	9.
10	11	12	13	14	15	16.
17	18	19	20	21	22	23.
24	25	26	27	28	29	30.
						17.

2023 May

Mo	Tu	We	Th	Fr	Sa	Su
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				22.

2023 June

Mo	Tu	We	Th	Fr	Sa	Su
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		26.

2023 July

Mo	Tu	We	Th	Fr	Sa	Su
1	2					26.

Home

Bastlírna RIGOL oscilo

test_osc_gen

Test

Shortcuts and Groups

History



07/04/2023 18:39:24

Name Waveform data

Type JavaScript

Result: t.unit.toLowerCase is not a function

07/04/2023 18:42:50

Name Waveform data

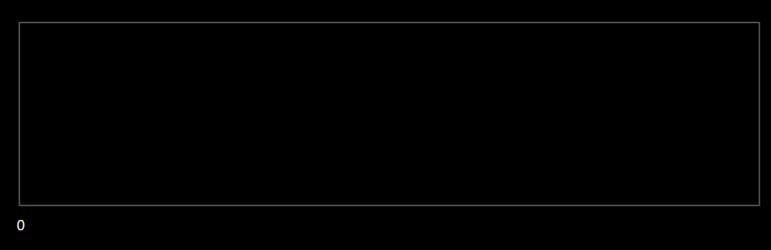
Type JavaScript

Result: Success

07/04/2023 18:42:50

application/eez-raw, 600 Bytes

Channel: 1, Sampling rate: 250000000



07/04/2023 18:43:24

application/octet-stream, 600 Bytes



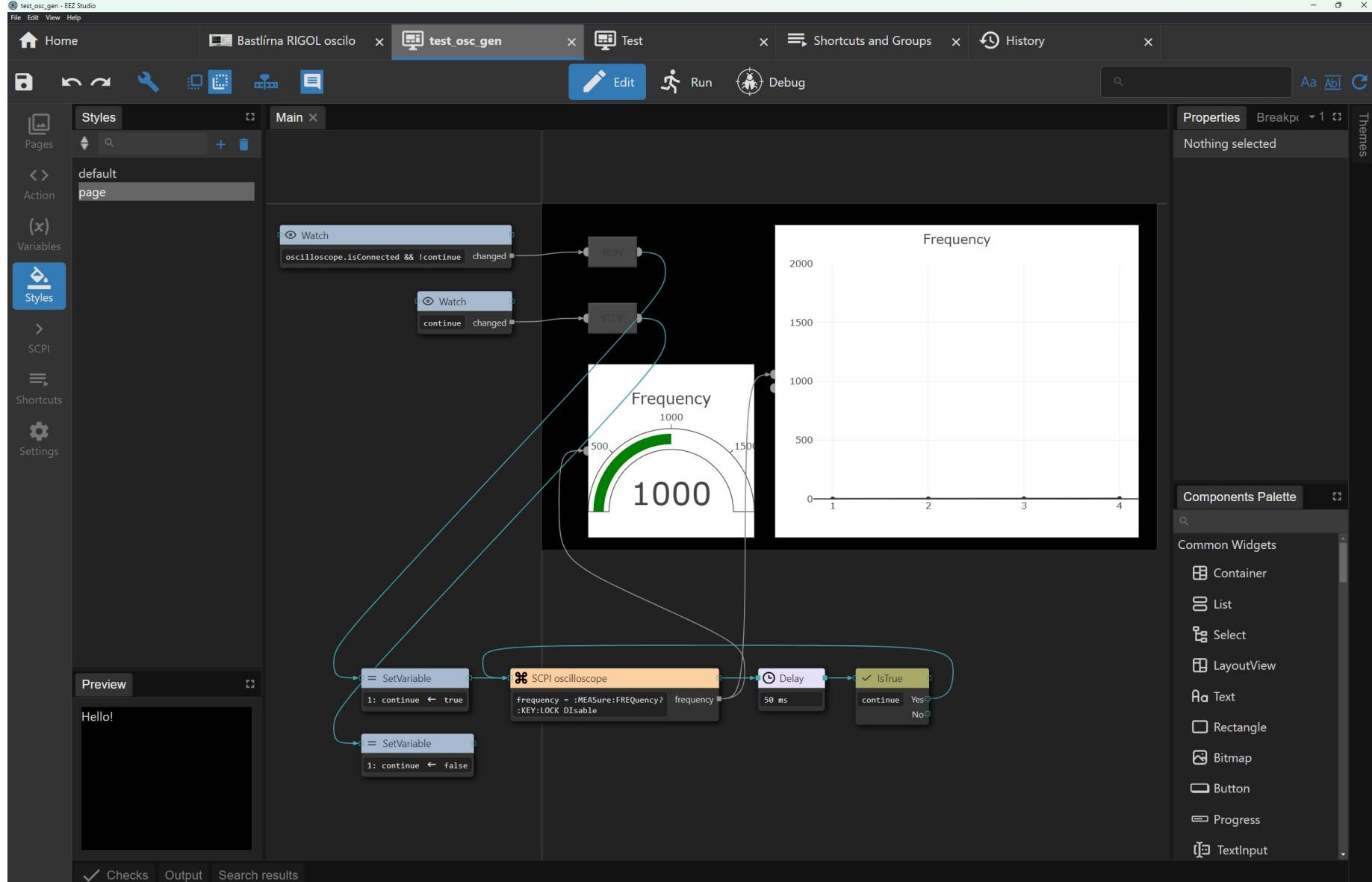
Calendar

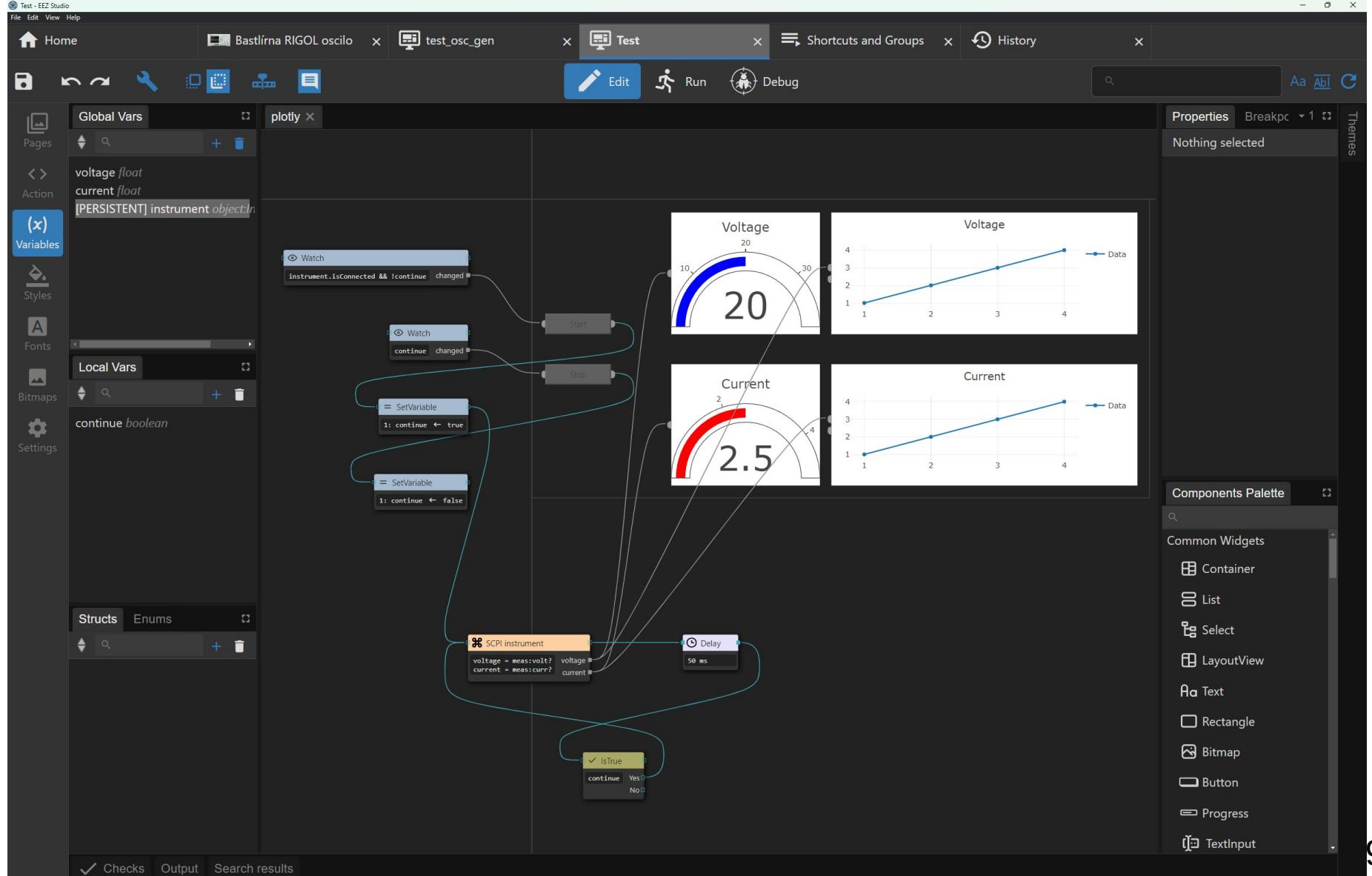
Sessions

Filters

Scrapbook

 Session start and close (4) Connects and disconnects (93) SCPI commands, queries and query results (402) Downloaded files (419) Uploaded files (0) Attached files (0) Charts (1) Notes (0) Launched scripts (281)





Prostor na dotazy bude u našeho stánku

(nebo si nás někde odchyt'te, případně děláme i Virtuální Bastlírnu)



bastlíři SH
MacGyver
macgyver.siliconhill.cz