

# UniLabTool Protocol v0.1

## General (IEEE-488.2)

### \*IDN?

▶ {Manufacturer, Model, Version, 0}

▶ "CTU,UniLabTool-F103C8,0.0.1,0"

- Device identification

### \*STB?

▶ StatusByte

▶ "0x00"

| BIT | NUM | DESCRIPTION     |
|-----|-----|-----------------|
| 0   | 0   | OK              |
| 2   | 4   | Query error     |
| 3   | 8   | Device error    |
| 4   | 16  | Execution error |
| 5   | 32  | Command error   |

- Status information

### \*RST

- Restarts whole device

### \*CLS

- Resets StatusByte to default value 0x00

## System

### :SYSTem:MODE?

▶ { SCOPE | VM | LA }

▶ "SCOPE"

- Reads current system main mode

### :SYSTem:MODE { }

● { SCOPE | VM | LA }

● "VM"

- Sets current system main mode

### :SYSTem:ERR?

▶ { ErrorNumber, ErrorString }

▶ "-123,Unknown command"

- Reads StatusByte error description

## Voltmeter

### :VM:READ:ALL?

▶ { CH1, CH2, CH3, CH4, VCC }

▶ "1,1054,0,35,654"

- Reads raw ADC data from all channels

### :VM:READ:CHn?

▶ Value; (n < <1;4>)

▶ "230"

- Reads raw ADC data from 1 channel

## Counter

### :CNTR:READ?

▶ Frequency

▶ "1000.0"

- Reads actual calculated frequency

### :CNTR:START

- Starts counter

### :CNTR:STOP

- Stops counter

Legend:

▶ Resp Format

▶ Resp Example

● Cmd Format

● Cmd Example

Query

Cmd

Cmd {params}

# Oscilloscope

## :SCOPE:SET:ALL {}

● {BIT, MEM, FS, CH, {TCH, TL, TE, TM}}

● "12, 1K, 5M, TFFF, 1, 0.0, R, A"

| PRM | RANGE     | DESCRIPTION                        |
|-----|-----------|------------------------------------|
| BIT | 12 / 8    | Each channel's sample bitness      |
| MEM | 0 - 32K   | Each channel's memory depth        |
| FS  | 0 - 5M    | Sampling frequency in Hz           |
| CH  | 4x T / F  | Enabled channels (True / False)    |
| TCH | 1 - 4     | Trigger source channel number      |
| TL  | 0 - 100%  | Trigger level (percentage)         |
| TE  | R / F     | Trigger edge: Rising / Falling     |
| TM  | A / N / S | Trig. mode: Auto / Normal / Single |

- Oscilloscope settings - all

## :SCOPE:SET:BIT {}

● {12 | 8}

● "12"

- Scope settings - sample bitness

## :SCOPE:SET:MEM {}

● {<1;32K>}

● "1K"

- Scope settings - memory depth

## :SCOPE:SET:FS {}

● {<1;5M>}

● "5M"

- Scope settings - sampling frequency

## :SCOPE:SET:CH {}

● {BBBB}; (B ∈ {T | F})

● "TFFF"

- Enabled/disabled 4 channels settings

## :SCOPE:SET:TRIG {}

● {<1;4>, <0;100>, {R|F}, {A|N|S}}

● "1, 0.0, R, A"

- Oscilloscope settings - trigger

## :SCOPE:RST

- Resets scope buffers
- Reenables DMA

## :SCOPE:GET:ALL?

▶ {BIT, MEM, FS, CH, {TCH, TL, TE, TM}}

▶ "12, 1K, 5M, TFFF, 1, 0.0, R, A"

- Reads all settings (viz. :SET:ALL)

## :SCOPE:READ:ALL?

▶ {#DN {CH1-B0 ..} {CH2-B0 ..}}

▶ "#104 <0x01><0x02> <0x01><0x02>"

- Reads all channels (GPIB binary syntax)
- Either 8-bit or 16-bit, first channel first
- Reenables DMA

## :SCOPE:READ:CHn?

▶ {#DN B0 B1 ..}; (n ∈ <1;4>)

▶ "#102 <0x01><0x02>"

- Reads 1 channel (GPIB binary syntax)
- Either 8-bit or 16-bit raw ADC data
- Reenables DMA

# Logic Analyzer

## :LA:SET:ALL {}

{MEM,CH, {TCH,TE,TM}}

"1K, TFFF, 1, R, A"

| PRM | RANGE     | DESCRIPTION                        |
|-----|-----------|------------------------------------|
| MEM | 0 - 32K   | Each channel's memory depth        |
| CH  | 4x T / F  | Enabled channels (True / False)    |
| TCH | 1 - 4     | Trigger source channel number      |
| TE  | R / F     | Trigger edge: Rising / Falling     |
| TM  | A / N / S | Trig. mode: Auto / Normal / Single |

- Logic analyzer settings - all

## :LA:SET:MEM {}

{<1;32K>}

"1K"

- LA settings - memory depth

## :LA:SET:CH {}

{BBBB}; (B ∈ {T | F})

"TFFF"

- LA settings - trigger

## :LA:SET:TRIG {}

{<1;4>,{R|F},{A|N|S}}

"1, R, A"

- Enabled/disabled 4 channels settings

## :LA:RST

- Resets scope buffers
- Enables DMA

## :LA:SET?

{MEM,CH, {TCH,TE,TM}}

"1K, TFFF, 1, R, A"

- Reads all settings (viz. :SET:ALL)

## :LA:READ:ALL?

{#DN{CH1-B0 ..}{CH2-B0 ..}}

"#104 <0x01><0x02> <0x01><0x02>"

- Reads all channels (GPIB binary syntax)
- Bits packed into bytes, first channel first
- Reenables DMA

## :LA:READ:CHn?

{#DN B0 B1 ..}; (n ∈ <1;4>)

"#102 <0x01><0x02>"

- Reads 1 channel (GPIB binary syntax)
- Bits packed into bytes
- Reenables DMA

## Signal Generator

### :SGEN:SET:CHn?

▶ {FREQ, AMPL, TYPE}; (n < <1;2>)

▶ "1000,50,SINE"

| PRM  | RANGE   | DESCRIPTION                        |
|------|---------|------------------------------------|
| FREQ | 1 - 1M  | Generated signal frequency in Hz   |
| AMPL | 0 - 100 | Generated signal amplitude in %    |
| TYPE | ...     | SINE   SAW   SQUARE   TRIA   NOISE |

- Reads signal generator settings

### :SGEN:SET:CHn {}

● { FREQ, AMPL, TYPE }

● "800,40,SQUARE"

- Sets signal generator parameters

### :SGEN:START

- Starts signal generator

### :SGEN:STOP

- Stops signal generator

## PWM Generator

### :PWM:SET:CHn?

▶ { FREQ, DUTY }; (n < <1;2>)

▶ "1100,60"

| PRM  | RANGE   | DESCRIPTION                   |
|------|---------|-------------------------------|
| FREQ | 1 - 1M  | Generated PWM frequency in Hz |
| DUTY | 0 - 100 | Generated PWM duty in %       |

- Reads PWM generator settings

### :PWM:SET:CHn {}

● { FREQ, DUTY }

● "900,30"

- Sets PWM generator parameters

### :PWM:START

- Starts PWM generator

### :PWM:STOP

- Stops PWM generator

# Overview

**\*IDN?**  
**\*STB?**  
**\*RST**  
**\*CLS**

**:SYSTem:MODE?**  
**:SYSTem:MODE** { SCOPE | VM | LA }  
**:SYSTem:ERR?**

**:VM:READ:ALL?**  
**:VM:READ:CHn?**

**:SGEN:SET:CHn?**  
**:SGEN:SET:CHn** { FREQ, AMPL, TYPE }  
**:SGEN:START**  
**:SGEN:STOP**

**:PWM:SET:CHn?**  
**:PWM:SET:CHn** { FREQ, DUTY }  
**:PWM:START**  
**:PWM:STOP**

**:SCOPE:RST**  
**:SCOPE:SET:ALL** { BIT, MEM, FS, CH, { TCH, TL, TE, TM } }  
**:SCOPE:SET:BIT** { 12 | 8 }  
**:SCOPE:SET:MEM** { <1;32K> }  
**:SCOPE:SET:FS** { <1;1M> }  
**:SCOPE:SET:CH** { BBBB; (B  $\in$  { T | F }) }  
**:SCOPE:SET:TRIG** { <1;4>, <0;100>, { R | F }, { A | N | S } }  
**:SCOPE:GET:ALL?**  
**:SCOPE:READ:ALL?**  
**:SCOPE:READ:CHn?**

**:LA:RST**  
**:LA:SET:ALL** { MEM, CH, { TCH, TE, TM } }  
**:LA:SET:MEM** { <1;32K> }  
**:LA:SET:CH** { BBBB; (B  $\in$  { T | F }) }  
**:LA:SET:TRIG** { <1;4>, { R | F }, { A | N | S } }  
**:LA:SET?**  
**:LA:READ:ALL?**  
**:LA:READ:CHn?**

**:CNTR:READ?**  
**:CNTR:START**  
**:CNTR:STOP**

# Examples

// Identify after connect

> :IDN?

\$ CTU,UniLabTool-F103C8,0.0.2,0

// Restart, set mode to Voltmeter, check Status, and read all channels

> \*RST

> :SYST:MODE VM

> \*STB?

\$ 0x00

> :VM:READ:ALL?

\$ 1,2024,0,35,654

// Try to reset Scope, check Status, failed so read error message, and reset status

> :SCOP:RST

> \*STB?

\$ 0x16

> :SYST:ERR?

\$ -2,Invalid mode

> \*CLS

// Switch mode to Scope, set up, check Status, optionally reset and read buffer of CH3

> :SYST:MODE SCOPE

> :SCOP:SET:ALL 8,2,1K,FFTF,3,50,F,S

> \*STB?

\$ 0x00

> :SCOP:RST

> :SCOP:READ:CH3?

\$ #3002 <0x01><0x02>