supracon

AC Quantum Calibrator

External Control via TCP

How to communicate with AC-supraVOLTcontrol via TCP

To use this option, you must know your IP address and you have to send/receive all commands to port 31180. If you are using different computers, both must be in the same network and your firewall must allow the commands in both directions.

➔ **TCPCP** Frame Format

Instruction Send 1 Byte	**Bytes to Send/Receive** 2 Byte (0…65535)	**Data Send/Receive** 0…65525 Byte	**Read Status Receive** 2 Byte
Send Command 1	Send 2 Byte	Please refer to the list: Send Commands	OK
Read Result 2	Receive 2 Byte	Please refer to the list: Read Results	-
Ask Status 3	Receive 2 Byte	Please refer to the list: Ask Status	-

➔ Send Commands

CMD	PARA	DATA
Set_PJVS	AC, Waveform, Samples T/F, 0…4, 2…256	Voltage, Frequency, Trim-Current Voltage: ±10.1V (Frequency = 0Hz) Voltage: 0…7.2VRMS (Frequency ≠ 0Hz) Frequency: 0.5…10000Hz Trim-Curr.: -2…2mA

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	Explanation - If AC = True, an AC waveform will be applied and Frequency must be different from zero. - Different Waveforms: 0 → Sinewave 1 → Triangle 2 → Sawtooth 3 → Rectangle 4 → Arbitrary - Samples must be a number between 2 and 256 and gives the number of steps into which the waveform is divided. - Voltage and Frequency are float values. - If you would like to check the stepwidth or if the step is quantised you can apply an additional Trim-Current to your array dependent bias current. Example **Set_PJVS;T,0,20;1.46,125,0** (Set PJVS array, AC, Sinewave, 20Samples, 1.46V_{RMS}, 125Hz, 0µA-Trim-Curr)	
Set_Mux	Filter, ShortNano, AC T/F,T/F,T/F …	Multiplexer 1 – Short DC Nano / Voltmeter 2 – Short AC Sampler 3 – Short Switch DC 4 – Short Switch AC 5 – JVS - Voltmeter 6 – Channel A positive 7 – Channel A negative 8 – Channel B positive 9 – Channel B negative 10 – Channel C positive 11 – Channel C negative 12 – Nulldetektor – Channel_A+ 13 – Nulldetektor – Channel_A- 14 – Nulldetektor – Channel_B+ 15 – Nulldetektor – Channel_B- 16 – Nulldetektor – Channel_C+ 17 – Nulldetektor – Channel_C- 18 – ext.Voltmeter – Channel_A+ 19 – ext.Voltmeter – Channel_A- 20 – ext.Voltmeter – Channel_B+ 21 – ext.Voltmeter – Channel_B- 22 – ext.Voltmeter – Channel_C+

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	…	23 – ext.Voltmeter – Channel_C-
	Explanation - Filter are integrated in the Multiplexer and will be used for DC application typically. - ShortNano will short the Nanovoltmeter and leave all other relays depending on Data for Multiplexer. - AC option decides whether you connect a nulldetector or a sampler to PJVS or DUT. Example **Set_Mux;F,F,T;6** (Set Multiplexer, NO Filter, NO Short Nano, AC-Nulldetektor, Channel A positive)	
Set_57XX	ext. PhaseLock, Current, ext. Guard T/F,T/F,T/F	Voltage/Current,Frequency DC-Voltage: -10.2…10.2V AC-Voltage: 0.001…7.2V_{RMS} Current: -0.01…2200mA Frequency: 10…10000Hz
	Explanation - To synchronize PJVS and 57XX the external PhaseLock must be True and a Signal with the same frequency should be there otherwise the 57XX switches the output OFF automatically. - If the parameter Current = True, the 57XX will be set to current mode otherwise the 57XX will be set to voltage mode. - Usually the external Guard is turned OFF and the internal Guard will be used. If you set ext. Guard = True, you could connect an external Guard to the 57XX. Example **Set_57XX;T,F,F;1.46,125** (Set Calibrator, ext. PhaseLock, Voltage Mode, internal Guard, 1.46V_{RMS}, 125Hz)	
Set_Gen	Init, Waveform T/F, 0/1	Voltage,Frequency,Phase Output Voltage: 0.1…5Vpp Frequency: 0.01…50MHz

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		Phase: 0…359.99°
	Explanation - External 10MHz required. - Init True or False, you can change the phase without a new initialisation. - i.e. without switching to Standby mode - Choose "0" for Sinewave and "1" for Square Example **Set_Gen;T,0;2.5,125,170.4** (Set Generator, Init, Sinewave, 2.5V Amplitude, 125Hz, Phase Shift 170.4°)	
Set_Synthesizer	ON/OFF	
	Explanation - If the Parameter = ON, optimal microwave parameters (frequency and power) for the PJVS array will be check/adjusted. - If the parameter = OFF, there is no change in microwave frequency, only the output power of the synthesizer is maximally attenuated. Example **Set_Synthesizer;ON**	
Nanovoltmeter Read_Nulldetector	Time/Number,Result as Mean? T/F,T/F	Time/Number,Config Time [seconds]: 1…120s Number of Meas.: 1…255 Config: No Config: Default Config: individually
	Explanation - If the Parameter Time/Number is True, it's a timed read out of the Nulldetector. In the other case you send a number to be read. - If the Parameter Result as Mean is True, you get the mean and standard deviation as result otherwise you get all times and values. - For the first read out of the Nulldetector you must config it. Either with the "Default" command, in that case the optimal and tested settings will be applied, or you send your own settings. Default settings are: :*RST; :INIT:CONT ON; :SENS:FUNC 'VOLT'; :SENS:VOLT:NPLC 1;	

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:SENS:CHAN 1;
:SENS:VOLT:CHAN1:RANG:AUTO ON

e.g. if you want to lock a range, config is:
:*RST;
:INIT:CONT ON;
:SENS:FUNC 'VOLT';
:SENS:VOLT:NPLC 1;
:SENS:CHAN 1;
:SENS:VOLT:CHAN1:RANG 10

Example

Read_Nulldetector;F,T;20,Default
(Read Nanovoltmeter specified by number, Result as Mean, 20 Values, default Config)

Trigger per period, one have to be sure the slope is correct to the PXI is not triggered at T/2, but 0 or 2π of the period

NI 5922

Read_Sampler

TriggerSlope, Vertical-Range, Result as Mean?		Loops, MeasuringTime	
PXI:	T/F,1/5,T/F	Loops:	1…1000
3458:	-,-,T/F	Meas.Time (PXI):	0.01…10s
		Meas.Time (3458):	-

Explanation

- The most important thing is that you have to execute the command "Set_PJVS" with an AC waveform before read out the sampler.
- If the parameter TriggerSlope is True, the read out of the Sampler starts with the rising edge of the trigger signal (PXI)
- Vertical Range can be 1Vpp or 5Vpp
- If the Parameter Result as Mean is True, you get the mean and standard deviation as result otherwise you get all RMS values.
- Loops means the number of Measurements and could have values between 1 and 1000.
- MeasuringTime could be between 0.01 and 10 seconds, the default value should be 1s. The number of periods to be measured will be calculated by the software.

Example

PXI: Read_Sampler;T,5,T;10,0.5
(Read Sampler, Trigger on rising edge, Vertical Range is 5V, Result as Mean, 10 Values, Measuring Time 0.5 second)

3458: Read_Sampler;-,-,T;10,-
(Read Sampler, Result as Mean, 10 Values, automatic Triger Slope, Range, Meas. Time)

Read_Sensors	Explanation - The Command Read_Sensors measures the environmental temperature, humidity, barom. pressure and in case of a cryocooler system the cooler temperature too Example **Read_Sensors**

➔ Read Results

CMD	Finished Command	Message (examples)
2	Set_PJVS;F,0,0;10,0,0	DC-Josephson Voltage: 9.999944168
2	Set_PJVS;T,0,20;5,1000,0	AC-Voltage: 5.000059 Vrms 20 Voltage-Values: 0.000000000 V, 2.185065320 V, 4.156366270 V, 5.720692749 V, 6.725062288 V, 7.071108042 V, 6.725062288 V, 5.720692749 V, 4.156366270 V, 2.185065320 V, 0.000000000 V, -2.185065320 V, -4.156366270 V, -5.720692749 V, -6.725062288 V, -7.071108042 V, -6.725062288 V, -5.720692749 V, -4.156366270 V, -2.185065320 V
2	Set_Mux;....	-
2	Set_57XX;....	-
2	Set_Gen;....	-
2	Set_Synthesizer;ON	Frequency = 69.999999985 GHz Power = 50
2	Read_Nulldetector;F,T;20,Default	Mean = -0.0635588826 V, Stdev = 4.07E-2 V
2	Read_Sampler	Values [V]:5.001977659, 5.001977663, 5.001977725, 5.001977552, 5.001977641, 5.001977564, 5.001977681, 5.001977589, 5.001977532, 5.001977599

2	Read_Sensors	Temperature [°C] = 26.1, Barometric Pressure [mbar] = 1002, Humidity [%] = 24, Temperature Cooler [K] = 3.75

➔ Ask Status

CMD	Message	Explanation
3	…waiting…	AC-supraVOLTcontrol is waiting for a command to control something of the PJVS system.
3	…processing…	The software received the command and is processing the command at this time.
3	...error command...	There is some fault in the command, e.g. the length of the command is not correct, a parameter is missing or a parameter is out of the permissible range
3	Set_PJVS-Done-14:40:58	The command Set_PJVS was executed successfully at the given time.
3	Set_Mux-Error-14:43:12	The command Set_Mux wasn't executed successfully because of an error due to the communication with the multiplexer.

Set Synthesizer-Error-time

-Done -Results/Frequency and Power

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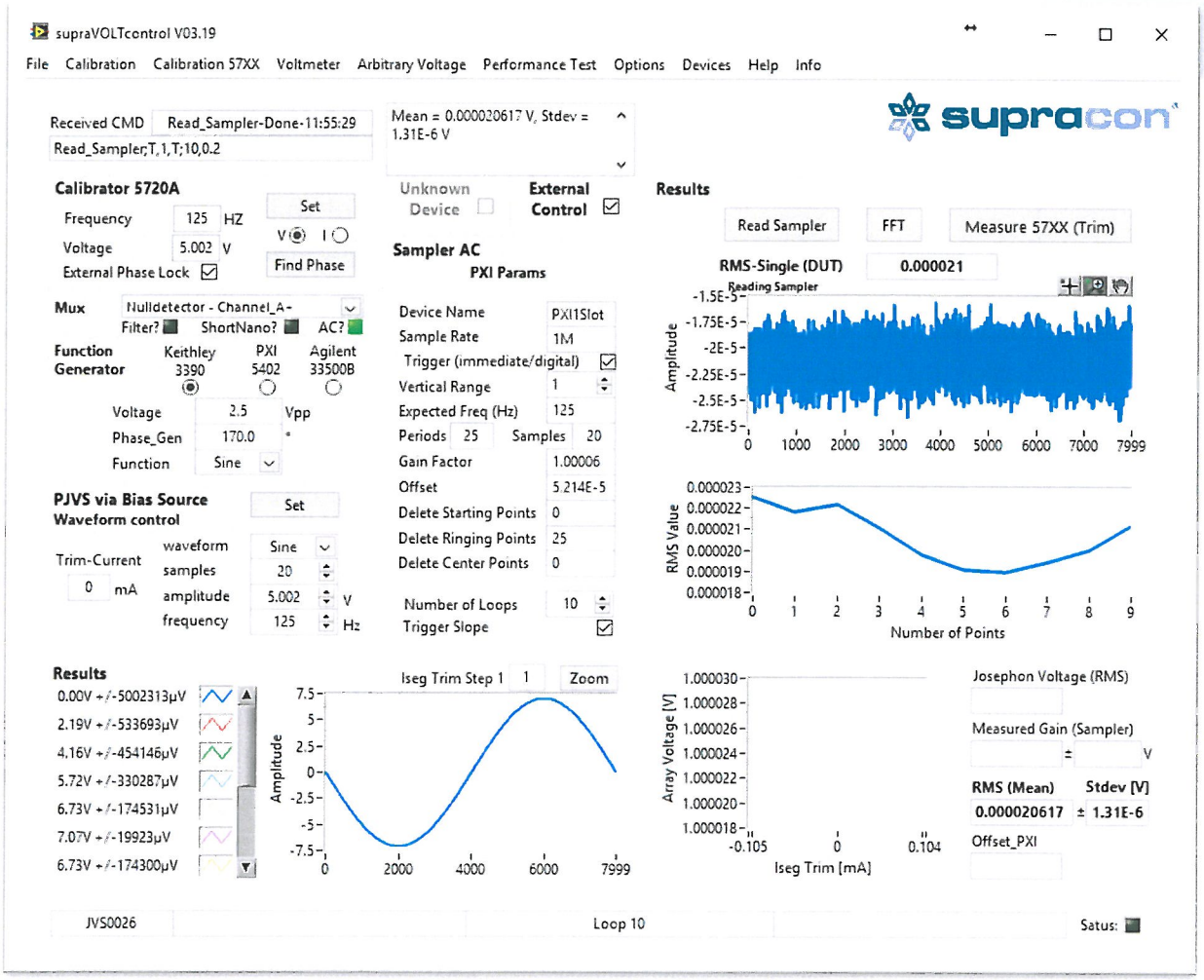
➔ Prepare AC-supraVOLTcontrol for external Control via TCP (Port 31180)

- Go to Performance Test → Set Devices AC
- Activate External Control
- Now AC-supraVOLTcontrol is ready to receive commands



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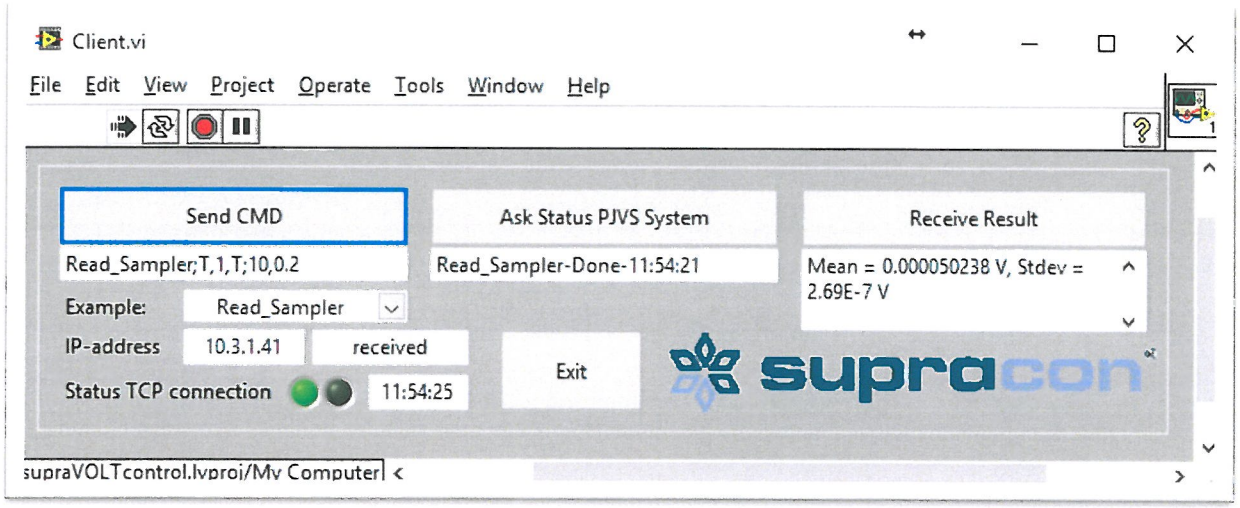
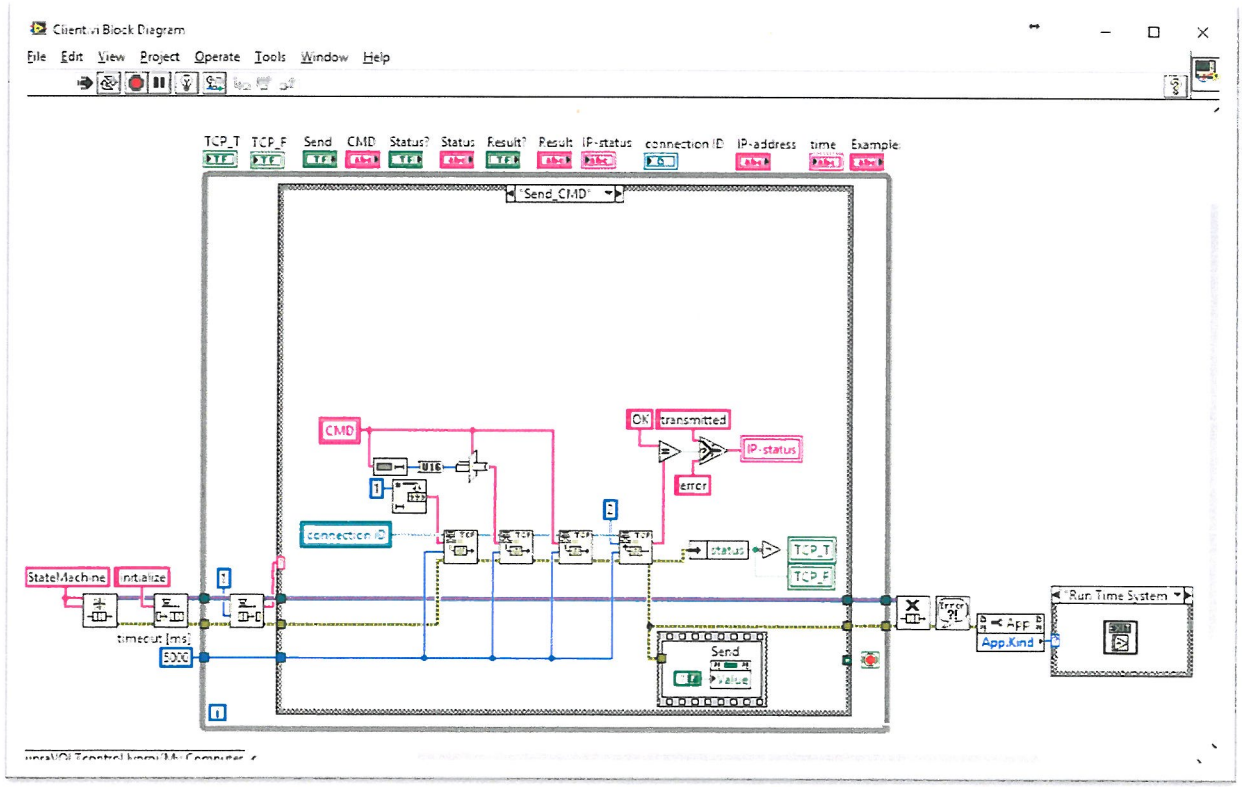
➔ Example how to control the AC-supraVOLTcontrol system external

- You must now and enter the correct IP address of the system where the AC-supraVOLTcontrol is running
- The correct communication port (31180) is considered.
- It's possible to send commands, for each command there is one example included
- You can ask the status of the PJVS system and whether the command is still running.
- If the status gives the message that the command was executed you receive the result by pressing the "Receive Result" button.





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