2.4.4.4.1. On trigger signal acquisition

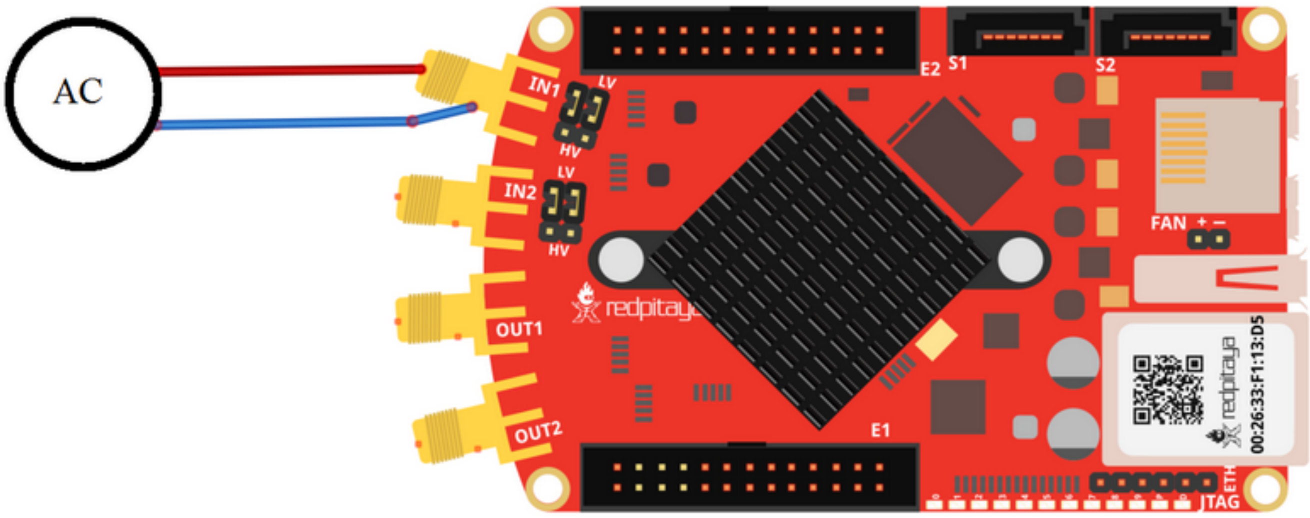
2.4.4.4.1.1. Description

This example shows how to acquire 16k samples of signal on fast analog inputs. Signal will be acquired when the internal trigger condition is meet. Time length of the acquired signal depends on the time scale of a buffer that can be set with a decimation factor. Decimations and time scales of a buffer are given in the table. Voltage and frequency ranges depends on Red Pitaya model.

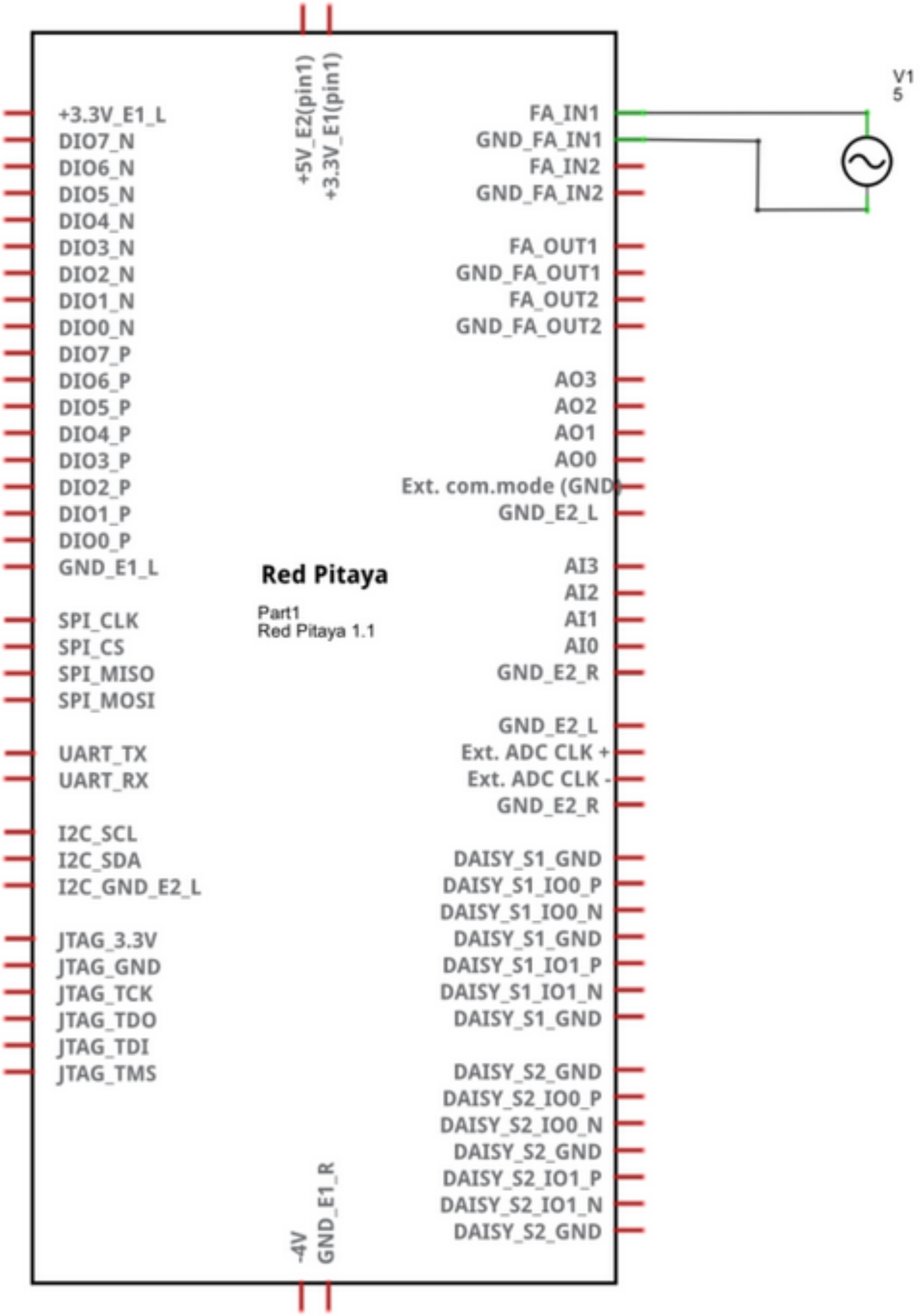
2.4.4.4.1.2. Required hardware

- Red Pitaya device
- Signal (function) generator

Wiring example for STEMlab 125-14 & STEMlab 125-10:



2.4.4.4.1.3. Cicuit



2.4.4.4.1.4. Code - MATLAB®

The code is written in MATLAB. In the code we use SCPI commands and TCP/IP communication. Copy code to MATLAB editor and press run.

```
%% Define Red Pitaya as TCP/IP object
clear all
close all
clc
IP= '192.168.178.111';                % Input IP of your Red Pitaya...
port = 5000;
tcpipObj = tcpip(IP, port);
tcpipObj.InputBufferSize = 16384*32;

%% Open connection with your Red Pitaya

fopen(tcpipObj);
tcpipObj.Terminator = 'CR/LF';

flushinput(tcpipObj);
flushoutput(tcpipObj);

% Set decimation vale (sampling rate) in respect to you
% acquired signal frequency

fprintf(tcpipObj,'ACQ:RST');
fprintf(tcpipObj,'ACQ:DEC 1');
fprintf(tcpipObj,'ACQ:TRIG:LEV 0');

% there is an option to select coupling when using SIGNALlab 250-12
% fprintf(tcpipObj,'ACQ:SOUR1:COUP AC'); % enables AC coupling on channel 1

% by default LOW level gain is selected
% fprintf(tcpipObj,'ACQ:SOUR1:GAIN LV'); % user can switch gain using this command


% Set trigger delay to 0 samples
% 0 samples delay set trigger to center of the buffer
% Signal on your graph will have trigger in the center (symmetrical)
% Samples from left to the center are samples before trigger
% Samples from center to the right are samples after trigger

fprintf(tcpipObj,'ACQ:TRIG:DLY 0');

%% Start & Trigg
% Trigger source setting must be after ACQ:START
% Set trigger to source 1 positive edge

fprintf(tcpipObj,'ACQ:START');
% After acquisition is started some time delay is needed in order to acquire fresh samples in to
buffer
% Here we have used time delay of one second but you can calculate exact value taking in to
account buffer
% length and smaling rate
pause(1)

fprintf(tcpipObj,'ACQ:TRIG CH1_PE');
% Wait for trigger
% Until trigger is true wait with acquiring
% Be aware of while loop if trigger is not achieved
% Ctrl+C will stop code executing in Matlab

while 1
     trig_rsp=query(tcpipObj,'ACQ:TRIG:STAT?')

     if strcmp('TD',trig_rsp(1:2))  % Read only TD

     break

     end
 end
```

```
% Read data from buffer
signal_str=query(tcpipObj,'ACQ:SOUR1:DATA?');
signal_str_2=query(tcpipObj,'ACQ:SOUR2:DATA?');

% Convert values to numbers.% First character in string is “{“
% and 2 latest are empty spaces and last is “}”.

signal_num=str2num(signal_str(1,2:length(signal_str)-3));
signal_num_2=str2num(signal_str_2(1,2:length(signal_str_2)-3));

plot(signal_num)
hold on
plot(signal_num_2,'r')
grid on
ylabel('Voltage / V')
xlabel('samples')

fclose(tcpipObj)
```

2.4.4.4.1.5. Code - C

Note

C code examples don’t require the use of the SCPI server, we have included them here to demonstrate how the same functionality can be achieved with different programming languages. Instructions on how to compile the code are here -> link

```c
/* Red Pitaya C API example Acquiring a signal from a buffer
 * This application acquires a signal on a specific channel */

#include <stdio.h>
#include <stdlib.h>
#include <unistd.h>
#include "rp.h"

int main(int argc, char **argv){

        /* Print error, if rp_Init() function failed */
        if(rp_Init() != RP_OK){
                fprintf(stderr, "Rp api init failed!\n");
        }

        /*LOOB BACK FROM OUTPUT 2 - ONLY FOR TESTING*/
        rp_GenReset();
        rp_GenFreq(RP_CH_1, 20000.0);
        rp_GenAmp(RP_CH_1, 1.0);
        rp_GenWaveform(RP_CH_1, RP_WAVEFORM_SINE);
        rp_GenOutEnable(RP_CH_1);


        uint32_t buff_size = 16384;
        float *buff = (float *)malloc(buff_size * sizeof(float));

        rp_AcqReset();
        rp_AcqSetDecimation(RP_DEC_8);
        rp_AcqSetTriggerLevel(0.1); //Trig level is set in Volts while in SCPI
        rp_AcqSetTriggerDelay(0);

        // there is an option to select coupling when using SIGNALlab 250-12
        // rp_AcqSetAC_DC(RP_CH_1, RP_AC); // enables AC coupling on channel 1

        // by default LV level gain is selected
        // rp_AcqSetGain(RP_CH_1, RP_LOW); // user can switch gain using this command

        rp_AcqStart();

        /* After acquisition is started some time delay is needed in order to acquire fresh
samples in to buffer*/
        /* Here we have used time delay of one second but you can calculate exact value taking in
to account buffer*/
        /*length and smaling rate*/

        sleep(1);
        rp_AcqSetTriggerSrc(RP_TRIG_SRC_CHA_PE);
        rp_acq_trig_state_t state = RP_TRIG_STATE_TRIGGERED;

        while(1){
                rp_AcqGetTriggerState(&state);
                if(state == RP_TRIG_STATE_TRIGGERED){
                break;
                }
        }

        rp_AcqGetOldestDataV(RP_CH_1, &buff_size, buff);
        int i;
        for(i = 0; i < buff_size; i++){
                printf("%f\n", buff[i]);
        }
        /* Releasing resources */
        free(buff);
        rp_Release();
        return 0;
}
```

2.4.4.4.1.6. Code - Python

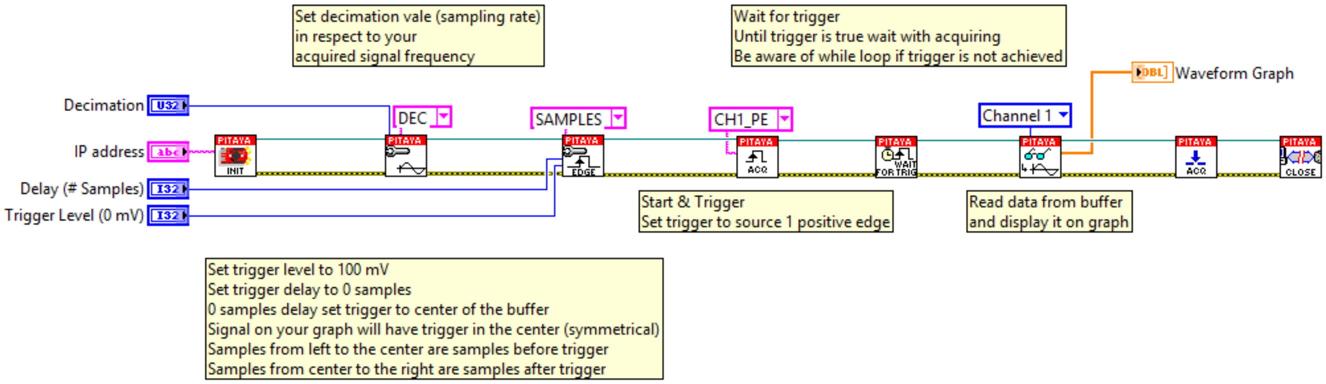
```
#!/usr/bin/python

import sys
import redpitaya_scpi as scpi
import matplotlib.pyplot as plot

rp_s = scpi.scpi(sys.argv[1])

# there is an option to select coupling when using SIGNALlab 250-12
# rp_s.tx_txt('ACQ:SOUR1:COUP AC') # enables AC coupling on channel 1

# by default LOW level gain is selected
# rp_s.tx_txt('ACQ:SOUR1:GAIN LV') # user can switch gain using this command

rp_s.tx_txt('ACQ:START')
rp_s.tx_txt('ACQ:TRIG NOW')

while 1:
    rp_s.tx_txt('ACQ:TRIG:STAT?')
    if rp_s.rx_txt() == 'TD':
        break

rp_s.tx_txt('ACQ:SOUR1:DATA?')
buff_string = rp_s.rx_txt()
buff_string = buff_string.strip('{}\n\r').replace("  ", "").split(',')
buff = list(map(float, buff_string))

plot.plot(buff)
plot.ylabel('Voltage')
plot.show()
view rawacquire_trigger_posedge.py
```

2.4.4.4.1.7. Code - Scilab

Scilab socket input buffer can read approximately 800 samples from Red Pitaya. This is the problem in contributed code for Scilab sockets. How to set socket is described on Blink example.

```
clear all
clc

// Load SOCKET Toolbox.
exec(SCI+'contribsocket_toolbox_2.0.1loader.sce');
SOCKET_init();

// Define Red Pitaya as TCP/IP object
IP= '192.168.178.56';            // Input IP of your Red Pitaya...
port = 5000;                     // If you are using WiFi then IP is:
tcpipObj='RedPitaya';            // 192.168.128.1

// Open connection with your Red Pitaya

SOCKET_open(tcpipObj,IP,port);

// Set decimation value (sampling rate) in respect to you
// acquired signal frequency

SOCKET_write(tcpipObj,'ACQ:DEC 8');

// Set trigger level to 100 mV

SOCKET_write(tcpipObj,'ACQ:TRIG:LEV 0');

// there is an option to select coupling when using SIGNALlab 250-12
// SOCKET_write(tcpipObj,'ACQ:SOUR1:COUP AC'); // enables AC coupling on channel 1

// by default LOW level gain is selected
// SOCKET_write(tcpipObj,'ACQ:SOUR1:GAIN LV'); // user can switch gain using this command

// Set trigger delay to 0 samples
// 0 samples delay set trigger to center of the buffer
// Signal on your graph will have trigger in the center (symmetrical)
// Samples from left to the center are samples before trigger
// Samples from center to the right are samples after trigger

SOCKET_write(tcpipObj,'ACQ:TRIG:DLY 0');

//// Start & Trigg
// Trigger source setting must be after ACQ:START
// Set trigger to source 1 positive edge

SOCKET_write(tcpipObj,'ACQ:START');
SOCKET_write(tcpipObj,'ACQ:TRIG NOW');

// Wait for trigger
// Until trigger is true wait with acquiring
// Be aware of while loop if trigger is not achieved
// Ctrl+C will stop code executing

xpause(1E+6)

// Read data from buffer

signal_str=SOCKET_query(tcpipObj,'ACQ:SOUR1:DATA:OLD:N? 800');

// Convert values to numbers.// First character in string is “{“
// and 2 latest are empty spaces and last is “}”.
signal_str=part(signal_str, 2:length(signal_str)-3)
signal_num=strtod(strsplit(signal_str,",",length(signal_str)))';

plot(signal_num)

SOCKET_close(tcpipObj);
```

2.4.4.4.1.8. Code - LabVIEW



Set decimation vale (sampling rate)
in respect to your
acquired signal frequency

Wait for trigger
Until trigger is true wait with acquiring
Be aware of while loop if trigger is not achieved

Start & Trigger
Set trigger to source 1 positive edge

Read data from buffer
and display it on graph

Set trigger level to 100 mV
Set trigger delay to 0 samples
0 samples delay set trigger to center of the buffer
Signal on your graph will have trigger in the center (symmetrical)
Samples from left to the center are samples before trigger
Samples from center to the right are samples after trigger

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