Tausand AB1000 library example: Multiple Read Example

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Reads continously and saves data from a Tausand Abacus coincidence counter. Uses functions in the Tausand_AB1000_MatlabLibrary. Handles errors and retry readings and connections when lost. To be used in Matlab's command window.

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Constants to be defined by user

```
samples_to_read = 10; %change this parameter to set how many samples
 to read
my_sampling_time_ms = 1000; %change this parameter to set your
 sampling time. 1000=1s.
my_port = 'COM23'; %change this port to the adequate one
```

Define the desired channels to be read. Example:

```
channels_to_read = ["A","B","C","AB","AC","multiple_1"]; %multiple_1
 corresponds to a multi-fold mesurement, to be configured, e.g. 'ABC'
```

Establish a connection

```
disp("******************************");
disp("MATLAB multiple read example");
disp("******************************");
disp("1. Establish a connection");

my_abacus = openAbacus(my_port)
device_idn = idnQuery(my_abacus)
```

```
******************************
MATLAB multiple read example
******************************
1. Establish a connection
```

```
   Serial Port Object : Serial-COM23 AB1504

   Communication Settings
      Port:               COM23
      BaudRate:           115200
      Terminator:         'LF'

   Communication State
      Status:             open
      RecordStatus:       off

   Read/Write State
      TransferStatus:     idle
      BytesAvailable:     0
      ValuesReceived:     21
      ValuesSent:         7



device_idn =

    'Tausand Abacus AB1504'
```

Write and read new settings

```
disp("2. Write and read new settings");
```

```
2. Write and read new settings
```

Write settings, using configureByName function:

```
configureByName(my_abacus,"sampling",my_sampling_time_ms);
```

Several configurations may be applied with a single command line:

```
configureByName(my_abacus,...
    ["coincidence_window","delay_A","delay_B","sleep_A","sleep_B"],...
    [50,0,10,0,20]);
    %this sets: coincidence_window=50ns, delay_A=0ns, delay_B=10ns,
    %sleep_A=0ns, sleep_B=20ns.
```

Upgrade 'TAUSAND:timeout' warning to an error, to catch them.

```
my_warn = warning('error', 'TAUSAND:timeout');
```

Read current settings

```
max_try=5;
for attempt=1:max_try
    try
        [setting_values,setting_labels]=queryAllSettings(my_abacus);
        current_settings=[setting_labels,setting_values];
        disp('Current settings are:');
        disp([setting_labels,setting_values]);
        break;
    catch ME
        switch ME.identifier
            case {'TAUSAND:unexpectedReadByte',...
                    'TAUSAND:checksumFailed','TAUSAND:timeout'}
                %ignore these errors, just retry.
            case 'MATLAB:serial:fwrite:opfailed'
                %if connection is lost, maybe device has been
                %disconnected
                closeAbacus(my_abacus)
                try
                    openAbacus(my_abacus)
                catch
                    %ignore error
                end
            otherwise
                warning('Unexpected error. Device connection closed.')
                closeAbacus(my_abacus)
                rethrow(ME)
        end
    end
end
warning(my_warn.state, 'TAUSAND:timeout'); % Restore this warning back
 to their previous (non-error) state
if (attempt == max_try)
    warning('TAUSAND:timeout',['Communication error after
 ',int2str(max_try),' attempts']);
end
```

```
Current settings are:
    "sampling"              "1000"
    "coincidence_window"    "50"
    "delay_A"               "0"
    "delay_B"               "10"
    "delay_C"               "0"
    "delay_D"               "0"
    "sleep_A"               "0"
    "sleep_B"               "20"
    "sleep_C"               "0"
    "sleep_D"               "0"
    "config_multiple_1"     "240"
```

Create plaintext file

```
disp("3. Create file");
date_time_string = string(datetime,'yyyy-MM-dd_HHmmss');
column_headers = cat(2,["PC time","countersID"],channels_to_read);
file_name =
 strcat('data_multipleReadExample_',date_time_string,'.txt');
```

```
3. Create file
```

Create file,

```
myfile = fopen(file_name, 'a'); %create file in append mode
disp(strcat("File ",file_name," has been created"));
```

```
File data_multipleReadExample_2021-03-15_154853.txt has been created
```

and write file headers,

```
fwrite(myfile,['multipleReadExample',newline]);
fwrite(myfile,['-------------------',newline]);
fwrite(myfile,['Begin time: ',char(date_time_string),newline]);
fwrite(myfile,['Device: ',device_idn,newline]);
fwrite(myfile,['Settings: ',newline]);
fprintf(myfile,'%s\t%s\n',[setting_labels,num2str(setting_values)]');
fwrite(myfile,[newline,newline]);
fprintf(myfile,'%s\t',column_headers);
fwrite(myfile,newline);
```

Multiple read using function waitAndGetValues

```
disp('4. Multiple read using waitAndGetValues function begins');
fprintf('\t%s',column_headers); %print in command window
fprintf('\n');
tMultipleReadExample = tic;
for sample=1:samples_to_read
    try
        my_data = waitAndGetValues(my_abacus,channels_to_read);
        s=strcat(sprintf('%.3f',toc(tMultipleReadExample)),sprintf('\t
%d',my_data),string(newline));
        fwrite(myfile,s);
        t = [num2str(sample),'/',num2str(samples_to_read)];
        fprintf('%s\t%s',t,s);    %print data in command window
    catch ME
        switch ME.identifier
            case {'TAUSAND:unexpectedReadByte',...
                    'TAUSAND:checksumFailed','TAUSAND:timeout'}
                %ignore these errors, just continue.
            case 'MATLAB:serial:fwrite:opfailed'
                %if connection is lost, maybe device has been
                %disconnected
                closeAbacus(my_abacus)
                try
                    openAbacus(my_abacus)
                catch
                    %ignore error
                end
            otherwise
                warning('Unexpected error. Device connection closed.
 File access closed.')
                fclose(myfile);
                closeAbacus(my_abacus)
                rethrow(ME)
        end
    end
end
```

```
4. Multiple read using waitAndGetValues function begins
 PC time countersID A B C AB AC multiple_1
1/10 0.382 1845 15625 31250 31250 15625 15625 1736
2/10 1.365 1846 15624 31249 31249 15624 15624 1736
3/10 2.507 1847 15625 31249 31249 15625 15625 1736
4/10 3.348 1848 15625 31250 31250 15625 15625 1736
5/10 4.364 1849 15624 31249 31249 15624 15624 1736
6/10 5.353 1850 15625 31249 31249 15625 15625 1736
7/10 6.710 1851 15624 31249 31249 15624 15624 1736
8/10 7.354 1852 15625 31250 31250 15625 15625 1736
9/10 8.344 1853 15625 31249 31249 15625 15625 1737
10/10 9.696 1854 15624 31249 31249 15624 15624 1736
```

Close connection and close file

```
fclose(myfile);
closeAbacus(my_abacus)
```

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