

Debugging NPS High Voltage Channel Initialization Graphical User Interface

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I developed a Python program to generate a graphical user interface (GUI), using the *tkinter* Python package, and set the parameters for all channels of all CAEN high voltage modules used for NPS. The purpose of the GUI, Fig. 1, is to provide users the ability to set the parameters for all channels of all high voltage modules to the same value and save the values to a text file.

When the GUI was used for NPS testing in the EEL building, a user noticed an issue where some channels, upon receiving the command to set a parameter, would return an EPICS Channel Access warning that the “Channel write request” had failed, Fig. 2. At first it appeared that this warning meant that the parameter for these channels had not been set, but upon further investigation it was found that the parameter for these channels had indeed been set despite returning a warning. I also discovered that some channels randomly would not receive the command and would not return an error or warning at all.

One attempted solution was to include a 0.25-s wait after each set command was sent. This had the effect of adding 4.5 minutes to the program execution time while not resolving the issue.

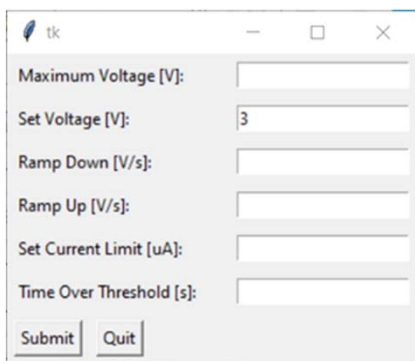


FIG.1. Screenshot of HV channel initialization GUI

- **Random high voltage channels do not receive the command to set parameters to new values**
- **Tried three different methods of resolving this issue**
- **In the end, none worked and the set command has to be sent multiple times**

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Another attempted solution was to try and force the set command by repeatedly checking the set value against the input value and resending the set command until the two values matched. This had the potential to add significant time to the execution of the program as well.

The EPICS Channel Access command used to set high voltage channel parameters is *caput* and the command used to read the parameter values is *caget*. These are part of the *epics* Python package. Included in this package are the *caput_many* and *caget_many* commands. I was initially iterating over all 1080 channels and using the *caput* command to set the chosen high voltage parameter. I was able to use the *caput_many* command, which takes a list of PVs, to send commands to all PVs at the same time. I altered the code to generate the PV list based on which high voltage parameter is being set and then to use *caput_many* to set all channels for each crate. I use two commands (one for all channels of each crate separately) to ensure that the command is sent and received for all channels. The *caput_many* command has a wait parameter that when set to wait='each' is supposed to make it so that the execution waits until each PV has received the command before moving on to the next PV. This did not happen, and so I had to alter the code to issue the *caput_many* command twice for each crate. I will be contacting CAEN technical support to see if they can figure out a solution that doesn't require issuing EPICS commands more than once to get a channel to accept a new setpoint.

```
if v0set:
    for i in range(14):
        a = []
        A = []
        for j in range(36):
            pfix = "hchv20:"+mod[i]+":0"+chans[j]+prefix2
            prefix = "hchv21:"+mod[i]+":0"+chans[j]+prefix2
            a.append(pfix)
            A.append(prefix)
        #print(a)
        #print(caget_many(a))
        b = [v0set] * len(a)
        val = caput_many(a,b,wait='each')
        val = caput_many(a,b,wait='each')
        b = [v0set] * len(A)
        val2 = caput_many(A,b,wait='each')
        val2 = caput_many(A,b,wait='each')
        print(caget_many(a))
        print(caget_many(A))
```

FIG.3. Screenshot of the HV channel initialization GUI Python program

```
CA.Client.Exception.....
Warning: "Channel write request failed"
Context: "op=1, channel=hchv20:00:008:V0Set, type=DBR_DOUBLE, count=1, ctx="hchv20:00:008:V0Set""
Source File: c:\jenkins\win64-2\workspace\epics-base-3.15-win64\src\ca\client\oldchannelnotify.cpp line 160
Current Time: Tue Feb 14 2023 11:55:00.596785414
.....
The set voltage for hchv20:00:008:V0Set is 6.0
```

FIG.2. Screenshot of EPICS Channel Access warning