Title:	UDCM Operating Procedure (Limited Functionality prototype)
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Title:　　　　**UDCM Operating Procedure (Limited Functionality prototype)**

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Summary

The UDCM is a two channel low current measurement device designed to record sub-nano-amp to micro-amp currents from radiation detectors. The UDCM incorporates a Commercial-Off-The-Shelf (COTS) processor enabling both serial over USB as well as Ethernet communications. The instrument includes microSD and USB flash memory for data storage as well as a programmable High Voltage (HV) power supply for detector bias. The UDCM incorporates a unique TTL output feature first used in the LANL Current to Pulse Converter (CPC). Two SMA connectors on the UDCM provide TTL pulses at a frequency proportional to the input currents.

Do to the early development phase, the limited functionality prototype has the following limitations:

1. Not yet RAINSTORM compliant
2. Not yet MIC compatible
3. Data storage on uSD card only
4. USB2.0 host not enabled
5. Non-configurable single IP address (192.168.0.10:22000)
6. No serial over USB communications
7. No real-time clock

Figure 1. UDCM front and back panel images.

Specifications

- *Power requirements: 12V, 4W.*
  – center positive barrel 2.1 ID, 5.5 OD, 10mm
- *Inputs:*
  - *-Two Channel low current inputs from -0.2nA to -2uA.*
    - *-Connector: Lemo EPL.OS.250.CLN*
- *Outputs:*
  - *- Negative high voltage detector bias (0 to -1kV)*
    - *- Connector: Lemo EPL.O0.250.NTN*
  - *-Two Channel TTL output (frequency proportional to input current at 100cps/nA)*
    - *- 100 cps/nA.*
    - *- 40ns wide inverted pulse (newer versions will use 1us wide non-inverted)*
    - *- Connector: SMA*
- *Communications:*
  Ethernet web-browser {Future: RAINSTORM, Serial over USB (MIC compatible), USB2.0 host.}
- *Temperature: -10 to 50 degrees C.*
- *Memory: 1GB DDR3 SDRAM, 128Mb QSPI Flash, Micro SD card, USB flash drive.*
- *Weight: < 800g*
- *Dimensions: 180x100x50 mm^3.*

Procedure

1. Connect the current output of the detector to the UDCM current input, IN.
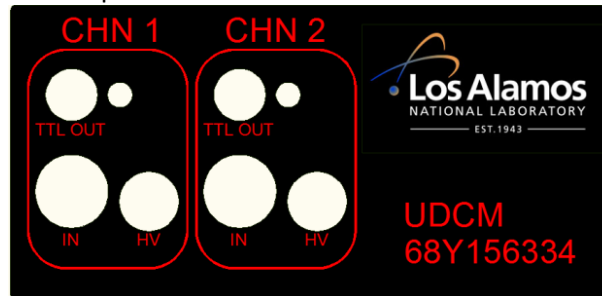2. Connect the HV bias input of the detector to either HV connector on the UDCM, HV.

Figure 2. UDCM Front Panel Label

3. Connect a 12V power supply to the input power jack.
4. Connect a computer to the UDCM Ethernet connector.
   a. Set the operating computer network IP address to be on the same subnet as the UDCM, 192.168.0.XX. (UDCM IP address is 192.168.0.10:22000)
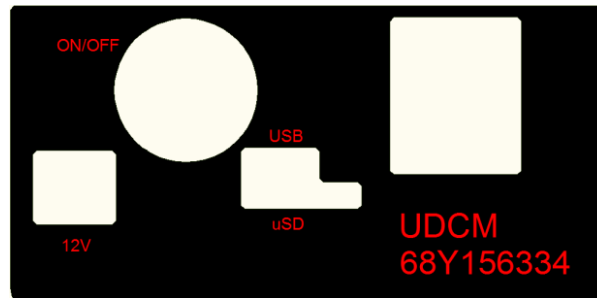5. Turn on UDCM power switch.

Figure 3. UDCM Rear Panel Label

6. Configure the UDCM.
    a. Open a web browser on the operating computer.
        Note: The limited functionality UDCM does not have a real time clock and the date and time will need to be set after each boot up.
        To set the date and time enter the date and time after the URL and port in the exact format: /?time=MM/DD/YYYY_HH:MM:SS
            Example: 192.168.0.10:22000/?time=06/08/2016_17:15:00
    b. Set the date and time from the browser if time stamping of the data is desired.
    c. After the time has been set use the following URL and port: 192.168.0.10>:22000.
    d. The user interface shown in Figure 4 will be displayed in the web browser.
    e. Set the HV bias value. The HV is always negative value but can be entered as either a positive or negative number.
    f. Set the Gain of both channels:
        High Gain is for currents between -0.2uA to -2.0uA.
        Low Gain is for currents between -2uA to -20uA.
            0   =>   both channels set to high gain
            1   =>   channel one to low gain, channel 2 to high gain
            2   =>   channel one to high gain, channel 2 to low gain
            3   =>   both channels to low gain
7. Set the data acquisition time:
    a. The UDCM acquires current measurements every 100ms. This data is averaged over the user's defined data acquisition time, Acq time. The average value of the acquired data is stored on the uSD card upon the completion of each data acquisition period. The UDCM will run continuously in this mode until stopped by the user.
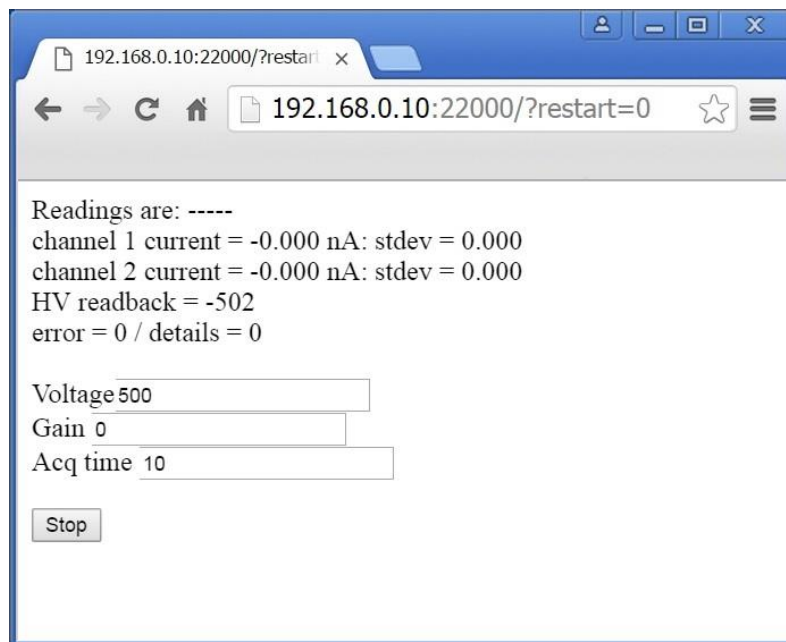
Figure 4. UDCM operating display

Data Format

The UDCM saves data in two files. One is a comma delimited file that can be easily read into an Excel spreadsheet and the other is a BI0 file that is compatible with the IAEA Rad Review software. The comma delimited file uses the date as the file name with a incremented reference number (year/month/day/ref#), e.g. 16061055.cvs. The data is stored in eight columns with the following definitions:

Column 1:	Date and time
Column 2:	Channel 1 current (-nA)
Column 3:	Channel 1 standard deviation
Column 4:	Channel 2 current (-nA)
Column 5:	Channel 2 standard deviation
Column 6:	Acquisition time (s)
Column 7:	Number of samples
Column 8:	Status (undefined in limited functionality prototype)

The BI0 file has the same naming convention using the date and reference number. This file can be read directly by Rad Review.