



New Experiment Setup Guide

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1 Introduction

The follow chapters describe how to manage a new MoNA-Sweeper experimental account.

Many experimental codes run programs that reside in the `/user/mona` account, like Readout and SpecTcl, but are called with setup and hardware files from within the new experimental account.

Most of the following procedures can be done from a `spice` machine by logging in with the experiment user account.

2 Experimental Account

A couple weeks before the experiment is scheduled to run a user account should be created by the computer group. The user account name is set to the experiment number (#####) issued by the PAC (like 03038 or 05124). When the account is made a standard password will be assigned.

2.1 Password

There are two passwords for every user. The first is the Linux (or DAQ) password and must be changed to a custom one when you login the first time by using the `> yppasswd` command. It will ask you to enter the original password and then your new one twice.

The second password is for the Windows machines. Go to the Data U. and login into a Windows machine and it will notify you that the standard password has expired and you must enter a new one. The password manager allows only ones that include capitals, lower case, and numbers. All three groups must be represented in the password. The Linux machines do not have this restriction, but it is advised to choose one that can be used for both.

2.2 Group Members

Contact a member of the computer group or send a e-mail to add the users `mona` and `sweeper` to the experiments user group. Also ask that the new account be added to the `mona` and `sweeper` groups. This is to ensure that when we login as the new account we can copy over the necessary files from the `/user/mona` directories. You must also ask to add your personal account to the experiments user group along with other collaborators of your research team. You can view the members of a group by the following command:

```
> ypmatch monag group
```

Substitute "monag" with "#####g" or any group name you wish to query. You can also find the list of groups a user account is a member of. The following is an example for the user "mona".

```
> groups mona
```

2.3 SSH

Many DAQ codes are called from the Data U. machine but actually run on another machine (usually `spdaq16`). Since the codes are trying to communicate with the `spdaq` machine, it will ask for the password before continuing. This pause in the action will usually cause the desired program call to fail. By setting up a proper `.ssh` directory you can then call these programs without providing a password.

There are directions in the Data U. for setting up the `.ssh` directory to ssh without passwords, but I will cover them here as well. From a Linux Data U. machine login is with the experiment account and follow these commands.

```
> cd ~/
> chmod 0750 .
> rm -rf .ssh
> mkdir .ssh
> cd .ssh
> chmod 0700 .
> ssh-keygen -t dsa -P "" -f id_dsa
> mv id_dsa.pub authorized_keys
> mv id_dsa identity
> chmod 0600 identity
> chmod 0640 authorized_keys
> cd ~/
```

2.4 Event Space

When the account was created the computer group should have also issued space on an event disk for recording event files. Create a link called "stagearea" to this issued directory address.

```
> cd ~/
> ln -s /user/event3/05124 stagearea
```

Replace `event3` and `05124` with the proper assigned values issued by the computer group.

2.5 Log Book

Log books are provided by the NSCL and one should be taken from the main-level copy room. Put the date and the experiment number on the cover.

2.5.1 Inside Cover I like to use the inside cover to record the list of collaborators and the password.

3 Bash Profile

Similar to the `.ssh` directory, some of the programs refer to the standard directory structure (outlined in the next chapter) and are given environment variables within the `.bashrc` file. The standard bash files can be copied from the `/user/mona/Bash_files` directory. After logging in with the experiment account, follow these commands.

```
> cd ~/
> cp -rp /user/mona/Dot_files/ .
> cp -p ~/Dot_files/.bash* .
```

4 Directory Structure

As mentioned above many standard programs used in the DAQ system rely on strict directory structures and files.

4.1 Mona

Copy the `/user/mona/mona` directory structure to the experimental account:

```
> cd ~/
> cp -rp /user/mona/mona/ .
```

4.1.1 Xamine Files There are two Xamine files that get used to control the color and layout of Xamine. To use the standard files, simply copy them from the `/user/mona` directory:

```
> cd ~/
> cp -p /user/mona/Xamine* .
```

4.2 Tandem

Copy the `/user/mona/shared/exp_tandem` directory structure to a local tandem directory:

```
> cd ~/
> cp -rp /user/mona/shared/exp_tandem/ tandem
```

4.3 Experiment

Readout needs an `/experiment` account to run properly. Create this by:

```
> cd ~/
> mkdir experiment
```

When Readout is first tested it will automatically make the subdirectories `current`, `orphans`, and `staged`. Also a folder is made after each run is completed called `run####`.

4.3.1 Current The contents of the `experiment/current` directory is copied into each `run####` folder. It can be made by hand before starting Readout. All important setting files for the experiment should be linked to from the `experiment/current` directory. Since there are also sweeper settings files to be linked, I make two folders:

```
> cd ~/experiment
> mkdir current
> cd current
> mkdir mona_settings
> mkdir sweeper_settings
```

Then I fill the `mona_settings` folder with important MoNA files (and the folder that contains all the cfd settings) that might change during the experiment.

```
> cd mona_settings
> ln -s /user/#####/mona/config/MoNA_scaler_setup.tcl
> ln -s /user/#####/mona/config/MoNA_setup_run.tcl
> ln -s /user/#####/mona/config/MoNA_dynamic_var_run.tcl
> ln -s /user/#####/mona/config/MoNA_readout_run.tcl
> ln -s /user/#####/mona/config/MoNA_spectcl_run.tcl
> ln -s /user/#####/mona/config/MoNA_hardware_run.tcl
> ln -s /user/#####/mona/config/QDCfittedTHRE.tcl
> ln -s /user/#####/mona/config/QDCfittedSLOOFF.tcl
> ln -s /user/#####/mona/config/MoNA_Param_run.tcl
> ln -s /user/#####/mona/config/Xpos_cal.tcl
> ln -s /user/#####/mona/fpga/xlm_values.dat
> ln -s /user/#####/mona/hv_control/hv_files/Vout_current.tcl
> ln -s /user/#####/mona/cfd/
```

Daniel Bazin should fill the `current/sweeper_settings` folder with the proper Sweeper related files, or one could try to copy them from a previous experimental account and then he can edit them as needed. Daniel does not use links but instead sources the settings files from this folder directly when configuring the Sweeper DAQ.

4.3.2 Complete The scaler files are saved each time Readout is ended in a subdirectory of `experiment`. This makes it easier to transfer all the relevant data to tape after the experiment is finished. A new subdirectory called `experiment/complete` must be made.

```
> cd ~/experiment
> mkdir complete
```

4.4 Desktop

The `Desktop` directory is used by the Data U. machines to create the desktop environment and the function call buttons. There is a standard set of buttons in the `/user/mona/shared/exp_desk` directory.

```
> cd ~/
> rm -rf Desktop
> mkdir Desktop
> cd Desktop
> cp -p /user/mona/shared/exp_desk/* .
```

Login to a Data U. machine with the experimental account and from the KDE environment right-click on a command button and check that the command path points to your current account, or through an environment variable, or to the correct `/user/mona` destination.

5 Running Experiment

While running the experiment be sure to always save the settings like "xlm_values" and cfd control files so they are up to date when copied by Readout from the links in the `experiment/current/mona_settings` folder.

5.1 Edit Settings Files

Please read the MoNA report on MoNA calibration [2] to understand which files do what within the Readout and SpecTcl programs. Of particular importance are the different data packets created in the `mona/config/MoNA_hardware_run.tcl` file. Some of the commonly used packets are `mona`, `bitpattern`, and `ncans`. These are then added to the DAQ by the `MoNA_readout_run.tcl` file and added to the SpecTcl unpacker by the `MoNA_spectcl_run.tcl` file. Edit these as needed within the `mona/config` directory to add or subtract packets from the DAQ.

5.2 Orphaned Runs

If Readout or the `spdaq16` machine crashes during a run, the automatic copying and transferring of settings and event files will not happen properly. A properly recorded run creates a run folder, `~/experiment/run####`, that contains the two settings folders and a link to the actual .evt file in `~/user/event#####/complete`.

To get the links and the Readout program back to working order after a crash first check to see if `spdaq16` needs to be rebooted.

```
> ping spdaq16
```

Type `[CONTROL] ^C` to quit pinging. If there is no response you must go into the N6 area and reboot `spdaq16` (directions for rebooting are on orange tape on the machine). If the pinging worked or after rebooting `spdaq16` make sure there are no Readout codes running. The following command lists the current programs containing "eadout".

```
> ps axuww|grep eadout
```

Then kill any programs still running by using the procedure number listed:

```
> kill ####
```

Rebooting `spdaq16` will also kill stray procedures, but requires the user to restart many control programs after.

Follow this check list before continuing with the next run.

1. Restart Readout and manually increase the run number.
2. Start and then stop a run without recording.
3. Use the `>ls -la` command in the `~/experiment` directory to look for a run folder (`run####`) made for the interrupted run.
4. Look for copied `mona_settings` and `sweeper_settings` folders within the the run folder.
5. If needed, copy the settings folders into the interrupted run folder:

```
> cd ~/experiment
> cp -rp /current/mona_settings/ run####/
> cp -rp /current/sweeper_settings run####/
```

6. Now look for a linked `.evt` file.

Within the run folder, look for a linked `.evt` file pointing to the actual `.evt` file in one of the `stagearea` subdirectories.

Look for a linked `.evt` file in the `experiment/orphans` or `/current` directories.

7. Find the actual `.evt` file in `stagearea/complete` or `/current` or `/orphan` directories.
8. Move the actual `.evt` file for the interrupted run into `stagearea/complete`.
9. Fix links to the `.evt` file for the interrupted run within the `experiment/run####` folder to link to the actual file now located in the `stagearea/complete` directory.

```
> cd ~/experiment/run####
> ln -s ~/stagearea/complete/run####-4096.evt .
```

10. If needed, delete old links from the `experiment/orphans` or `/current` directories.

If all goes well, the next run can now be recorded. Be sure to make a note in the log book during which run the Readout program halted.

6 Post Experiment

As the experiment time is completed there a few prudent procedures to perform to ensure the data is capable of being analyzed properly.

6.1 Calibration Runs

Before turning MoNA HV off, take a couple cosmic background runs for future calibration checks. One long run (6 hours) with MoNA self triggered/stopped and multiplicity set to "1-fold" and then another long run, again self triggered and stopped, with multiplicity set to "cosmics" (3-fold). The first one can be used to double check the QDC and Xpos calibration[2]. The second run is used to set the Tmean independent offsets for each bar[2].

6.2 Archive Tapes

When all the experiment runs and the additional calibration runs are completed, the event files must be copied to tape and then read off the tape into the `evtdata` disk space. The NSCL provides a nice manual for copying data onto tapes called "Perparing to Close your Experimental Account". I will not cover all the directions contained in that manual, so it should be read as well. I will go through the most common steps and address common problems that have arisen in the past.

1. Acquire a DTL or similar digital tape from the Computer help room.
2. Double check that all run folders within the `experiment` directory contain proper links to actual `.evt` files in the `stagearea/complete` directory.
3. Login to the "tapehost" machine (currently in the Data U. 2 cubicle) with the experimental account.
4. Change directories to the `experiment` directory. `> cd ~/experiment`
5. Identify the tape drive you are using. Maybe `/dev/st2` or `/dev/st0`. It is used as the third argument in steps 6 and 9.
6. Record entire `experiment` directory onto tape. `> tar -cvhf /dev/st2 .`
7. Wait for entire directory to be recorded onto the tape (it may take a couple hours). The terminal window should display all items written.
8. Change directories to the `evtdata/#####` space provided by the computer group. `> cd /evtdata/#####`
9. Read the files from the tape. `> tar -xvf /dev/st2 .`
10. When the reading is completed, check that the entire `experiment` directory was copied, including actual `.evt` files (not links).
11. Eject tape and label it with the date, experiment number, and runs included.

If all the `~/experiment` run folders were repaired properly if Readout crashed the actual `.evt` files should have been copied correctly. If they were not copied correctly, find the run folders for the missing `.evt` files and rewrite the link to the actual `.evt` file. Then delete the files you just wrote to the `evtdata/#####` space and start over from step 4.

Since this process copies each `.evt` file inside their respective `experiment/run####` folders, it is not possible to attach multiple files when analyzing the date with `SpecTcl`[6]. A useful trick is to make a new folder within the `/evtdata/#####` space that contains links to all the `.evt` files.

1. `> cd /evtdata/#####`

2. `> mkdir evt_links`
3. `> cd evt_links`
4. `> for i in ../experiment/run*/*.evt ; do ln -s $i . ; done`
5. Check that all `.evt` files have a link in this folder.

6.3 Analysis Space

Along with an `/evtdata` space the computer group also should have provided a `/projects` space to copy the analysis files. The `/projects` area can be accessed from the high-speed spice machines, and should be used for all off-line analysis.

1. Login as the experiment onto "tapehost".
2. `> cd /projects/proj#/#####`
3. `> cp -rp /user/#####/* .`
4. Check that all subdirectories got transferred properly.

6.4 Executables

The executable files, specifically those that end in ".scr" use environment variables, that are defined inside the user's `.bashrc` file, to navigate to the proper configuration files. Once the experimental user account is deleted the user becomes you and not the experimental account. This means that unless you only want to analyze one experiment, you can't define these environment variables inside your `.bashrc` file. To overcome this limitation we must define the environment variables used for a specific executable directly in the file that sources it.

1. Start by opening the `tandem_spectcl.scr` for editing from the `/projects` directory it was copied into.
2. Comment out, or delete the first couple lines that source `etc/profile` and `~/ .bashrc`.
3. Open the experimental account's `.bashrc` file.
4. Copy list of exported variables and paste them at the beginning of the `.scr` file. They include:

```
export SHARED_READOUT=/user/mona/shared/readout ## shared from /user/mona
export SHARED_SCALER=/user/mona/shared/scaler
export SHARED_SPECTCL=/user/mona/shared/spectcl_shared

export MONA_DAQ=${HOME}/mona/daq
export MONA_READOUT=${MONA_DAQ}/readout
export MONA_SCALER=${MONA_DAQ}/scaler
export MONA_SPECTCL=${MONA_DAQ}/spectcl
export MONA_CONFIGDIR=${HOME}/mona/config ## configuration directory.
export MONASETUP=${HOME}/mona/config/MoNA_setup_run.tcl ## MoNA_setup_file
```



```
export TREADOUT=${HOME}/tandem/readout ## tandem directories
export TCONFIG=${HOME}/tandem/spectcl
export TSPECTCL=${HOME}/tandem/spectcl
```

```
export READOUT_SWEEPER=${HOME}/sweeper/scriptedReadout
export SPECTCL_SWEEPER=${HOME}/sweeper/spectcl
```

5. Add `export EXP_HOME=/projects/proj#/#` to the very top of the `.scr` file. Be sure to fill in the appropriate directory address and note that one can't begin an exported environment variable with a number, but be creative with the `EXP_HOME` name to ensure it is not reused.
6. Edit all the following environment variables to begin with the name you choose for `{EXP_HOME}` instead of `{HOME}`.
7. This maybe the only executable you need to edit, but follow a similar procedure for any others that may need it.

References

- [1] R. Fox, *SpecTcl - User's Guide* October 28, 2003. NSCL.
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- [2] J. Miller, M. Strongman, L. Elliott, D.B. Hecksel, M.M. Kleber, P.J. Voss, T. Pike, R. Pepin, A. Ratkiewicz, W.A. Peters, *MoNA Calibration* 2005. NSCL.
`/projects/proj1/mona/reports`
- [3] G. Christian, W.A. Peters, *MoNA Position Calibration* 2005. NSCL.
`/projects/proj1/mona/reports`
- [4] K. Yoneda, W.A. Peters, *MoNA Fitting Codes* 2004. NSCL.
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- [5] A. Ratkiewicz, W.A. Peters, *MoNA SpecTcl Guide* 2006. NSCL.
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- [6] W.A. Peters, *Tandem SpecTcl Guide* 2006. NSCL.
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