DAQ2SPIKE2 PACKAGE

The daq2spike2 package is a collection of utilities that convert and correct files in one format to another format. Here is how to use the utilities.

CYGNUS RECORDINGS

The Cygnus tapes were copied to disk from the original digital recordings using the ddrescue utility. This is a Linux program that can be installed from the Debian repository. Ddrescue reads the original tapes and saves a bit-for-bit copy to a disk file. It also creates a map file that contains information about the original recording. The convention is to name the disk file based on the experiment, type letter and recording number, and .dd extension, e.g., b04.b1.dd. Here is an example of the ddrescue command line:

```
ddrescue --cpass=1 -b 65024 -c 1 -r 0 --size=5000M --skip-size=0 --no-scra
pe --no-trim -v -v -v -v -u /dev/nst0 b04.b1.2ndrec b04.c1.2ndrec.map
```

Bad Sector Fixup

Many of the tape files have bad sectors. These are not valid data sectors that became corrupted later, they are locations on the tape that are flawed, probably due to a manufacturing defect. The Cygnus recording software skips these while recording and continues writing data when it finds the next good sector on the tape. These skipped sectors need to be removed from the disk file. The *cyg_fixup* program does this. This is not an interactive program, and operates only on one file at a time.

This is the help for it:

```
Usage: cyg_fixup -f input_file_name
A map file created by the ddrescue program with the same base name is expected in the same
directory, such as b04.b1.map.

It appears that the 'bad sectors' that ddrescue found on the Cygnus tapes
are not read errors of valid data sectors that have been corrupted. Instead,
it appears that during the original recording, the Cygnus machine detected a
bad sector and wrote the block to the next valid location on the tape.
This program uses the bad sector offsets in the .map file, and creates a new file
that removes the so-called bad sectors.
```

This creates a file with the same base name as the input file and adds "_sector_fixed" to the file name, e.g., b04.b1_sector_fixed.dd.

Correct Sampling Rate And Upscale To 25KHz

The Cygnus recordings were sampled at 24KHz. Since multiple machines were used to record in parallel, a common timing pulse signal was recorded by each machine. The pulse rate was 5 per second, which is a period of 200 milliseconds. There is some variation in the number of samples in each 200 ms interval. Most of the lab software is hard-wired to expect a 25KHz sampling rate. Use the *cyg2cyg25KHz* program to make the recording rate constant and to upscale the recordings to 25KHz. This can be used interactively or from the command line with arguments. It can be used on multiple files from an experiment or a subset of files. The files produced by *cyg_fixup* should be used to create .daq files; using files with bad sectors will have unpredictable results. The new files will have "_25KHz" added to the base file name, e.g., b04.b1_sector_fixed_25KHz.dd

Here is the help:

```
Usage: cyg2cyg25KHz [-a A_Tape_filename,timing_pulse_chan] [-b
B_Tape_filename,timing_pulse_chan] [-c C_Tape_filename,timing_pulse_chan] [-d
D_Tape_filename,timing_pulse_chan]

Read one or more Cygnus tapes from an experiment and make new Cygnus files
that have a constant number of samples per timing pulse
interval and upscaled to 25KHz.

This can be used in a command line prompt mode, or using command line arguments.
If there are no arguments, the program will prompt for input.
If using command line arguments, use commas with no spaces
This must be run from the directory containing the Cygnus files.
```

Create DAQ file from Corrected and Upscaled Cygnus Files

Use the **cyg2daq** program and the files created by c**yg2cyg25KHz** to create a .daq file. This program needs all of the files from an experiment. There is a maximum of four, generally referred to as A, B, C and D tapes. It is not an error if a tape is missing. This program aligns the first timing pulse in each file and creates a .daq file. All of the down-stream tools can use this, such as splitting, cleaning, spikesorting, and so on. It creates a file with "_from_cyg_1-64" added to the base file name. It can be run interactively or with command line arguments. You must specify the output name. One convention is to use the experiment name and tapes as the name, such as b04.b1.c1.d1. The complete output file name is b04.b1.c1.d1_from_cyg_1-64.daq. Here is the help:

```
Usage: cyg2daq [-a A_Tape_filename,timing_pulse_chan] [-b B_Tape_filename,timing_pulse_
chan] [-c C_Tape_filename,timing_pulse_chan] [-d D_Tape_filename,timing_pulse_chan]
-o outfile_name [-t tag_text]

Read one or more corrected and upscaled Cygnus files from an experiment
and make a .daq file. The timing pulse channels are used to align the tapes
so the first timing pulse occurs at the same sample time.
Note: Use commas with no spaces.

This can be used in a command line prompt mode, or using command line arguments.

If there are no arguments, the program will prompt for input.
This must be run from the directory containing the Cygnus files.
```

Note: Any earlier recordings that were recorded at 25KHz, such as Datamax recordings, and that have a program that can split them into .chan files can be unsplit using the **daq2_unsplit** program. This recombines the chan files into a .daq file. This program is part of the daq2-clean package.

Create Spike2 .smr File From .daq File

Any .daq file can be used to create a Spike2 file using the ***daq2spike*** program. This is a command line program. Here is the help:

```
Usage: daq2spike2 -n daq_file_basename -t "date/time stamp" from recording's log file
For example:

daq2spike2 -n 2014-06-24_001 -t "2014-06-24 21:31:53:515"

The data/time stamp is in the log file and generally looks like this:
Recording started at 2014-06-24 21:31:53:515
Note: You must put it in quotes because it contains a space.
This must be run from the directory containing the daq2 files.


If you are using Cygnus recordings, you can run the print_cygdate program to get the date
and time from one of any Cygnus .dd file. Type print_cygdate -h for help. The times may
differ slightly, pick one.
```

EDT and BDT Files to Spike 2 .smr Files

The edt2spike2 program creates files that Spike2 can read. The neuron channels treat the spikes as events in time. The analog channels are saved as analog-to-digital signals. This is not interactive and only operates on one file at a time. It creates a .smr file using the basename of the input file. Here is the help:

```
Usage: edt2spike2 -n <filename.edt | filename.bdt>
For example:

edt2spike2 -n 2014-06-24_001.edt

This must be run from the directory containing the edt/bdt files.
```

BUT FIRST, RESAMPLE OLDER BDT FILES

Some older .bdt files have variable sampling rates due to tape stretching and other factors. This causes problems for the spike2 program. This uses several utilities that you generally will not use as stand-alone programs (though you certainly can.) For convenience, a Python program, ***bdt_fix.py***, automates the process of resampling and correcting the sampling rate to be constant. It creates a new file using the basename of the old one and attaches "_remerged" to the name. So, for example, the old file "s38m1f-v11-c.bdt" is converted and save to "s38m1f-v11-c_remerged.bdt."

[TO BE DONE] Old .bdt files have variable sampling rates. Work is in progress on a program to correct this. The edt2spike2 program will need adjustments and this program must be added to this package.