Rockland Technical Note 063

— Cyclic Sampling— With RDL Based Instruments

William Douglas

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Rockland Scientific International Inc.
520 Dupplin Rd
Victoria, BC, CANADA, V8Z 1C1
www.rocklandscientific.com

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info@rocklandscientific.com
tel: +1 250 370 1688

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2023-02-10	Initial version
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1 Introduction

This technical note describes the configuration of cyclic sampling on Rockland instruments with a Rockland Data Logger (RDL) installed. The details in this technical note do not apply to older CF2 Persistor based Rockland instruments.

Cyclic sampling allows for Rockland RDL instruments to turn on and off on a specified schedule. This documents describes how a schedule is specified.

2 Overview

When cyclic sampling is enabled the RDL looks for a file in the root of the storage module with the name "*cyclic_sampling.csv*".

WARNING: Do not save cyclic_sampling.csv files with MicroSoft Excel, this can cause formatting errors. Use an ASCII text editor.

An example of a "*cyclic_sampling.csv*" file is shown in Listing 1.

Listing 1: Example *cyclic_sampling.csv* file.

```
# Example file used to configure cyclic sampling
StartDate,              Duration,  Repeat
2023-02-10 12:00:00,    1h,        1
+2h,                    1h,        10
```

3 Structure of File

The *cyclic_sampling.csv* file is formatted as a CSV file with three columns. The first row is used for the column labels and is ignored by the data logger. Comments can be added by starting the line with a pound character "#". The remaining lines are treated as events.

Each event consists of three columns.

- *StartDate* A date and time value that indicates when data acquisition should start.
- *Duration* The duration over which data acquisition should remain on.
- *Repeat* Number of times the event should occur.

3.1 StartDate

The *StartDate* column specifies the time when data acquisition should start. The instrument will turn on in advance to ensure the data file starts at the specified time.

The StartDate value can be formatted as either an absolute date or as a relative time offset. An absolute date is the fully specified time at which data acquisition should start. A relative time offset specifies a time relative to the previous event.

3.1.1 Absolute Date

The idea of an absolute date is simple enough but specifying the date can be difficult due to the large number of sometimes conflicting ways that dates can be specified. ISO 8601 specifies a standard format for writing dates. We will use a simplified version of the ISO 8601 format. Absolute dates and times should be expressed using the format:

`YYYY-MM-DDTHH:mm:ssZ`

Where *T* represents *time* and is optional to allow for easier reading. *Z* indicates that the date and time are referenced to the UTC timezone. Only UTC time is used so the *Z* is implied and can be excluded.

A typical date and time looks like:

`2021-06-21 6:24:00`

3.1.2 Relative Time Offset

The relative time offset specifies a time equal to the previous event time plus the provided time offset. Relative time offsets are used when creating repeating events. In the example in Listing 1, file duration is 1h and relative time offset is +2h, resulting in 1 hour files with a 1 hour gap with no data between each file.

Times are formatted as defined in Appendix A. Time offsets differ only in that they are prefixed with a plus character (+). A typical value, which also happens to be a typical period of a tidal cycle, is shown in Listing 2.

Listing 2: Relative time offset - once per tide.

```
1          +12h25.2m
```

3.2 Duration

The duration identifies the time interval over which a data file should be collected. Data acquisition will attempt to stop at, or just after, the specified duration.

The duration format is described in Appendix A. See Listing 1 for example declarations of duration.

3.3 Repeat

The first event must use an absolute date for *StartDate*. As such, it can not repeat and must have a repeat value equal to *1*.

Events using a relative time offset for a *StartDate* have the option to repeat. The *Repeat* column should contain the number of times an event will occur. Each repetition results in the relative time offset being added to the previous event time.

One should not set the repeat value to be excessively high. Doing so is tempting because it allows one to simulate "forever" - but it comes at a cost. Verification files are generated on every boot and include a line for each repeat count. As such, excessively long verification files could be generated thereby slowing the boot process. However, so long as realistic repeat values are specified there should be no issues.

4 Verification

New or modified cyclic sampling configuration files should be verified before deployment. This is to ensure the data logger is able to correctly read and interpret the file.

To assist in verifying cyclic sampling configuration files, the data logger will write the inferred schedule into a text file. Users can view this file to verify that the planned schedule aligns with what was specified in the configuration file.

4.1 Verification File

A cyclic sampling verification file is generated when an instrument boots and observed a cyclic sampling configuration file. This verification file is titled *cyclic_sampling_schedule.txt* and is generated adjacent to the cyclic sampling configuration file. An example verification file shown in Listing 3.

Listing 3: Example verification file, `cyclic_sampling_schedule.txt`.

```
Current UTC Time:    Fri Feb 10 20:40:47 2023

PROFILE   START                              STOP
-------------------------------------------------------------------------
      1   Fri Feb 10 12:00:00 2023   Fri Feb 10 13:00:00 2023
      2   Fri Feb 10 14:00:00 2023   Fri Feb 10 15:00:00 2023
      3   Fri Feb 10 16:00:00 2023   Fri Feb 10 17:00:00 2023
      4   Fri Feb 10 18:00:00 2023   Fri Feb 10 19:00:00 2023
      5   Fri Feb 10 20:00:00 2023   Fri Feb 10 21:00:00 2023
      6   Fri Feb 10 22:00:00 2023   Fri Feb 10 23:00:00 2023
      7   Sat Feb 11 00:00:00 2023   Sat Feb 11 01:00:00 2023
      8   Sat Feb 11 02:00:00 2023   Sat Feb 11 03:00:00 2023
      9   Sat Feb 11 04:00:00 2023   Sat Feb 11 05:00:00 2023
     10   Sat Feb 11 06:00:00 2023   Sat Feb 11 07:00:00 2023
     11   Sat Feb 11 08:00:00 2023   Sat Feb 11 09:00:00 2023
```

The verification file contains two items that should be checked by the user,

- current instrument time (UTC),
- list of acquisition start and stop times.

The current instrument time allows the user to verify that the current instrument clock has the correct time. It should be noted that time is presented as UTC time. The timestamp is generated shortly after the instrument boots so users should take note of when their instrument turns on.

Planned start and stop times are then listed sequentially. All time values are presented as UTC time.

4.2 Verification Procedure

To verify that a cyclic sampling configuration file works as intended, one should perform the following tasks.

- Create or update a cyclic sampling configuration file.
- Copy configuration file to the root folder of an Rockland instrument.
- Disconnect USB and turn the instrument off.
- Turn the instrument on using main power. Leave USB disconnected.
- Wait for the instrument to boot. This can result in the instrument powering off after booting. This is expected, the instrument is just waiting for the next scheduled start time.
- Connect the USB deck cable. This should turn on the instrument, if required, and mount the data volume.
- The verification file (*cyclic_sampling_schedule.txt*) can now be found in the mounted volume.

5 Last Notes

5.1 ON/OFF Switch

When the ON/OFF switch is turned off (or magnet removed) the instrument will never turn on. This is to ensure that the battery is never discharged when the instrument is in storage.

When the ON/OFF switch is turned on (or magnet attached) the instrument should always turn on. But if a valid cyclic sampling configuration file is present the instrument will turn off immediately after booting. This is expected and should be observed when deploying an instrument. It indicates that the instrument is performing cyclic sampling.

5.2 Repeat Column

One should take it easy when specifying the numeric repeat value within a configuration file. The number of repeats should be calculated based on the planned deployment schedule. This is because larger repeat values result in larger verification files and more overhead every time the instrument powers on. It is not that significant but could be an issue if, for example, 9999999 is entered to imply forever.

A Duration Format

Time durations are declared as a sum of the time types *days*, *hours*, *minutes*, *seconds*. Each type is optional when defining a duration. At least one type must be defined for a valid duration.

```
DURATION :   [DAYS] [HOURS] [MINUTES] [SECONDS]

DAYS : <NUMBER>d
HOURS : <NUMBER>h
MINUTES : <NUMBER>m
SECONDS : <NUMBER>s

EXAMPLES : 2d13h4m32.4s
1h30m
5400s
Note:
One of DAYS, HOURS, MINUTES, or SECONDS must be defined.
DURATION equal to the sum of the components.
```

End of document