



Topographic Laser Integration in HYSWEEP®

By David Madock



HYPACK® has had the ability to log and process data from RIEGL topographic lasers since HYPACK® 2008. Though originally developed for the LMS-Q120 2D laser, over the years we have expanded the driver to support any model which uses RIEGL's riscanlib interface as well as their RISYNC timing module. In HYPACK® 2010, new HYSWEEP® drivers for the MDL Dynascan and the Optech ILRIS systems were added. Upcoming development will also bring the new RIEGL V series into the mix.

As our LIDAR support becomes more diverse and complex, it is important that our users understand our approach for integrating this type of device into HYSWEEP® so they know what to expect of the software and how to configure for optimum results. With this article, I aim to address these issues, introduce you to the new drivers, and hopefully clarify some misconceptions of the RIEGL driver as it has evolved.

WHAT'S OUT THERE AND OUR USE CASE

Even within the small list of devices we support, there is a surprising amount of variability in how they operate:

- Some are simple 2D line scanners, some offer 3D capability.
- Some provide timing information per point, some per line, some not at all.
- Some allow the head to rotate in the horizontal plane.
- The Dynascan returns a 360° "swath" while the others provide only a sector.

Because we expect that HYPACK® users will be adding LIDAR capability to an existing survey vessel in order to collect topographic data of the shoreline, the drivers are developed for this use case. As such, the drivers assume that the laser is mounted pointing off the port side of the vessel, operating in 2D (ie. line scan) mode, and returning an angular sector of data points. Any other mount should be reflected in the device offsets.

Finally, if exceeding the HYSWEEP® limit of 1440 beams per ping (ie. per 2D line scan), the points must be downsampled to fit. This is only an issue in the highest resolution options of some devices. Consider that in a 60° sector, 1440 points allows an angular resolution of less than 0.05°! Although, we are investigating how we may deal with even higher resolution data for future development.

NEW DRIVERS

MDL Dynascan: This laser has a 360° angular range. HYSWEEP® will log a 144° sector of interest from a user-selected start angle with a 0.1° angle step. The points are timetagged using the message arrival time at the HYPACK® computer.

Optech ILRIS: This 3D laser is supported in line scan mode. It is recommended that the ILRIS software be configured with angle step and sector such that HYSWEEP® need not downsample. However, it will do so, if necessary, to a user-selected beam count. The driver has an option to timetag using Veritime or the time as supplied by Optech.



RIEGL V Series: (forthcoming) This driver is for RIEGL devices that use the new rivlib interfacing library.

RIEGL LMS TIMING MODES

Finally, I would like to go into some detail regarding timing for our more mature RIEGL LMS Series driver as there seems to be some confusion about how this works. In HYPACK® 2009A/2010, we can now handle two possible scenarios for timetagging RIEGL data.

RiSYNC OPTION

If you have the RiSYNC configuration option, you can simply check the RiSYNC box in HYSWEEP® HARDWARE. You will do the typical RiSYNC process for setting up the laser. During acquisition then, the laser will give us a full timestamp.

This operating mode was added in 2009A.

PPS-ONLY OPTION

In this mode, the laser can only provide us with a nanosecond counter which "rolls over" every 3 minutes or so (or when it gets a PPS pulse). Both HYPACK® and the Q120 then are supplied with the PPS pulse and their clocks are synchronized to the second using PPS. The timetag is created using whole seconds from HYPACK® and nanoseconds from the laser.

In HYPACK® 2008 only option #2 is supported. If RiSYNC is not being used, it is critical then that the PPS pulse be properly received by the laser in order to integrate with HYPACK®. Failure of the laser to sync the above counter with PPS will result in bad timetags being logged. If the laser is operating in HYPACK® 2008, but not in 2009A/2010, no PPS is the culprit. HYPACK® 2009A/2010 will not allow mode #2 if it discovers the laser does not see a PPS.