Water Linked DVL protocol Draft 2

This document describes the Water Linked DVL protocol.

The document is currently in draft state and might change before release.

Terminology

- DVL - Doppler Velocity Log - Hydro-acoustic unit which uses acoustic beams to measure distance to bottom surface and the velocity which the unit is moving across the surface.
- ACK - Acknowledgement. The command issued was successful.
- NAK - Negative acknowledgement. The command issued failed.

Version

This document describes protocol/software version 2,0,x (major,minor,patch)

The protocol versioning follows semantic versioning in that:

- MAJOR version increments represents incompatible API changes,
- MINOR version increments represents added functionality in a backwards-compatible manner
- PATCH version increments represents backwards-compatible bug fixes

Serial Protocol

Overview

The serial communication format is 115200 8-N-1 (no hardware flow control).

Packets sent to and received from the DVL start with a w and end with end with LF or CR+LF. The packet format is:

Start byte	Direction	Command	Options (0 to many)	Checksum	End byte
w	c or r	x	,[option]	*xx	\n or \r\n

Direction is command (c) for commands issued to the DVL and the DVL replies with direction set to response (r). The commands can be sent as a string or entered one char at a time from a terminal.

The protocol can support Water Linked DVLs with different features sets. To support any Water Linked DVL the connection procedure is to:

- Get protocol version. Verify that the major version number is 2.
- Get product detail. Verify product type is dvl.

!!!note Checksum is optional when sending commands to the DVL. The DVL always returns a checksum. The checksum algorithm is CRC-8 and it is formatted as a hexadecimal number using 2 lower-case charaters (ex: *c3).

Commands

Commands in the table are shown **without** the checksum for readability.

Command	Description	Response	Description
wcv	Get protocol version	wrv,*[major],[minor],[patch]*	Protocol version. eg: wrv,2,0,0
wcw	Get product detail	wrw,*[type],[name],[version]*	Where type is dvl, name is product name and version is product version: eg: wrw,dvl,dvl-a50,1.0.0-20191225-xxxxyyyy
wcc	Get configuration	TBD	Get configuration
wcs,*[TBD]*	Set configuration	TBD	Set configuration
		wrx,*[details below]*	Velocities measured. See details below
		wr?	Malformed request: Response when packet cannot be understood
		wr!	Malformed request: Packet does not match the given checksum

Velocity report

Velocity report is outputted after each measurement has been completed. The expected update rate varies depending on the altitude and will be in the range is from 2-10 Hz. The X, Y, Z axis are oriented according to the marking on the DVL.

The velocities measured response is on the following format: wrx,*[time],[vx],[vy],[vz],[std],[distance],[valid]*

Variable	Description
time	Milliseconds since last velocity report (ms)
vx	Measured velocity in x direction (m/s)
vy	Measured velocity in y direction (m/s)
vz	Measured velocity in z direction (m/s)
std	Standard deviation, a measure of the accuracy of the measured velocities (m/s)
distance	Measured distance/altitude to the bottom (m)
valid	If valid is "y" the DVL has lock on the bottom and the distance and velocities are valid (y/n)

Example: wrx,125,0.05,0.01,0.001,0.5,0.1,y

Ethernet protocol (UDP)

Overview

The ethernet communication uses UDP datagrams. The target IP address and port can be configured via the HTTP API.

Each datagram sent contains a velocity report from the DVL on JSON format.

Velocity report

Velocity report is outputted after each measurement has been completed. The expected update rate varies depending on the altitude and will be in the range is from 2-10 Hz. The X, Y, Z axis are oriented according to the marking on the DVL and compencated for the configured rotation of the DVL set in the API (default is 0 deg).

Variable	Description
time	Milliseconds since last velocity report (ms)
vx	Measured velocity in x direction (m/s)
vy	Measured velocity in y direction (m/s)
vz	Measured velocity in z direction (m/s)
std	Standard deviation, a measure of the accuracy of the measured velocities (m/s)
distance	Measured distance/altitude to the bottom (m)
valid	If valid is true the DVL has lock on the bottom and the distance and velocities are valid (true/false)

Example of UDP report. (indented for readability)

```
{
  "time": 100,
  "vx": 1.5,
  "vy": 0.5,
  "vz": -0.5,
  "std": 0.1,
  "distance": 0.3,
  "valid": true
}
```