Diversion of Tier 1 data

Instruments that are deployed on the ONC observatories that are of concern to the Royal Canadian Navy (RCN) and US Navy (USN) are called Tier 1 instruments. Currently, three types of instruments fall into this category:

Seismic instruments

- Accelerometers
- Seismometers
- Tiltmeters

Passive acoustic instruments

- Hydrophones

Magnetometers

The RCN and USN have the ability to control (divert) the realtime data flow from the Tier 1 instruments to the ONC data archive.

Seismic Instruments

At present, three manufacturers of seismic instruments are deployed (Güralp, Nanometrics, RBR)

- The seismic instruments provide multiple data streams
- A high rate raw data stream (20SPS, 200SPS, or 500SPS, depending on the instrument)
- A low rate raw data stream; the low rate stream will be equal to or less than 8S/s

The high rate raw data stream is subject to diverts, while the low rate raw data stream is not. Diverted high rate raw data may be returned to ONC if the navies determine there is nothing of concern in the data.

For seismic instruments (Güralp) that were deployed during the years 2009 to 2013,

- The high rate raw data stream was 100SPS
- The low rate raw data stream was less than or equal to 1SPS

Hydrophones

Hydrophone WAV audio file data product documentation, sub-page: Hydrophone acquisition and diversion options documentation

At present, two manufacturers of hydrophones are deployed (Ocean Sonics, Jasco Applied Sciences). A mix of single element and four element hydrophone arrays are deployed. Two models of Ocean Sonics hydrophones

- icAF
- icHF

icHFs deployed with:

- Raw acoustic data sampled rate at 64000S/s or 128000S/s or 256000S/s
- Very low resolution FFT data sample rate at 256000S/s

icAFs deployed with:

- Raw acoustic data sampled rate at 32000S/s

On the offshore observatory (formerly NEPTUNE) and inshore observatories (formerly VENUS), the raw acoustic data stream is subject to diverts, while the low resolution FFT data stream is not. Near-shore observatories are in general not subject to diverts. Diverted raw acoustic data may be returned to ONC if the navies determine there is nothing of concern in the data.

Magnetometers

The first magnetometer will be installed in 2025. While this magnetometer (LEMI-089) will be subject diverts, the details of this are still to be worked out.

Historical Hydrophones

Naxys

- Sampling at 96 kHz (002, 003 low gain problems)
- Potential problems with dropped samples/timing
- Changes in file size (53.33 s in the beginning, longer files mostly 5 minutes later on)
- No divert
    - 5 minute files full bandwidth files without mode modifier
- Divert
    - 5 minute files highpass filtered transition 6-6.5 kHz; mode HPF

    - Exception for VPS hydrophone at some point HPF transition 3-3.5 kHz; mode HPF
- Return (after Navy assessment)
    - Historically: down-sampled to 12 kHz (12.000 SPS) file length 11 minutes 22 seconds (essentially 6 kHz lowpass data); no special mode that tells you that it's not original data
    - Currently should no longer be down-sampled

Ocean Sonics icListen HF Hydrophone

- Sampling at 64 kHz
- Filesize always 5 minutes
- Future: 256 kHz FFT data that will not be diverted
- No divert
    - 5 minute files full bandwidth files without mode
- Divert
    - in the beginning: 5 minute files highpass filtered transition 6-6.5 kHz; mode HPF
    - Currently: at some point HPF transition 3-3.5 kHz; mode HPF

- Return (after Navy assessment)
    - in the beginning: Down sampled to 12.8 kHz (12.800 SPS) file length 5 minutes (essentially 6.4 kHz lowpass data); no special mode that tells you that it's not original data
    - Intermediate: Down sampled to 6.4 kHz (6.400 SPS) file length 5 minutes (essentially 3.2 kHz lowpass data); no special mode that tells you that it's not original data
    - Currently should no longer be down-sampled

Ocean Sonics icListen LF Hydrophone

- Sampling at 4 kHz
- Filesize 5 minutes except for returned data 10 minutes (to be fixed)
- No divert
    - 5 minute files full bandwidth files without mode
- Divert
    - Currently: no realtime data

- Return (after Navy assessment)
    - Historical: Full data 10 minutes; no special mode that tells you that it's not original data
    - Currently: Full data 5 minutes

VENUS

IOS

- Array with 3 elements not synchronized until recently: Sampling at 44.15, 120.12, 50 kHz in succession, 50 kHz seems to be optimum
- Filesize highly variable, currently 5 minutes
- Return
    - Historical: No data returned/recorded during divert
    - Currently: high-pass filtered data returned

Ocean Sonics icListen LF Hydrophone

- Sampling at 4 kHz
- Filesize 5 minutes
- No divert
    - Full data; no mode
- Divert
    - Sample rate changed to 250Hz on hydrophone, then Lowpass filtered 3-4Hz transition; mode LPF