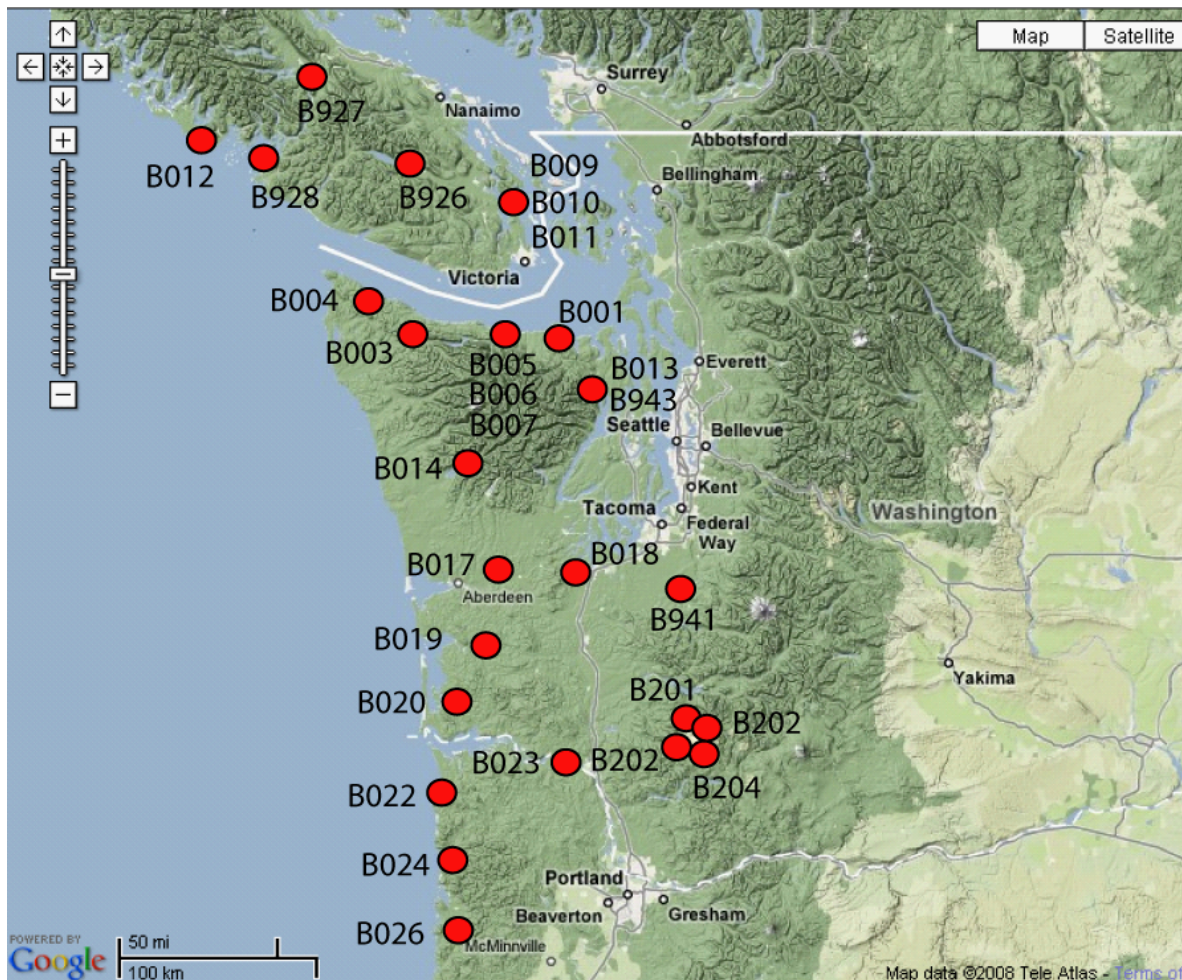


Station Notes for B010, Pacific Geoscience Centre, pacgeosi2bbc2005

Latitude:	48.650 (WGS 84)
Longitude:	-123.451 (WGS 84)
Elevation:	5 m / 16.4 ft
Install Depth: ¹	199 m / 653 ft
Orientations: ²	CH0=267.8, CH1=207.8, CH2=147.8, CH3=117.8
Install Date:	26 September 2005
GTSM Technologies #:	US09
Executive Process Software:	Version 1.14
Logger Software:	Version 2.02.2
Home Page:	www.unavco.org/instrumentation/networks/status/pbo/overview/B010
Notes Last Updated:	October 2, 2019

¹Install depth is from the top of the casing to the bottom of the strainmeter.

²Orientations are in degrees East of North.



Pacific Northwest PBO strainmeter network, April 23, 2008



Instrumentation at Strainmeter

Instrument	Units	Bottle/ASCII Scale Factor	SEED Scale Factor
Pore Pressure	Hecto Pascals	1.0	N/A
GTSM Barometer	Kilopascals	1.0	0.0001
Rain Gauge	Millimeters/hour	N/A	N/A
Down hole Temperature Sensor	Degrees Celsius	1.0	0.0001
Logger Temperature Sensor	Degrees Celsius	1.0	0.0001
Setra Barometer	Hecto Pascals	N/A	N/A

1. General Information

- January 30, 2006 - First set of processed data released January 27 2006.
- Environmental door opened on April 27, Oct 19, 2006.
- Change in trend noted in May 2007 was attributed to irrigation in nearby fields. Transient was recorded on B009, B010 and B011.
- The strainmeter did not have GPS time from May 15 to September 23, 2007.
- Sensitivities of all EH channels corrected on March 4, 2010.
- The pore pressure sensor is installed at 44 feet with the packer inflated directly above the sensor.

2. Strainmeter Maintenance

- September 26-30, 2005. Engineers on site.
- October 4, 2005. Engineers on site.
- December 13, 2005. Mick Gladwin visited the strainmeter. Added lightning protection diodes.
- August 10, 2006. The GPS firmware at B010 was upgraded on 10 August 2006. The logger did not pick up GPS time after the upgrade.
- August 16, 2006 - The logger time is 10 seconds behind UTC time. The lag is increasing with time.

Wed Aug 16 12:46:32 GMT 2006 Logger time

Wed Aug 16 12:46:42 UTC 2006 Time on Boulder data server.

- August 29, 2006. Mike Hasting visits site to work on the GPS. The problem could not be fixed, the strainmeter is still not recording GPS time.
- October 19, 2006. The GPS unit was replaced 18:09:22 UTC picked up GPS time.
- May 15, 2007. Wade Johnson visited the site to restore power. The GFI plug had tripped. Unfortunately the site had been down long enough that the GTSM batteries were down to 3.5 volts. Wade replaced the GTSM batteries and installed a surge protector. No data was collected from April 4, 2007 to May 14, 2007. GPS time was lost shortly after this visit.
- May 21, 2007. Wade Johnson rebooted the GTSM21 to try and get GPS time back. The reboot did not fix the problem, and the GPS timing is still down.
- September 24, 2007 UTC – Steve Smith visited the site to fix the GPS timing working
17:04am - Arrive at B010.
17:05 - Take pictures.
17:08 - "LOAD" breaker @ 13.37V
"CHARGE" breaker @ 13.43V
GTSM battery @ 14.11V
GTSM Lab PS @ 15V

GTSM Lab PS @ 1.75A

17:15 - Noted desiccant is white.
17:25 - Data backup begun.
17:27 - BNC connector for GPS on power box is solid.
17:32 - First download attempt failed. 2nd attempt started.
17:43 - Doors closed.
18:26 - Doors open.
18:27 - USB transfer failed... trying 1GB.
18:31 - Can't get it to go.
18:35 - Proceeding with shutdown.
18:36 - Shutdown complete.
18:40 - New box in place.
18:41 - Take pictures and power on.
18:43 - Startup completed.

Lights operating normally.

18:55 - Discover fiber issue with phone call from Wade. Verify it is indeed a fiber issue.
Manipulating cable near suspected failure point yields intermittent traffic.

~19:30 - Doors closed.

- September 25, 2007 UTC - Steve Smith visited the site.
16:06 - Onsite.
16:16 - Doors open.
16:21 - Replaced fiber cable.
16:23 - NetRS ethernet unplugged, then GTSM unplugged from black fiber switch.
16:34 - According to the GTSM logger, it is accepting the GPS signal now.
16:43 - Power Change - UPS out, replaced with a power strip.
16:45 - Change completed - all equipment stayed up as expected.
17:26 - NetRS plugged back in, GTSM plugged in.
17:30 - Doors closed at B010.
17:33 - Offsite.
- September 27, 2007 UTC - Steve Smith visited the site.
15:00 - Onsite.
15:13 - Doors open.
15:15 - Observed instrumentation, looks good.
15:17 - NetRS unplugged.
15:23 - Confirmed problem still exists, between 40 and 80% packet loss to B010 GTSM
15:25 - New black media converter in place, still no ping! No link light.
15:27 - New white media converter/switch in place, now it works, 0% packet loss.
15:40 - Confirmed connectivity with Boulder.
15:57 - Attempted, without success, to get at least one black media converter to work, so it could be deployed in Ucluelet.
16:03 - Mac unplugged, plugged NetRS in, and took a picture.
16:06 - Doors closed.
After lunch refreshed the desiccant (microwaved) and replaced them in B010 and B011. Left the site at about 22:15.
- February 13, 2009 - Mike Gottlieb visited the site from 11:00-11:30 local time. He swapped in new F/O modems, and tuned the quadrature.
- February 20, 2009. B010 has lost GPS time. It is orphaning files.

- May 29, 2009. Pumping started at Pendray Farms. The wells are about 1 km from the strainmeters.
- July 17, 2009. Mike Gottlieb was at the site. The pore pressure at B010 was moved from a netRS to the Q330, and is recording on serial sensor 1. The white marmot on site was replaced with a blue marmot, UNID 27276. The powerbox and GPS antenna were also replaced, and the new antenna was moved so that it had a clearer sky view. The station now has GPS time.
- Nov 21, 2009 – The station began returning invalid data, and the Q330 went down at this time as well and has not responded to ping. CH2 quite sending data at this time, and the rest of the channels are at gain 1 or 0. The problems may have been caused by a nearby lightning strike, although there was no sign of physical damage to the station.
- Nov 23, 2009 – A seismic technician from the PGC was on site to look at timing issues. The VSAT modem was cycled at ~19:15 UT.
- Nov 25, 2009 – Herb Dragert visited the station to power cycle the GTSM. He also restarted the Q330, which came back online. Additional resets of CH2 did not help return the channel to measure mode (currently stuck in event mode), the board will need to be replaced. The Q330 should also be replaced due to a lack of timing.
- December 15, 2009 – A new GPS antenna was installed on the GTSM and Q330. These antennas have shortened cables to increase gain, and were mounted outside the hut. Currently both instruments are tracking satellites so the Q330 does not need to be replaced at this time. The firmware was reloaded on the GTSM, but it did not improve the logger situation so the logger board was replaced.
- September 10, 2010 - Ran birddog on seismometer. Adjusted quadrature on channels RT1 RT2 RT3. Noticed RT2 had old firmware. Upgraded from 1.18 to 1.20.
- July 10, 2012 – Replaced 3 batteries from 2005 with 1x2 gtsm batteries and 2x3 mains batteries. Installed 4 gauge jumpers. Found Ch3 in G2. Reset channel and it returned to G3. Set quadrature. Chop delays were checked and did not need adjustment.
- July 13, 2012 – Herb Dragert sent an email saying a strong thunderstorm was moving through the area, with a reported lightning strike very close to PGC at about 13:00 UTC. All four channels started returning junk data around this time, two of which were flatlined.
- July 16, 2012 – There was a lightning storm on Vancouver Island on July 14, 2012 that has affected B009 B010 and B011. CH2 stopped returning data at the same time as B011 started returning bad data. Lisa from PGC went and rebooted the equipment, but there are still a number of problems that will require attention. After the reboot 2 channels were still flatlined, with the other 2 giving errors. Mike Gottlieb plans on going up there in early August with spare uphole electronics to see what he can do.
- August 21, 2012 – Mike, Warren and Wade visited the site. The GFI outlet at the station was blown, and the station was without power. The batteries were down to 3 to 5 volts. The GFI was replaced. The batteries were left in place, but likely have little to no capacity after such complete discharge. The powerbox failed, and was replaced. The new powerbox has been

unable to track satellites and needs a new antenna, or possibly a new powerbox. RT1 and RT2 failed and were replaced. RT0, RT1, RT3 appear to be working properly. RT2 will not adjust quadrature, and the tap-step is -0.016 (normal is $\sim +0.38$). Attempts to adjust quadrature caused the channel to flatline at 50000xx and go to Gain 0, and so it was left out of adjustment. They measured the instrument response to manual changes in RT number, and noticed a factor of 10 less response in RT2 than the other channels. They suspect this to be a damaged downhole amplification circuit, but that there is still some data coming back from the sensor.

- September 5, 2013 – There was a lightning strike at PGC around 21:40 UTC. B009 and B011 were ok, but B010 was flat lined on all channels. Mike Gottlieb remotely rebooted the logger, but it didn't help. Michael Schmidt toggled the switches on the RT boards, but there was no change.
- September 10, 2013 – Mike Gottlieb visited the site to do some diagnostic work. He rebooted the whole system (including the oscillator) and reset the quadrature on all channels. CH0, CH1, CH3 needed large adjustments, and CH2 did not show any appreciable response in the AMP O/P signal to quadrature adjustment. The CH1 RT board was also replaced (the existing board was calibrating much too quickly, making it suspect). The channels are no longer flatlined at 50000xxx. This was primarily due to the OSC board reboot. The downhole amplification in CH2 was damaged a year ago by lightning, and this channel still has an incorrect tap step and diminished response. GPS time was invalid, and an antenna swap with the Q330 showed that the failure was in the powerbox. The SystemAmps were reading 0.00, which was incorrect. This started at the time of the lightning strike. Solar amps (input power from the isolation block) and battery voltages were normal. The powerbox should be replaced.
- September 22, 2013 – Power box was replaced.
- February 18, 2014 – Lisa at PGC power cycled the radio at B010. It did not fix the problem. She then power cycled the master inside PGC, the link light came back on, and comms were restored.
- March 20, 2014 – The station had show very high input amps. Mike fixed this by enabling coil current sensor in strain-logger.conf.
- October 29, 2015 – Replaced the GTSM power box and GPS to fix bad GPS time. Adjusted chops and quads.
- September 20, 2016 – Completed down hole test procedure on GTSM. Adjusted chops and quads.
- November 21, 2016 – Mike Gottlieb visited the site with Mick Gladwin to look at CH2. Checked the voltage response (amp i/p) to changing the first decade of the RT. One step = 200 mV, instead of the expected 3 V. This implies a factor of 15 lower response from downhole than nominal. The tap step on this channel was 15.8 mV. Similar to the type of loss of amplification on CH2 at B009, but more significant. Uphole electronics worked fine with a dummy load. No sign of leakage resistance in the cable between Oscillator (e-lines) and shield. Quad box showed some ability to adjust quadrature, but not enough to remove it all from the system. Could try soldering in a larger resistor, which might give better quad

control. Chopper was in the wrong place as well, the delay switches will allow a range of 0-60 microseconds, but we needed to delay an additional 100 microseconds past the max allowed to chop correctly. Could manually balance board, but there was too much quadrature for it to stay above G0 when allowed to control itself. If they can fix delay and quadrature issues, they might be able to get it back to higher gain. Also need to deal with calibration offsets (due to tap step < 80 mV).

- Mach 28, 2018 – Lisa at PGC went out to site. Power was up. She power cycled the M900 radio and the 4 port switch. The coms came back up after this power cycle.
- Aug 27, 2019 – Repaired cracked concrete pad, filled in gap between pad and hut. Added straps to ENV box and all equipment. Set quads. Attempted to fix ENV data issue by replacing logger, but new logger did not working properly (not logging all files, ethernet intermittent) so put the old one back in. Still no ENV data being collected.