Development of an Internet enabled Radar Tide Gauge – iTide

Introduction

This document describes the development by POL Liverpool, of a new type of tide gauge for deployment in remote areas of the world. An accurate radar sensor to used to measure sea surface height and the data is sent back via the Internet in the form of an email message.

Sample timing errors are eliminated by data logging synchronisation to the satellite derived time. The instrument can be controlled remotely via email commands, enabling sampling rate, integration period and data recipients to be changed remotely.

The instrumentation is low cost and simple to maintain, no components are in contact with sea water so installation can be carried out quickly and without the use of divers or heavy lifting machinary.

Development

Over the last year (2004-2005) a program has been developed by POL and Vascotrack Ltd to control and record the data from an OTT Kalesto radar sensor. The data is sent periodically back to a pre-determined email address. Vascotrack Ltd are the UK agents for Quake Global Inc., the producers of the Q1400/Q1200 Orbcomm modem units used in the tide gauge.

The powerful processor used in the Quake modem can support customer application programs. The software developed by POL and Vascotrack controls the radar sensor, interrogates it at regular intervals and stores the email messages in a buffer until a satellite comes into view and the messages are transmitted via the satellite through to a ground station and then onto the Internet in email format.

Timing data is normally derived from the satellite system but can also be synchronised from the integrated GPS receiver in the Orbcomm modem. The use of GPS allows the instrument to set itself up more quickly after a cold-start and also has the benefit that a GPS position can transmitted periodically along with the sea level data.

In a typical installation two antennae are used, a 1 metre whip antenna for the Orbcomm system and a small patch antenna for the GPS receiver. The Orbcomm antenna can be located up to 35 metres from the modem unit by means of an extension cable, but the GPS antenna cable must be no longer that the standard length (~5 metres).

A long term test has been carried out at our test tide gauge station at Holyhead in Anglesey, North Wales. A simple prototype system *(Illustration 1)* was installed in the tide gauge hut, with a radar sensor located nearby at the quayside *(Illustration 2)*. The original installation antenna can be seen in *Illustration 3.*

Illustration 1- PSU, Orbcomm modem and Interface Box

The interface box connects the Kalesto radar sensor to the Orbcomm modem. It converts the binary RS485 protocol from the radar sensor to RS232 ASCII protocol so the modem can control the radar sensor with simple serial commands.

Illustration 2- OTT Kalesto Radar Sensor at Holyhead

The radar sensor connects to the interface box by means of a 4-way cable, two cores for 12 volts power and two cores for RS485 data.

Illustration 3- Orbcomm 1 metre antennae

Two types of antenna can be seen *Illustration 3,* the one in the centre has an integrated GPS antenna at the base of the Orbcomm whip antenna. The one to the right is a normal Orbcomm antenna.

This simple installation ran successfully at Holyhead for about a year. Email data was received back at POL and displayed on the POL website – http://www.pol.ac.uk/ntslf/networks.html

As a comparison it plotted is against the normal Holyhead tide gauge record that is derived from a bubbler system and pressure sensor. Agreement is good and the gauge ran unattended for a great deal of the year. Occasional visits were made to upgrade the logging software.

Towards the end of 2004, two systems were built for use at Pemba and Inhambane in Mozambique, South East Africa. The instruments are housed in fibre glass cabinets with large capacity lead-acid batteries, to provide limited back-up power. A back up data logging system is also installed, this takes the data from a pressure sensor and logs it to memory. The pressure data can be downloaded independently via a line-powered 2400 baud telephone modem (Telemodem2 – Jekyll Electronic Technology Ltd).

Two of these systems have been sent out to Mozambique (March 2005) to be installed in April 2005. The inside of the cabinet can be seen in *Illustration 4* the backup data logger (OTT Logosens2) can be seen mounted on the inside of the door.

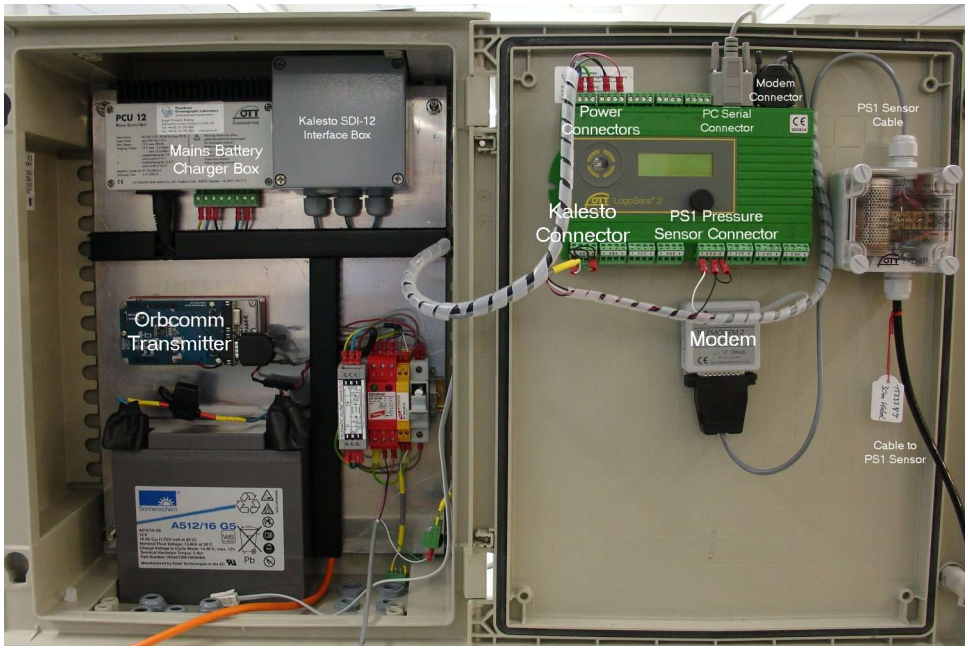

Illustration 4- Orbcomm Kalesto Tide Gauge - iTide

A close up of the Orbcomm modem can be seen in *Illustration 5,* the Kalesto sensor data is fed into the MTS RS232 serial data socket and the Orbcomm modem operation can be monitored by using the LOG socket (located above the MTS socket).

Illustration 5- Orbcomm Q1400 Transmitter

The Kalesto sensor can be seen in *Illustration 6,* the cable passes through a plastic water-tight gland and into a plug-in connector beneath the circular cover.

Illustration 6- OTT Kalesto supported from steel arm

The Kalesto sensor can be properly aligned with respect to the steel support arm, so that it is vertical by adjusting the swiveling bracket. The bracket can be locked into place by tightening screws.

Contact Information

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