5.2.2 Electronic Measurement

Two arrays of three gages each were employed, one 1.8 m up wave of the bar patch and the other 1.2 m down wave. The gages were a standard in house design with minor alterations to improve sensitivity. The gages operate by comparing the frequencies of two inductive-capacitive (LC) circuits where:

\[ f = \frac{1}{2\pi\sqrt{LC}} \]  

(5.3)

Inductance and capacitance were adjusted in a reference circuit to run at a constant frequency around 1 MHz. The sampling circuit was identical to the reference circuit except that an additional 'capacitor' was added, that being the capacitance contained between the probes, that is to say the probes act as capacitance plates with water being a variable dielectric. Since the wave amplitudes were to be less than 1.5 cm to maintain linear theory, the probes were only 6 cm long. Normally these gages are used with probe lengths 0.5 m or longer and the capacitance contained between them is of the order of 100 microfarads, while the 6 cm probes contained less than 10 microfarads. This made tuning the sample and reference circuits to be of greater importance than normal for these gages. The sampling circuit was tuned to run at a slightly lower frequency than the reference circuit for the full range of capacitance change in the probes. The two frequencies were subtracted in a chip and the difference frequency sent in the form of an RF signal to the signal conditioner. Therefore, as water level increased, the capacitance between the probes increased resulting in a drop in the frequency in the sampling circuit thus increasing the difference between the two frequencies, which, when processed in the signal conditioner, showed an increase in voltage.

The signal conditioner worked somewhat like a radio receiver, converting a RF signal to a voltage. The signal conditioner had adjustable gain and zero offset controls. The zero offset control allowed for the positioning of the mean voltage output, and was set, such that at still water the output was close to zero, (usually ± 0.2 volts). The gain was adjusted so