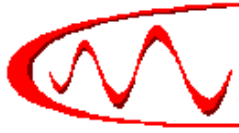


CHURCHILL CONTROLS

Wave Monitor



A simple and robust instrument for the measurement and recording of water waves in hydraulic models and ship tanks, which works on the principle of measuring the electrical conductivity between two parallel wires.

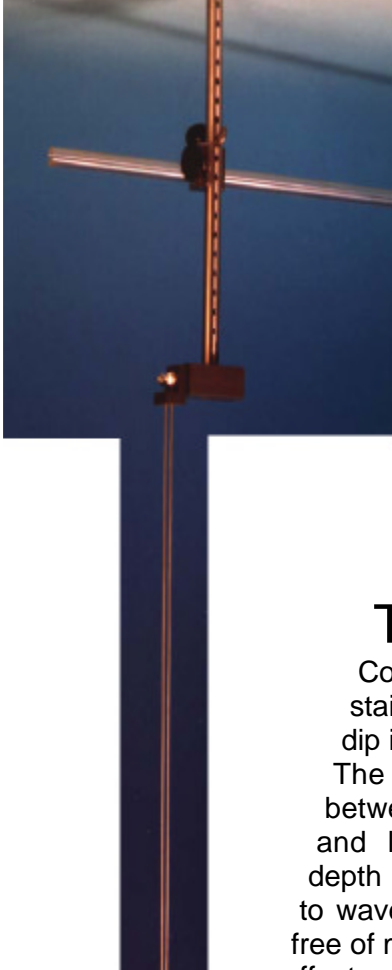


CHURCHILL CONTROLS

Wave Monitor

Features

- Simple probe having no moving parts and carrying no electronics.
- Linear calibration over a very large range.
- High dynamic accuracy.
- Plug-in modular electronics.
- Can be operated at different energisation frequencies to avoid mutual interaction between two or more closely spaced probes.
- Outputs for high speed recorders and data loggers.
- Easily set up and calibrated.



The Probe

Consists simply of a pair of stainless steel wires which dip into the water waves.

The electrical conductivity between them is measured, and linearly related to their depth of immersion and hence to wave height. The method is free of meniscus and "wetting" effects.

The result is a system giving high dynamic accuracy over a wide range of wave heights and frequencies.

Energisation is by means of an audio frequency drive signal which avoids all polarisation effects at the wire interface. The signal is balanced relative to earth to render the system immune to common mode voltages between the water and instrument earth. The frequency can be altered to permit two or more probes to operate in close proximity without mutual interference.

The size, shape and spacing of the wires is not critical thus enabling users to construct probes easily for special applications.

The standard configuration offered consists of two 1.5mm diameter stainless steel wires spaced 12.5mm apart and 300mm long. Other lengths up to 2 Metres can be supplied to order.

Probes over 500mm are constructed with 3mm diameter stainless steel rod.

Connection to the electronic module is by means of a twin flexible cable, the length of which is limited only by its resistance. Lengths of 100 metres are achievable with easily available low resistance cables.

Calibrated Probe Holder

The holder permits easy "in-situ" setting and checking of overall system calibration, from the probe to the recorder chart or data logger, by allowing the probe to be moved vertically in steps of 10mm up to a maximum of 170mm.

The holder comprises a moveable vertical bar, carrying the probe, held in a laboratory type clamp. The bar has a series of holes accurately drilled 10mm apart through which a retaining pin is inserted.

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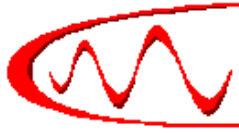
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CHURCHILL CONTROLS

Wave Monitor

Wave Monitor Module



The wave monitor module is cable connected to the probe and provides output signals to drive a chart recorder or for input to a data logger. The records enable wave height, frequency, and profile to be observed. Wave velocity can be measured by the means of two probes, spaced a known distance apart, each giving a recorder trace via its own monitor module.

The module comprises a high frequency oscillator to energise the probe and a sensing amplifier which measures the voltage drop produced by the probe current across a pair of series resistors. The drive circuit generates an energising voltage which remains constant in amplitude when the probe conductance varies, as waves move through it.

The probe current is sensed by a differential amplifier having a high common mode rejection. The final maximum output signal is ± 10 volts, centre zero, proportional to wave height.

A calibrated attenuator enables the output voltage swing to be set to any value below 10 volts. An auxiliary output gives a current of 10mA maximum from a source impedance of 1K Ohms.

The module incorporates a unique system of compensation for the resistance of the probe connecting cable which ensures that the characteristic of the probe remains linear, even for large dynamic ranges. The compensation is set up quickly and easily by disconnecting the cable at the probe end and plugging it into two additional sockets on the module panel, and then adjusting a preset potentiometer. No additional modules or test instruments are required.

A "Datum" control enables the output from the module to be set to zero for any chosen depth of probe immersion.

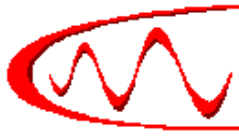
Power Supply Module



Alternative power supplies are available for operation A.C. mains or from an external 12 volt rechargeable battery, Both provide + and - 15 volt regulated supplies, with short circuit protection, to operate the other modules.

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Wave Monitor

Specification

Twin Wire Probe

Standard Construction: Two 1.5mm stainless steel wires spaced 12.5mm apart. Standard length 300mm, other lengths up to 2 metres available. Probes over 500mm are constructed with 3mm diameter stainless steel rod.
 NB. Not suitable for use in sea water.

Range of wave heights: 5mm to 2 meters.

Temperature coefficient: 2% of span per 1°C change in water temperature. The Wave Probe Module incorporates a control for easy calibration and resetting.

Cable length: Maximum resistance of 10 ohms per leg.
 Twin "figure 8" length of cable in metres
 cable size(metric) giving 10 Ohms per leg

7/0.25	192
13/0.20	222
28/0.15	276
42/0.15	416

Monitor Module

Input Connections:

Two 4mm sockets on front panel or via back wiring for probe.
 Two 4mm sockets on front panel for "compensation"

Voltage Output:

± 10 Volts maximum, centre zero, via BNC coaxial connector on the front panel or via back connector. Maximum load 10mA

Current Output:

± 10 mA maximum centre zero, via back connector. Source impedance 1K Ohms.

Indicating Meter:

Centre zero for adjustment of datum and cable compensation.

Front Panel Controls:

10 turn potentiometer for adjustment of datum
 10 turn potentiometer with calibrated dial for adjustment of output voltage.
 Single turn preset potentiometer for adjustment of cable compensation.

Frequency Response to 95% 10Hz
 Phase lag at 95% 17°

Energisation Frequencies:

Nominal values 4 KHz, 5KHz, 6KHz, 7KHz, 9KHz, 10KHz selectable by plug and socket connector on main circuit board.

Module Width: 10E(50.8mm 2")

Power Supply Module

Power supply options are available for operation from A.C. mains or from an external 12 Volt supply.

Input : A.C. Mains version
 115/240 volts 50/60 Hz.

Input: D.C. version 12 Volts -10% + 15%

Current consumption 700 mA nominal on full load.

Output: Both versions

+ and - 15 volts D.C. regulated with short circuit protection.

One power supply unit can power up to 7 probe modules delivering the maximum output of 10mA each.

Module width: 10E(50.8mm , 2")

Construction

High quality G.R.P. circuits boards are rigidly mounted in heavy duty plug-in modules. Rear connections are via heavy duty plug and socket connectors. A variety of mounting frames and instrument case assemblies are available, each complete with back wiring and connectors for A.C. mains or 12 volt D.C. input as follows:

Type	Module Capacity	Approximate dimensions in mm
Rack Mounting	1 PSU + 7 probes	480X177X280
Case size 2	1 PSU + 2 probes	154X180X295
Case size 3	1 PSU +3 probes	205X180X295

Single probe systems are supplied in a case size 2 with a blanking plate in the unused module position.

Case sizes 2 & 3 are finished in a matt textured blue paint and are fitted with four rubber feet and a carrying handle.

A case is also available to house the rack mounting frame, finished in matt textured R.A.F. blue grey acrylic paint and fitted with two retractable front legs to allow the cases to be tilted.

Approximate overall dimension 494X199X318mm

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