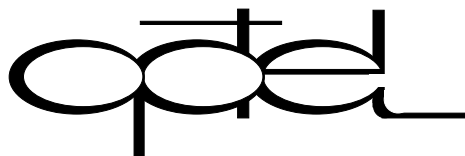


**Research & Development
Ultrasonic Technology / Fingerprint recognition**



DATA SHEETS

&

WDMS

<http://www.optel.pl>
email: optel@optel.pl

Przedsiębiorstwo Badawczo-Produkcyjne OPTEL Spółka z o.o.
ul. Otwarta 10a PL-50-212 Wrocław
phone: +48 71 329 68 53 fax: +48 71 329 68 52
NIP: 898-10-47-033

Water depth measurement system Technical manual

1. System description
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1. System description

The system is build from following components:

1. The measuring box of the size 300x150x200 mm, made from stainless steel contains following electronic elements (Fig. 1):
 - a) Ultrasonic card OPKUD 01/100 modified for this system;
 - b) WDMS Interface – special interface, providing connection between OPKUD card and RS485 Interface, containing microcontroler for signal analysis;
 - c) RS 485 Interface KSR-01L;
 - d) Sender/Receiver NAD_2000 for 200kHz water depth measurement transducers (produces short bursts with about 350Vp-p, with integrated switch and 33dB receiving amplifier);
 - e) Pulser&Receiver for reference channel (3MHz).
 - f) Power supply.
 - g) Battery pack.

Devices d and e are placed in the box inside the large box.

2. Pipe with transducer for water depth measurement and reference channel - measuring head (Fig. xxx).
3. Converter RS232/RS485 (communication box) for the connection between the system and computer.

The system is designed to be used in field conditions. All measuring boxes should be connected to the power supply and connected together and with RS232/485 converter with data cable (according to the Fig. 5).

Searching tube should be attached to the box, using flange, delivered with the system. To the tube B (Fig. 5) another – longer tube can be attached (welded) - according to the needs on the measurement site.

2. System function

Working principle of the system is basically the same as in each pulse-echo system. A relatively short burst (70 microseconds long) with high amplitude is send by the main transducer. After a short time reflected pulses are received.

Because the system is using oscilloscope card, the signal is sampled with high frequency. Included controller is able to analyze the signal, using the whole information it contains. The system is principally able to work with any kind of echoes: The software in the controller can analyze the signal and send via RS485 only the information about water depth or send a whole signal and let the computer

analyze the signal. The second solution cannot work very quickly, because the transfer of information via RS485 bus is relatively slowly (4800 baud).

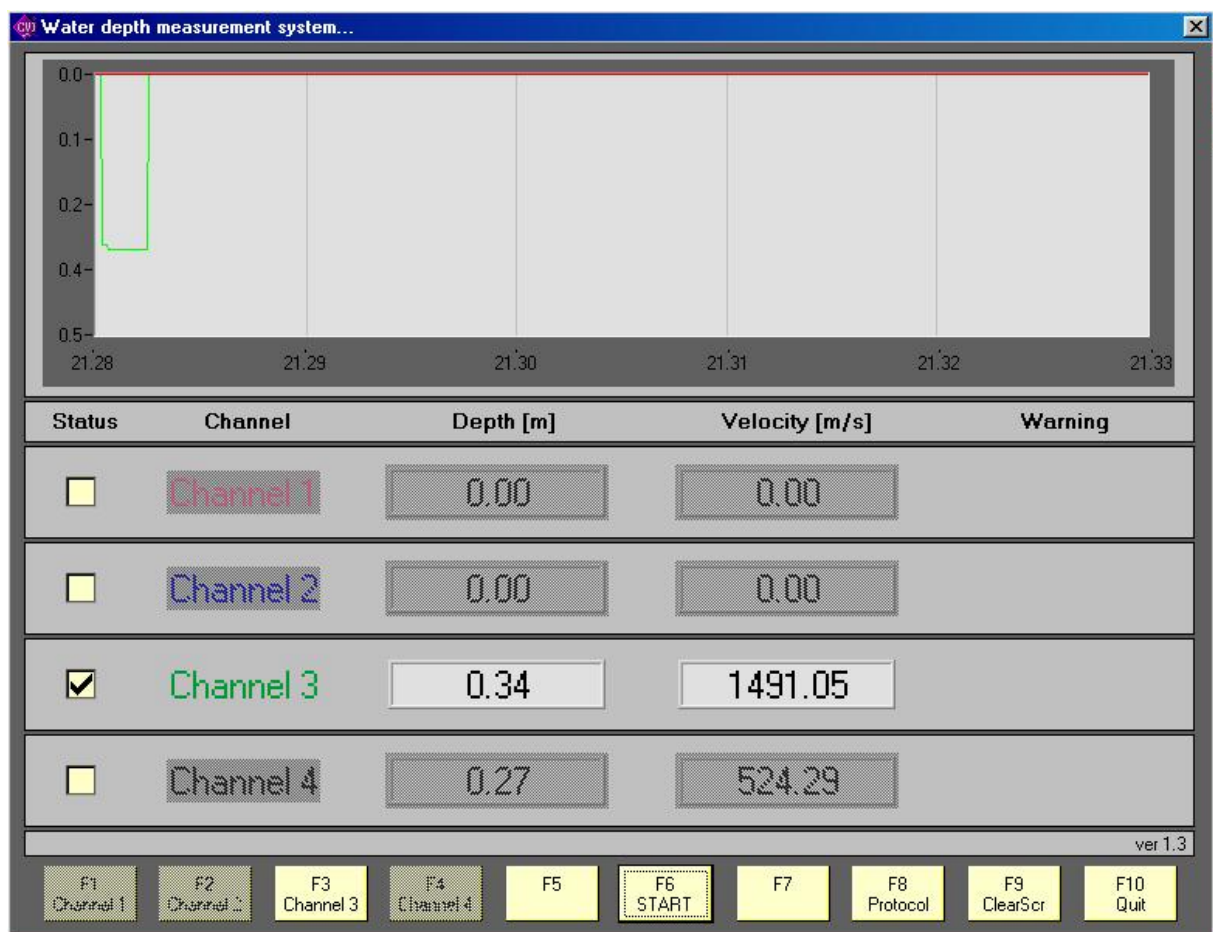
In the basic version of the system, the distance to the bottom is measured in the following way:

The system is searching echoes using time windows, depending on the parameter length and cut off level (see: service window). After such echo is found, exact time measurement is done and shown as a result of the measurement.

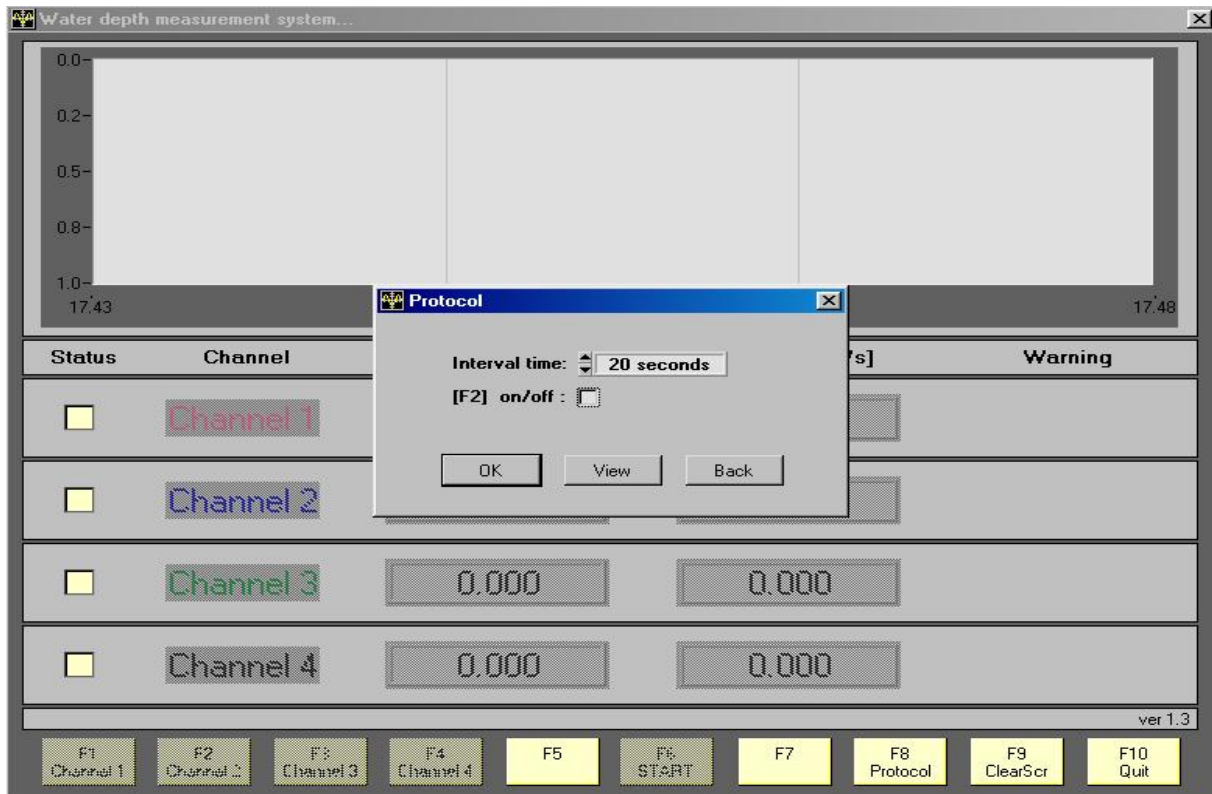
To enhance the precision of the measurement, a reference channel is used. In this channel the sound velocity in water is measured with higher precision (higher frequency transducers, higher sampling rate) and velocity changes are used for compensation.

3. Description of the software

The main window shows time depending changes of the bottom depth and the present depth and sound velocity in the water for each channel. Using F1-F10= buttons further windows can be reached.

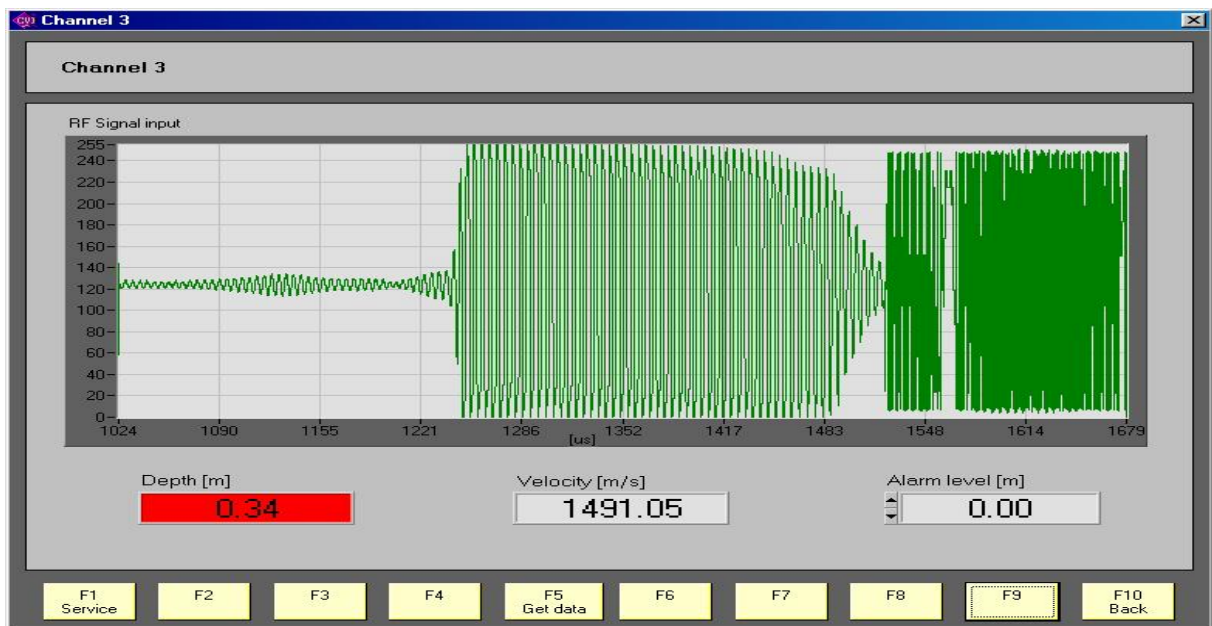


Pressing F8, protocol settings can be changed (interval time between measurements):

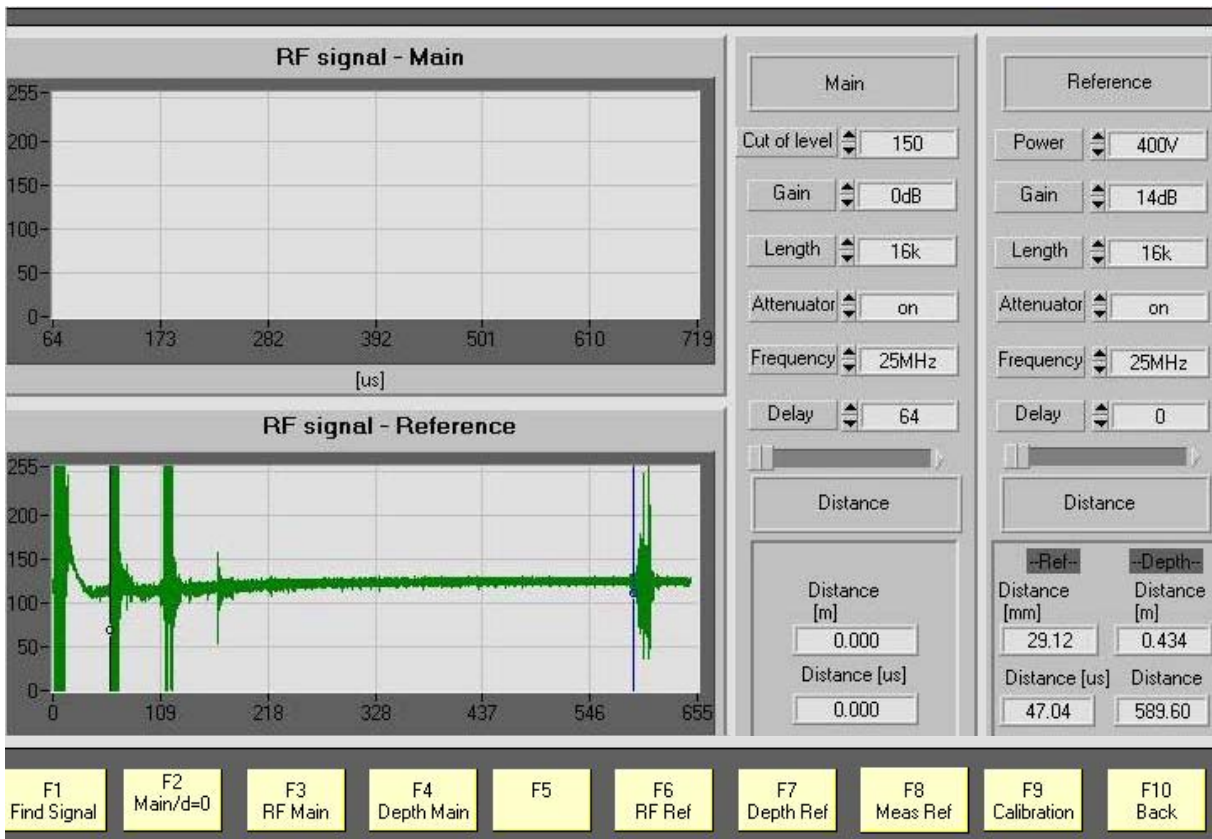
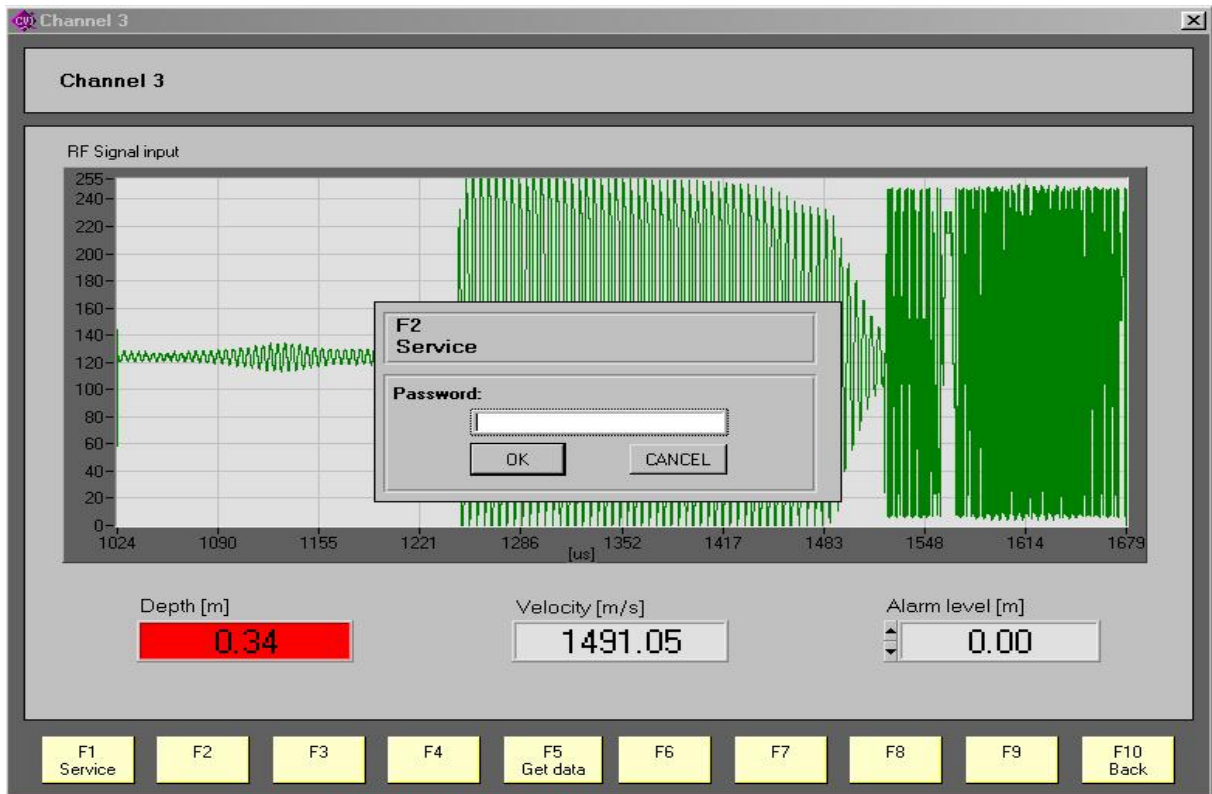


The program is storing the protocol in the directory WDMS, subdirectories are “protocol” and “settings”. Protocol can be viewed using “view” button. After pressing this button, notepad starts and allows to view measurements, print them etc.

Pressing F1-F4 button the channel window can be reached, that shows the signal from one channel, after pressing F5 the whole data set (signal data) is transferred to the computer. In this window it is possible to change the alarm level. If the bottom will be higher, than this level, a warning will be displayed in the main window.



After pressing F1, service window is reached (password is “service”).



In this window, control adjustments can be made:

Cut level means level, that the signal, that should be interpreted as an echo should at least reach.

Gain allows the adjustment of the gain of the amplifier of the oscilloscope card. Additionally an attenuator can be switched on or off.

Length is the length of the signal, that is stored in the oscilloscope card and delay means delay of the oscilloscope window.

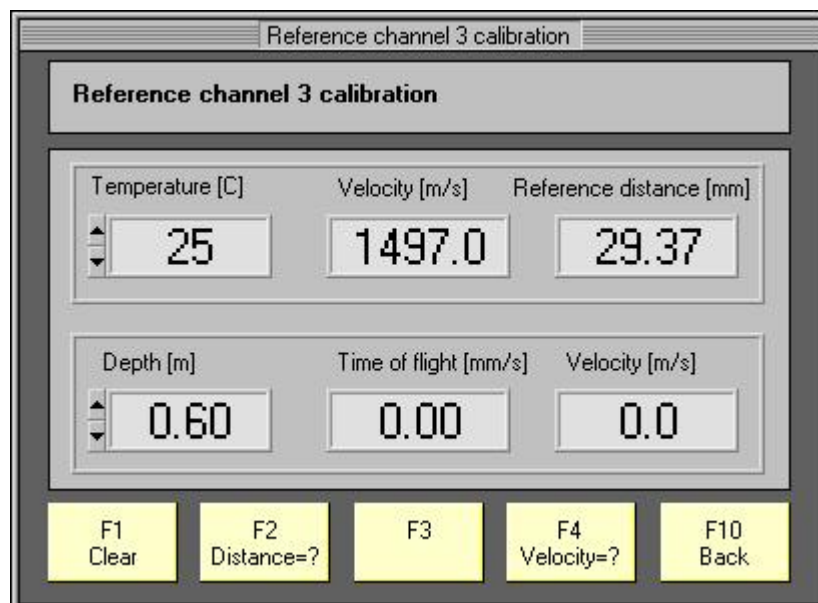
Frequency means the sampling frequency of the card. This can be set separately for both channels.

Suggested settings for reference channel are: power- 150 V, gain 6 dB, length 16k, attenuator off, frequency 25 MHz, delay 0.

Settings of main channel depend of kind of sediment very strong. It may be necessary to set high gain. But only test in real environment can answer questions what settings are really correct.

By depressing button F1 automatic search function starts. The system finds out the signal and shows results. It is possible to get results of measuring unknown depth. In some cases it is necessary to set parameters by hand.

Function F9 allows to make calibration procedure. It opens following window:



Before you start with measuring you are to do calibration of measure channel. This is necessary to enhance the precision of the measurement.

There are two functions:

- F2 to precise reference distance. In each measuring head can be small differences in these dimensions so this function eliminates its. It is necessary to immerse the head into a distilled water with known temperature. After F2