UltraSoundGate Charge Amplifier with adjustable Hi-Pass Filter

The UltraSoundGate Charge Amplifier can be used to connect a hydrophone directly to the an UltraSoundGate xx16x main unit. The integrated adjustable high-pass filter allows rejecting unwanted low-frequency noise.

The gain of the charge amplifier depends both on the nominal capacitance of the connected hydrophone and the selected input capacitance of the amplifier (Gain = 20 log (capacitance of the hydrophone / selected input capacitance)). A hydrophone capacitance of 3nF and an input capacitance of 1nF would provide a gain of approximately 10 dB. The alternate input capacitance of 100pF would rise the gain to 30 dB.

The black rotary knob selects the cut-off frequency of the high-pass filter. The filter attenuation is 6dB / octave below the selected cut-off frequency. The labels are valid for an input capacitance of 1nF. If the alternate 100pF setting has been selected, all frequency labels must be multiplied by factor 10.

High-pass cut-of frequencies and input impedances

rotary switch setting	cut-off frequency at 1nF	cut-off frequency at 100 pF (*)	input impedance
10	10 Hz	100 Hz	15 MOhm
25	25 Hz	250 Hz	6.8 MOhm
50	50 Hz	500 Hz	3,3 MOhm
100	100 Hz	1 kHz	1.5 MOhm
250	250 Hz	2.5 kHz	680 kOhm
500	500 Hz	5 kHz	330 kOhm
1k	1 kHz	10 kHz	150 kOhm
2.5k	2.5 kHz	25 kHz	68 kOhm
5k	5 kHz	50 kHz	33 kOhm
10k	10 kHz	100 kHz	15 kOhm
25k	25 kHz	250 kHz	6.8 kOhm
50k	50 kHz	500 kHz	3.3 kOhm

Care should be taken while connecting the hydrophone to the charge amplifier. Under some circumstances it is possible that the hydrophone or its cable have been electrostatically charged with high voltages (several thousands volts). These high voltages may damage the sensitive input stage of the amplifier (ESD). In order to maintain the maximum possible sound quality (low noise), there is no full ESD protection circuit at the amplifier input. Therefore, the hydrophone and its cable should be discharged before connecting them to the charge amplifier. This can be done by short-circuiting the hydrophone connector. Additionally, the amplifier should be switched off (either by disconnecting the amplifier from the USG main unit or by disconnecting the USG device from the PC) before connecting the hydrophone cable and the input impedance should be reduced by selecting a high cut-off frequency (greater than about 1 kHz). Once the hydrophone is connected to the amplifier, there is no further danger because any potential high voltages would be terminated by the internal resistors of the amplifier.

1: GND
2: positive signal output
3: negative signal output
4: +5V supply voltage (should not exceed 5.5V)
5: not connected