GENERAL

The Avanti Quartz Transducer Simulator generates 3 crystal controlled frequencies:
A pressure frequency (PF), a temperature frequency (TF) and a reference signal (REF). Direct Digital Synthesis (DDS) is employed, which provides quartz-stable signals with very low phase noise.

FREQUENCIES

PF / TF = 0…99999 Hz, resolution 0.005 Hz
REF = 7.200 MHz (second reference frequency on request)
Accuracy < 10 ppm, Drift < 2.5 ppm

OPERATION MODES

PF and TF can be set independently without any interaction:

- Enter constant frequencies directly in Hz.
- Step up or down in 0.1 Hz steps.
- Sweep continuously up or down between two frequency limits (saw tooth). The sweep speed can be set from 0.001 Hz per second to 99.999 Hz per second. The frequency is updated every 100ms in increments as small as 0.005 Hz.
- Store and recall up to 10 different setups.
- Generate a frequency profile with up to 10 steps by automatically recalling different setups in sequence. The duration of each step can be set individually between 1 minute and 9999 minutes.

EXTERNAL CONNECTIONS

- 2.1mm connector for external power supply (12V, 100mA).
- 9-way D-type socket for connection to the logging system (eg. memory board), carrying PF, TF, REF, ground, 12V supply and a control line to enable/disable the outputs.
- BNC socket for monitoring PF and TF, eg. with a frequency counter.

CONTROLS AND INDICATORS

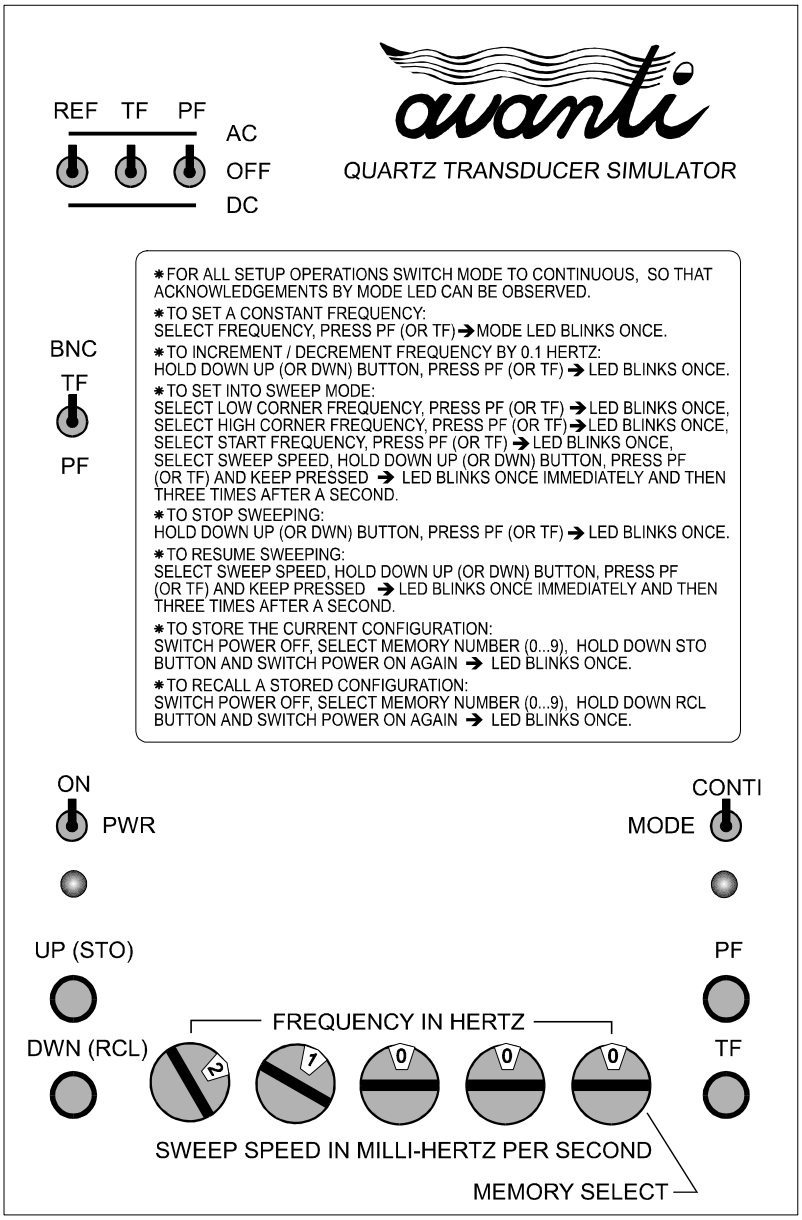
- There are 5 rotary switches reading 0..9, through which frequencies are entered in Hz and sweep speeds in milli-Hz per second. The rotary switches are also used for selecting the memory number when storing/recalling setups and for specifying the step duration in profile mode.
- There are 4 push buttons: PF/TF to enter data for the pressure or temperature channel and UP/DWN to step up and down or start/stop a sweep. The UP/DWN buttons are also used for storing/recalling setups and for starting profile mode.
- There are 6 toggle switches: The PWR switch turns the simulator on and off. A battery option (6 AA-cells) can be fitted on request, in which case the simulator runs automatically on batteries if no external power is applied.
  The MODE switch controls the frequency outputs. The outputs can be either permanently active (CONTI) or controlled through an external signal (eg. the tool switch of a memory board). The REF/TF/PF switches select the signal coupling (AC or DC) and allow channels to be switched on or off individually. The BNC switch selects PF or TF to be routed to the BNC socket.
- There are 2 LEDs: PWR will light up when the simulator is switched on. MODE will light, when the signal outputs are active. It is also used to acknowledge data entry.

ENCLOSURE

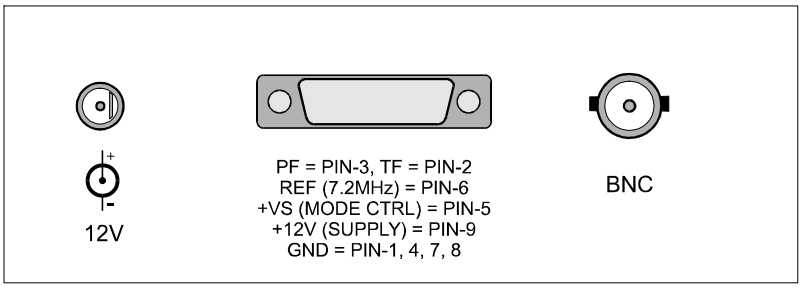
Aluminium enclosure measuring 165 x 121 x 56 mm.

APPLICATIONS

- Test accuracy and resolution of logging systems using constant frequencies.
- Test logging systems for abnormalities by sweeping very slowly over the entire frequency range.
- Test the time keeping of logging systems by choosing sweep parameters which produce saw tooth edges at predetermined times (eg. every 10 minutes).



Front panel layout
Most instructions are printed onto the front panel =>
Easy to use even without the user manual.



Side view (top end of enclosure),
Showing external connections

BATTERY OPERATION (OPTIONAL)

The simulator may be fitted with a battery option (on request only), in which case there are battery compartments at the bottom side for 6 AA-cells. Either alkaline or rechargeable NiMH cells may be used. NiCD batteries are not recommended.
The simulator draws circa 95mA when active (mode LED on) and circa 30mA when in standby (mode LED off). Alkaline cells have a typical capacity of 2.7Ah and will therefore last between 28 hours (active) and 90 hours (standby). Rechargeable NiMH cells provide approximately 1.6Ah and will last between 16 and 53 hours per charge.
When rechargeable cells are fitted, they will be charged automatically whenever external power is applied. The power switch doesn't need to be ON for this. To enable the charging option, a jumper link must be inserted into the PCB (see diagram inside the enclosure). With an external 12V supply the charge current is circa 50mA. It may be increased up to 150mA by increasing the supply voltage. However, when doing so, the charge current should be monitored and the power switch must be OFF. Do not exceed 18V. Note that while a charge current of 50mA is safe to be applied continuously, a higher charge current can damage the battery if applied for too long.

IMPORTANT: When using non-rechargeable batteries (e.g. alkalines), the jumper link must NOT be inserted.

EXTERNAL POWER

External power can be applied either through the power socket (2.1mm centre pin) or through the D-type connector at pin-9. The D-type pin is bi-directional, i.e. it can be used for either feeding power to the simulator or for taking power off the simulator to supply other circuitry. In this case the voltage available at the D-type pin is two diode drops lower than the voltage applied through the power socket.
The external voltage applied should be greater than 9V. The simulator may otherwise accidentally run on the internal batteries (if fitted). Regulated 12V are recommended.

MODE CONTROL

There are two modes: active and standby. When active, the mode LED is on and the simulator emits reference and signal frequencies. When in standby, the mode LED is off and no frequencies are emitted. However, the micro controller keeps running and updating the frequency ramps when in sweep mode.
An external control voltage (typically the transducer supply voltage from the target board) can be applied at pin-5 of the D-type connector (+VS). A voltage above approximately 4.25V switches the simulator into active mode. The threshold is adjustable through an internal trim-pot. There is a 10mA current sink across the control input in order to provide a load similar to a typical quartz transducer. The external control voltage can be overridden by the mode switch. When set to CONTI, the control input has no effect and the simulator is continuously active.

SETUP

All entries are acknowledged by the mode LED. In order to see the LED, the simulator must be active (mode switch set to CONTI). A valid entry causes the LED to blink, ie. to go off briefly. See the instructions printed onto the front panel for details.

SWEEP MODE

Sweep mode is acknowledged by 3 blinks. Sweep mode always uses the 3 last frequency entries as the minimum frequency, maximum frequency and the start point. Imagine this as 3 frequencies put onto a stack (first in/first out). The sweep speed is read from the rotary switches when the sweep mode is started, ie. while the UP/DWN plus PF/TF keys are being pressed.
The frequency stack remains valid until a new frequency is entered. This will automatically stop the sweep mode and push the oldest frequency off the stack.

Stepping up or down also stops the sweep mode but only alters the start point. The corner frequencies are not affected. The sweep mode can also be stopped by holding down both the UP and DWN keys together while pressing PF or TF. This again does not alter the corner frequencies but simply stops at the current frequency without causing a step.

Note that the sweep speed or sweep direction can also be altered while a sweep is running. Simply select a new sweep speed and start sweep mode again without stopping it in between.
Pressure and temperature sweeps can also be started synchronously by setting both channels into sweep mode (one after the other) and then switching power off and on again. Sweeping will then commence with the specified start frequencies of both channels at the same time.

SETUP MEMORY

The simulator keeps its current setting in non-volatile memory when powered down. In addition to that up to 10 different setups may be stored and recalled using the rightmost rotary switch (ones) as the memory select. The contents of the memory is verified during power-on. The mode LED will blink 20 times should the memory contain invalid values.

PROFILE MODE

The different setups stored in memory can be linked together to form a frequency profile with up to 10 steps.
For this a step duration must be specified when saving a setup to memory. While the memory number is selected by the rightmost rotary switch (ones) as described above, the remaining four rotary switches specify the step duration in minutes, ie. to store a setup in memory number 2 and give it a duration of 30 minutes the rotary switches must be set to 0-0-3-0-2 when saving. Note that the duration of a setup is only relevant for profile mode. Note also that the duration can be changed without altering the other parameters simply by recalling it and then saving it again.
Once the required profile steps have been defined and stored as different setups, the profile mode can be started:

- switch the simulator off
- select the first profile step using the second rotary switch from the right (tens)
- select the last profile step using the rightmost rotary switch (ones)
- hold down both the STO and RCL buttons while switching on again. Starting the profile mode is acknowledged by 3 blinks of the mode LED.

The simulator then sequentially steps through the specified memories and uses the stored setup for the specified duration. When the last step has been finished, the simulator returns to the first step and the whole profile is repeated.
The profile mode is stopped by pressing PF or TF (with or without the UP/DWN buttons), eg. to stop the profile mode without altering the current frequencies hold down both the UP and DWN buttons together and press either PF or TF. Note that the profile mode can be reset to the first step by simply turning power off and then on again.

KEY LOCK

In order to protect the setup of the simulator from being accidentally changed, the keys can be locked. This is done by holding down both the PF and TF keys together while switching the simulator on. The keys can be unlocked again in the same way. When locked, any key presses are ignored and the mode LED does not blink.

SIGNAL COUPLING

All signals are buffered through VHCMOS gates with a 51R resistor in series. Either DC or AC coupling can be selected through the signal switches REF, TF and PF.
For AC coupling a 100nF capacitor is inserted in series, providing compatibility to Quartzdyne QU transducers. When DC coupling is selected, the series capacitor is bypassed, providing signals similar to Quartzdyne SXP transducers. The BNC monitor socket is always AC coupled and cannot be changed.

ADDITIONAL BUFFERED OUTPUTS (OPTIONAL)

The simulator may be fitted with 4 additional, individually buffered outputs (on request only), so that four target boards can be tested simultaneously. Connection is made via four 9-way D-Type sockets, which are located on the side plate opposite to the main output. There are also four LEDs to show the status of each output (enabled or disabled).

The pin-out of these auxiliary sockets is similar to that of the main output. The outputs are enabled by a voltage fed into pin-5, typically the transducer supply voltage from the target board. A voltage above approximately 4.25V activates the output and the corresponding LED lights up. The threshold of each output is adjustable through an internal trim-pot. The control voltage is loaded by approximately 10mA at 5V in order to provide a load similar to a typical quartz transducer.
Note that 5V are available from the simulator at pin-9, so that the outputs can be permanently enabled through a wire link between pin-5 and pin-9.

Unlike the main output, the buffered outputs are always DC-coupled. The signal switches (AC-OFF-DC) have no effect. Note however, that the mode switch must be set to CONTI in order to produce any output signals.

SECOND REFERENCE FREQUENCY (OPTIONAL)

The simulator may be fitted with a second reference frequency (on request only). There are 3 internal switches to change from one to the other reference (see diagram inside the enclosure). Care must be taken not to touch the trimmer capacitors in order not to spoil the calibration.

CALIBRATION

There are trimmer capacitors provided to adjust the frequency of the internal crystal oscillators (see diagram inside the enclosure). To re-calibrate the simulator, remove the bottom panel and place the simulator onto a flat surface (table top) in order to keep a reasonably constant environment within the enclosure. Switch on and set the pressure and temperature frequency to 90000Hz. Monitor the reference frequency and the pressure frequency with a frequency counter via the D-type connector. Leave the simulator running for 15-30min to warm up. Then turn over the simulator and quickly adjust the trimmers to the nominal frequencies.
If a second reference option is fitted, switch over and let the simulator settle for another 15-30min before adjusting the third trimmer.

INSTRUCTIONS FOR OPENING THE ENCLOSURE

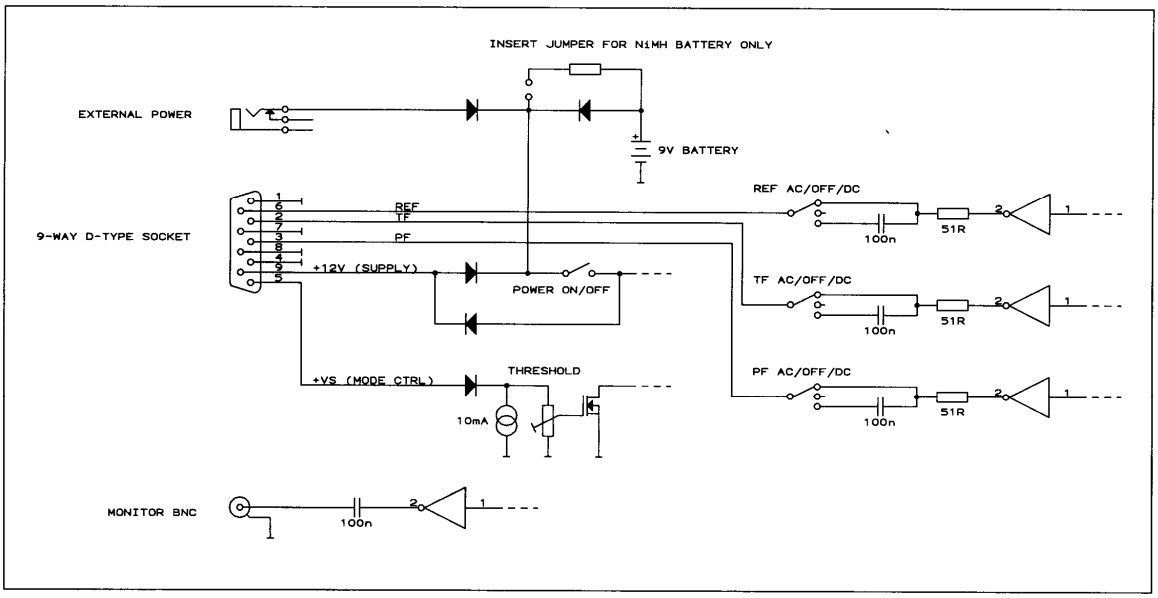
You may want to open the enclosure in order to re-calibrate the simulator, to change over to the optional second reference frequency or to enable the battery charging option. Please observe the following opening instructions depending on the type of simulator you have:

Standard simulator (no battery option, no buffer option):
1a. Disconnect external power before opening the enclosure.
2a. Remove 4 screws, which hold the blank side plate.
3a. Slide out the bottom panel.

Simulator with fitted battery compartment:
1b. Disconnect external power and remove battery cells before opening the enclosure, in order to prevent live terminals from touching other parts of the circuit.
2b. Remove 4 screws at the end where the battery compartment is located. Do not try to remove the side plate yet, since the battery holders might get caught by some of the higher PCB components when being pulled out.
3b. Shift the side plate a little bit to provide a gap for the bottom panel to slide out. Once the bottom panel has been removed, the side plate with battery holders can be lifted off easily.

Simulator with optional buffered outputs:
1c. Disconnect external power before opening the enclosure.
2c. Remove 4 screws at the end where the additional output sockets are located. Carefully slide out the side plate and the attached circuit board.
3c. Slide out the bottom panel.

INTERNAL CONNECTIONS



Model Number: _____ **Serial Number:** _____

Buffered Outputs: _____ **2nd Reference Frequency:** _____

Battery Option: _____ **Tested and Calibrated:** _____