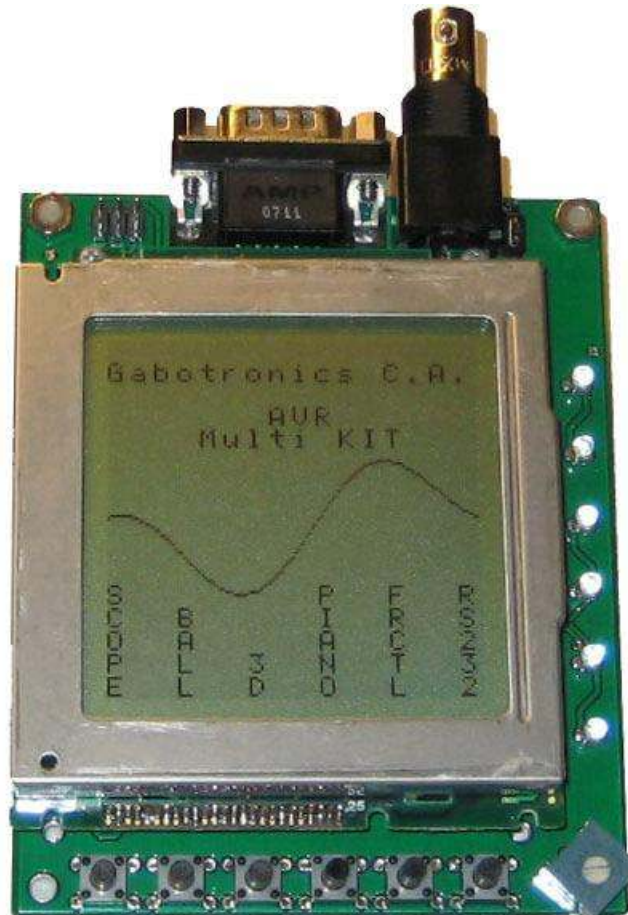


AVR Multi-development Kit



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What is MULTIKIT???

MultiKit is a multi purpose development kit using AVR microcontrollers. It is targeted for anyone who wants to start learning AVR micros. The big thing about MultiKit is that it is also a fully featured Mixed Signal Oscilloscope with frequency analysis.

The MultiKit demonstrates:

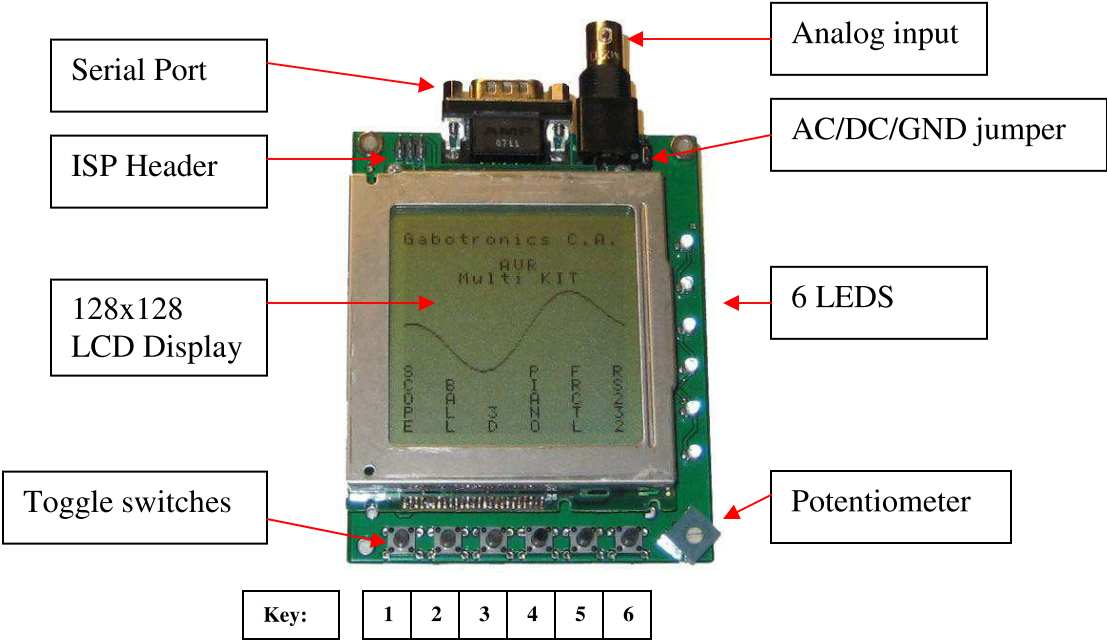
- LCD Displays
- Analog to Digital Converters
- Accelerometers
- RS-232 Interface & Xmodem file transfer
- Multiplexing LEDs
- Generating negative voltages
- Reading multiple switches with a single pin
- Multiple frequencies on a buzzer
- Fast Fourier Transforms
- Random numbers

These topics are demonstrated with 6 applications:

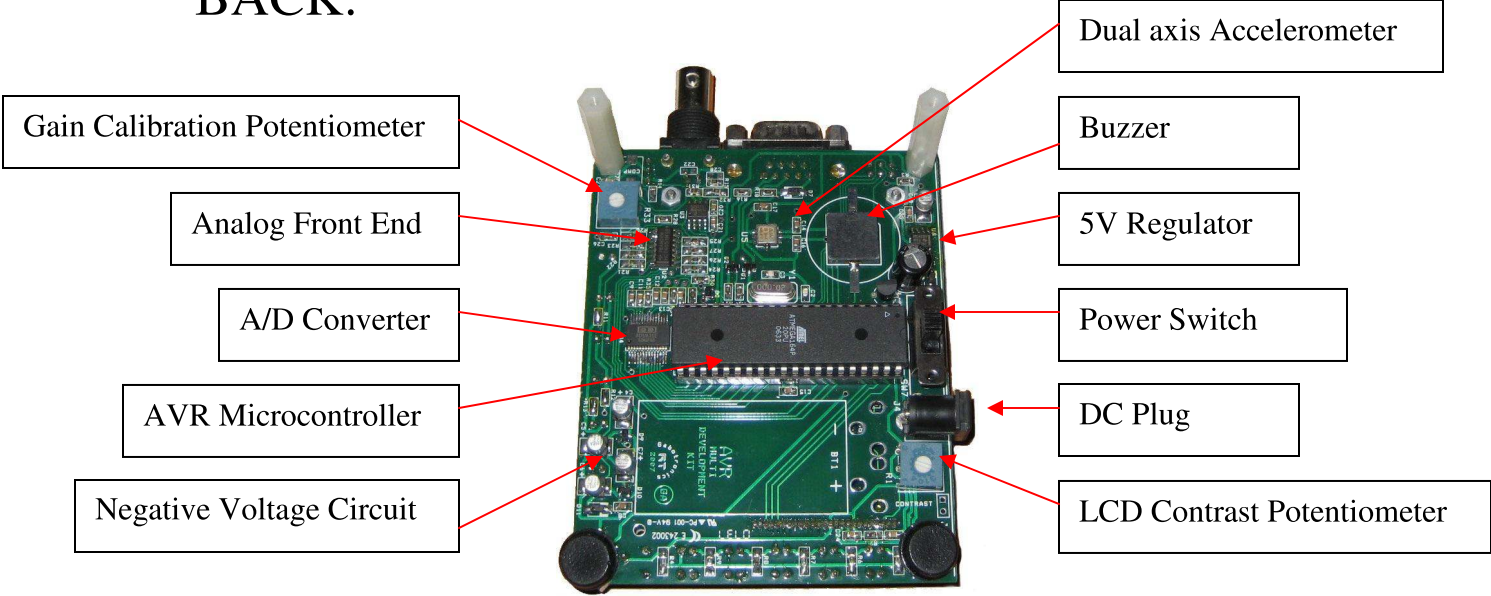
SCOPE: Fully featured Mixed Signal Oscilloscope with FFT
BALL: Bouncy ball in a Labyrinth game with tilt control
3D: Demo using accelerometer to change viewing angle of a sphere
PIANO: Mini Piano with dual frequency output
FRCTL: Fractal to demo simple math and random numbers
RS232: RS-232 Terminal

MultiKit Hardware Overview

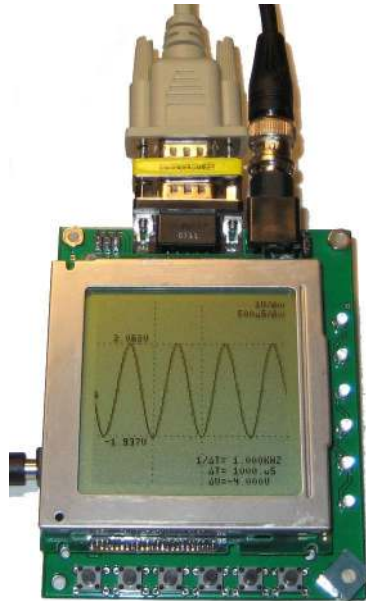
FRONT:



BACK:



SCOPE



Specifications:

1 Analog Input
Input Impedance: $1M\Omega$
Maximum Input Voltage: +/- 25V
A/D Converter Resolution: 8 bits
Max Sample Rate: 3.2MS/s
Trigger jitter: 2uS
3 Digital Inputs

Features:

Time Base (S/division): 5u, 10u, 20u, 50u, 100u, 200u, 500u, 1m, 2m,
5m, 10m, 20m, 50m, 0.1, 0.2, 0.5, 1, 2
Gain (Volts / division): 20m, 50m, 0.1, 0.2, 0.5, 1, 2, 5
Horizontal Cursors
Vertical Cursors
Automatic Average and Peak to Peak measurements
Fast Fourier Transform
Export to BMP through RS-232 using HyperTerminal

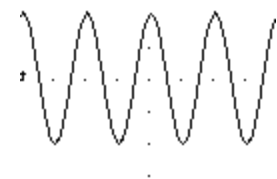
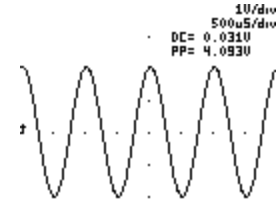
Scope Instructions:

K1: Gain Select

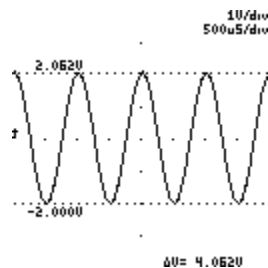
K2: Rate Select

K3: Math Select:

- Average & Peak to Peak:
Displays the Average (DC) & Peak to Peak voltage (PP) of the waveform
- FFT Display:
Displays the Fast Fourier transform of the waveform. The vertical cursors change to frequency cursors.
- Math and FFT off:
Default display



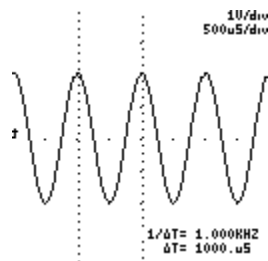
K4: Horizontal Cursor:



Press and hold K5 to adjust cursor

- 1st press: Adjust H1 Cursor with potentiometer
- 2nd press: Adjust H2 Cursor with potentiometer
- 3rd press: Horizontal Cursor off

K5: Vertical Cursor:



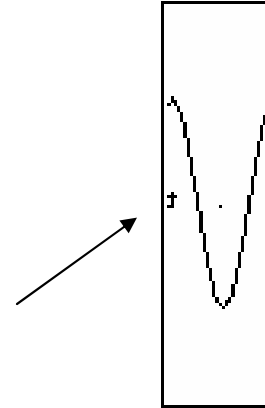
Press and hold K5 to adjust cursor

- 1st press: Adjust V1 Cursor with potentiometer
- 2nd press: Adjust V2 Cursor with potentiometer
- 3rd press: Vertical Cursor off

K6: Trigger Mode:

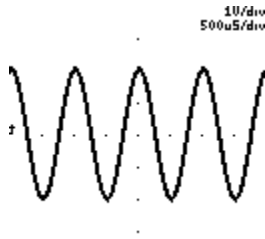
- 1st press: Normal mode (trace when trigger occurs)
- 2nd press: Stop (no trace)
- 3rd press: Single (trace once when trigger occurs)
- 4th press: Free (trace continuously)

To adjust the trigger level, press and hold K6
Move potentiometer up for rising edge trigger
Move potentiometer down for falling edge trigger
The arrow on the left side of the LCD represents the trigger level and edge direction



K1 and K2: Toggle between:

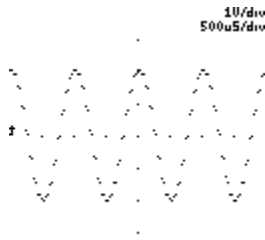
- Persistent display (traces will not be erased):



- Normal display

K2 and K3: Toggle between:

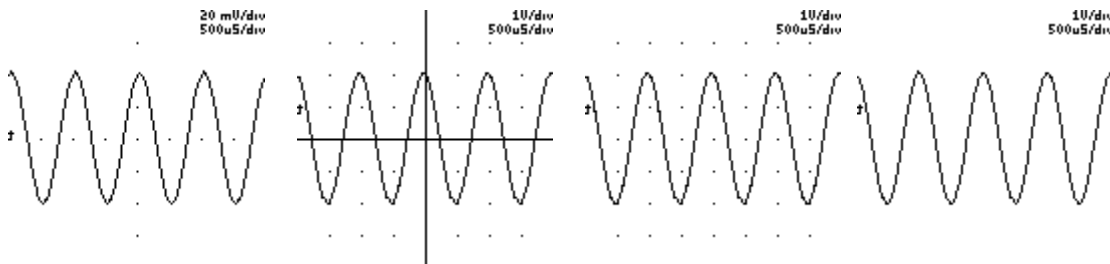
- Dot display (each sample is displayed as a single pixel):



TIP: The dot display is useful at slow sampling rates or when used in combination with the persistent mode.

- Line display (default mode, a line is drawn from sample to sample)

K3 and K4: Change between different grid displays:

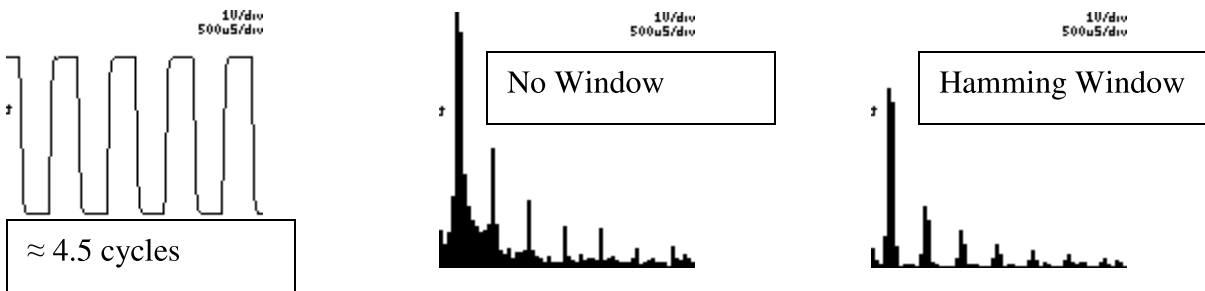


K4 and K5: Force trigger: Useful in the Stop mode if one trace needs to be displayed.

K1 and K3: Toggle between:
Show Gain and Rate settings
Don't show Gain and Rate settings

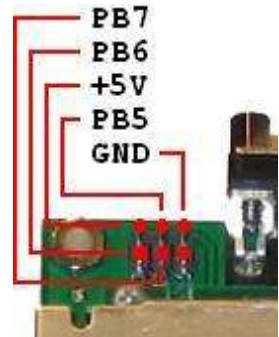
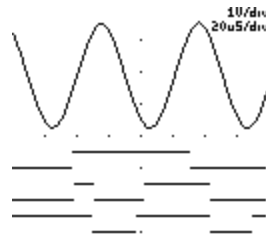
K2 and K4: Toggle between:
Hamming window (default)
No Hamming window

The Hamming window is useful when the number of cycles of the waveform is not an integer. Example:



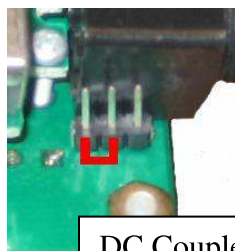
K3 and K5: Display Digital Data

The digital lines used for the ISP (PB5, PB6, PB7) are used as digital inputs.

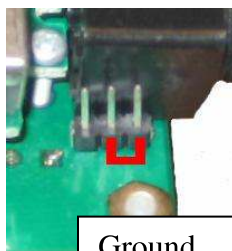


K1 and K5: exit Scope

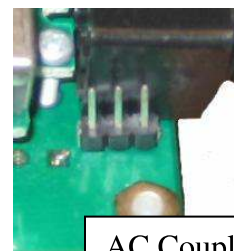
AC/DC/GND Jumper: Selects the different input coupling options:



DC Coupled



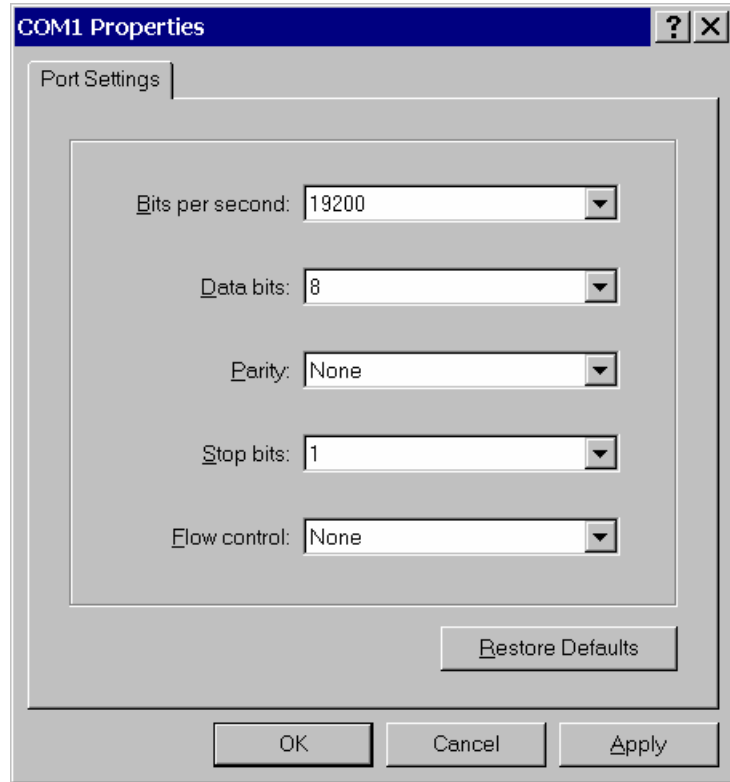
Ground



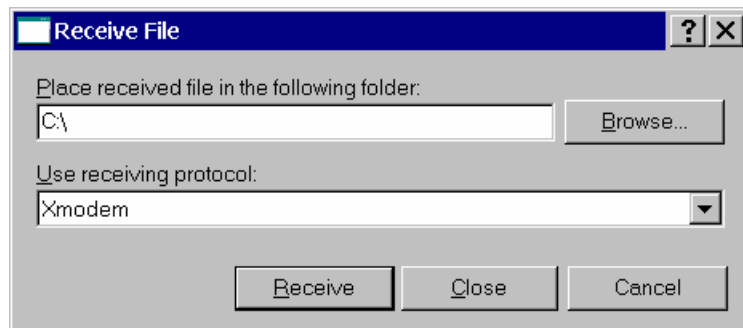
AC Coupled

To export a BMP file to a PC:

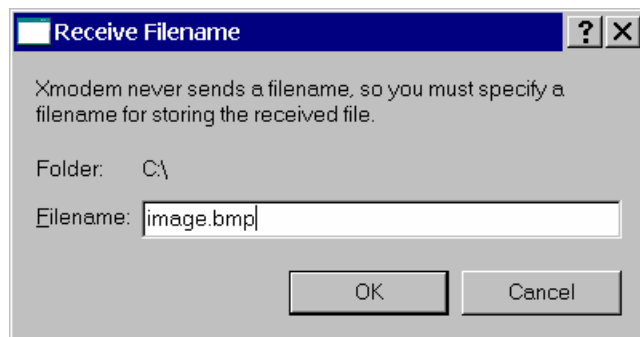
- 1) Open HyperTerminal.
- 2) Enter a name for a new connection (example: multikit).
- 3) Enter the COM port where the MultiKit is connected.
- 4) Select 19200 bits per second, 8 data bits, Parity None, 1 Stop bit, Flow control None.



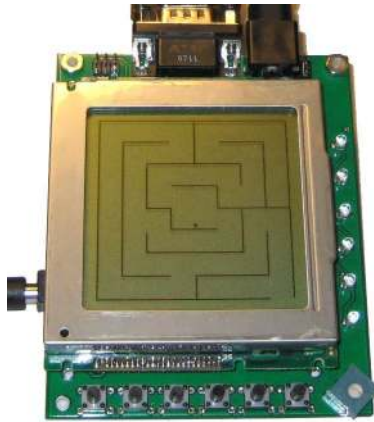
- 5) In the Transfer menu, select Receive File.
- 6) Enter a folder where to save the file and use the XMODEM protocol.



- 7) Enter a file name with a BMP extension and press OK.



BALL

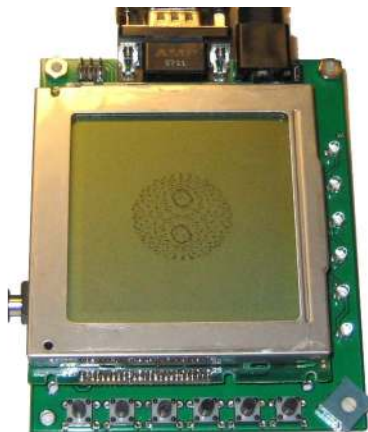


This is a simple game to demonstrate the accelerometer.

Tilt the board so that the ball rolls and bounces along the paths. The exit is on the lower right corner.

To exit press K6

3D



This is a simple application to demonstrate the accelerometer and 3D math.

Tilt the board to change the viewing angle of the sphere.

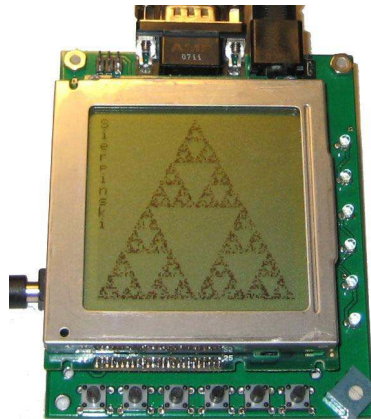
To exit press K6

PIANO

This is a simple application to demonstrate the use of the buzzer and generating multiple frequencies.

To exit press K6

FRCTL



This is a simple application to demonstrate fractals and random numbers

- K1:** Sierpinski Triangle
- K2:** Sierpinski Hexagon
- K3:** Mandelbrot Fractal
- K4:** Zoom out Mandelbrot
- K5:** Zoom in Mandelbrot
- K6:** exit

RS232

This is a simple RS-232 terminal application. Settings are:

19200 bps 8 data bits, No Parity, 1 Stop bit, No Flow control

Typing in HyperTerminal will display in the MultiKit, pressing the K1 to K5 keys will display the letters a thru e in the HyperTerminal window.

To exit press K6