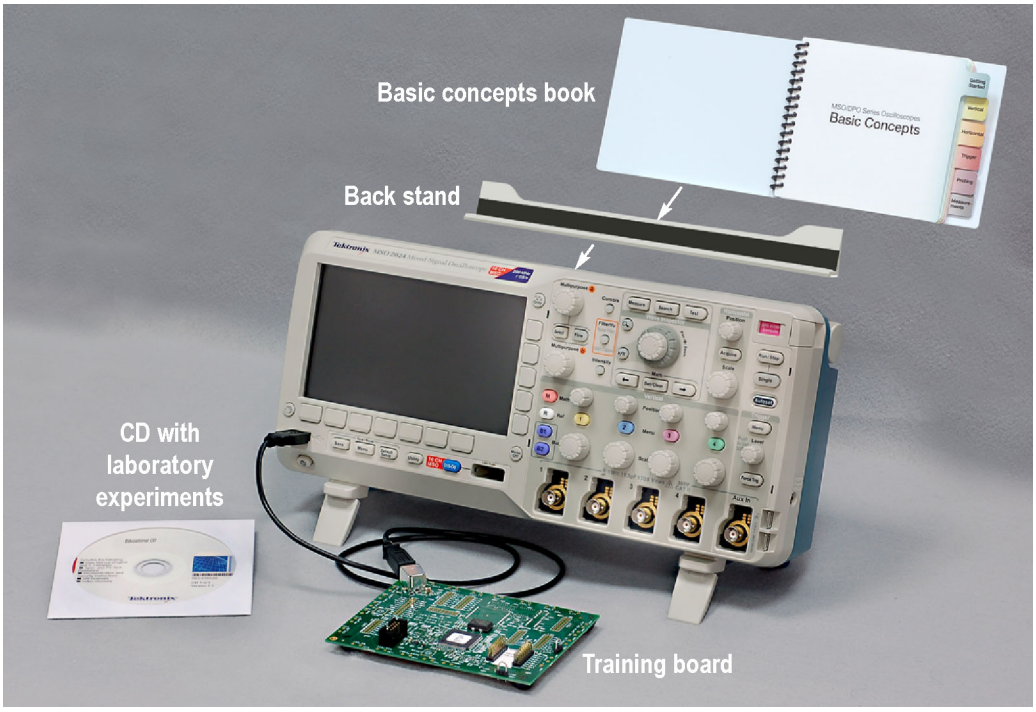
Educator's Resource Kit



The Educator's Resource Kit offers a comprehensive suite of tools for teaching engineering students the fundamentals of test and measurement. Included on the CD are six problem-based laboratory experiments, with matching instructor's guides and reference fact sheets, and a training board for use with the experiments. The laboratory experiments are designed to be scalable from two to four hours in length to match your lab needs. All instructional materials – lab experiments, instructor's guides and reference fact sheets – are provided in both .pdf format and an editable format (either as a Word document or a PowerPoint file). The copyright on the instructional materials grants you permission to reprint, modify and distribute in whole or in part the documents for the purpose of training students on Tektronix test instrumentation.

An Oscilloscope Basic Concepts book is also included, which covers the basic features and functions of an oscilloscope. Hardware to attach the Oscilloscope Basic Concepts to the oscilloscope is provided.

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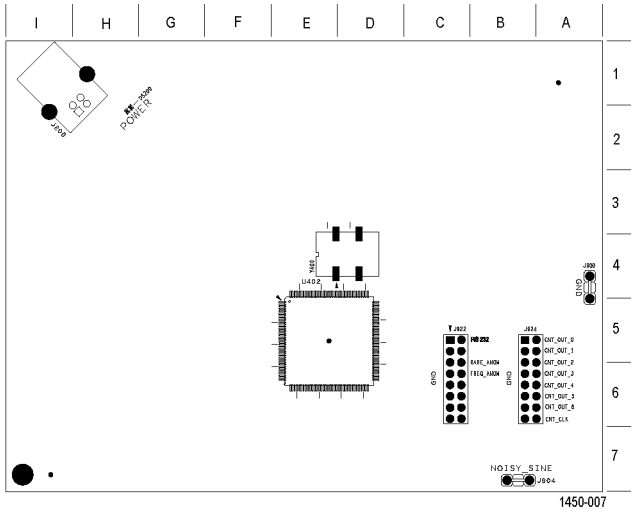
Resource Kit Contents	Description
Six Laboratory Experiments (on the CD): ■ Introduction to Oscilloscopes ■ Introduction to Oscilloscope Probes ■ Advanced Oscilloscope Features ■ Introduction to Arbitrary/Function Generators ■ Digital Debug with Oscilloscopes ■ Parallel and Serial Bus Analysis	Problem-based learning Hands-on using real-world signals Designed to match your lab time; scale from 2 to 4 hours
Six Instructor's Guides (on the CD)	One for each experiment Answers to the exercises Helpful hints to performing the experiments
Six Reference Fact Sheets (on the CD)	Designed for students Covers basic test and measurement theory Reference tools for use during the lab or future classes
Training Board	Provides signals for: Noisy sine wave Digital signal with common anomalies Parallel bus RS-232 serial bus

Locating Signals on the Training Board

The diagram includes a grid to help you locate signals on the training board connectors and headers. To find the desired signal on the diagram, look up the grid locations in the signal description, and then use the grid to find that location on the diagram and on the board.



CAUTION. *To avoid damage to the training board, handle it in a static conscious manner. Some components on the board are susceptible to damage from accidental ESD (electro-static discharge).*

Noisy Sine

Board label. NOISY_SINE

Connector grid location. B7

Description. The Noisy Sine signal is a 19.07 Hz sine wave with 64 analog steps per cycle, resembling those made by a digital-to-analog converter (DAC). It also has 18 glitches per cycle, resembling those from a switch-mode power supply.

RS232 UART, Transmit

Board label. RS232

Connector grid location. B5 to C5

Description. The UART signal is the logic level input to the RS-232 UART from the µC. The transmit signal (TX) is the RS-232 voltage level serial bus signal.

The decoded data packets display the ASCII string: "Tektronix", followed by six spaces and one error.

There are no matching receive or data flow control signals.

The baud rate is 9600. The data format is 1 start bit, and 8 data bits with no parity.

Counter Clock

Board label. CNT_CLK

Connector grid location. B6

Description. This is the 1.25 MHz clock signal for the 7-bit Counter Output described next.

Counter Output Bits

Board label. CNT_OUT0: CNT_OUT6

Connector grid location. B5, B6

Description. These are the 7-bits of the binary counter. The least significant bit (LSB) is CNT OUT0 at 625 KHz, that is half of the counter input clock. The Counter Output Bits and the Counter Clock signals are on eight adjacent sets of header pins for easy connection to a digital probe.

Frequent Anomaly

Board label. FREQ_ANOM

Connector grid location. B6 to C6

Description. There are three frequently occurring anomalies in this pulse train.

A half height runt signal occurs every 51.2 µs. You can use a Runt trigger to isolate the signal.

A 25 ns (narrow) and a 50 ns (narrow) pulse appears every 51.2 µs. You can use a Pulse Width trigger to isolate each signal.

The pulse train is a repeating group of three pulses. The three pulses are 100 ns, 200 ns, and 100 ns wide, with a 100 ns low between. The group repeats at a 1.6 µs rate.

The anomaly is a group of four pulses. The four pulses are 50 ns (narrow), 25 ns (narrow), 75 ns (runt), and 100 ns wide (full pulse), with a low time between them of 25 ns, 100 ns, and 225 ns.

Rare Anomaly

Board label. RARE_ANOM

Connector grid location. B6 to C6

Description. There are three less-frequently occurring anomalies in this pulse train.

A half-height runt signal occurs every 838.8 ms. You can use a Runt trigger to isolate the signal.

A 25 ns (narrow) and a 50 ns (narrow) pulse appears every 838.8 ms. You can use a Pulse Width trigger to isolate each signal.

The pulse train is a repeating group of three pulses. The three pulses are 100 ns, 200 ns, and 100 ns wide, with a 100 ns low between each pulse. The group repeats at a 1.6 μs rate.

The anomaly is a group of four pulses. The four pulses are 50 ns (narrow), 25 ns (narrow), 75 ns (runt), and 100 ns wide (full pulse), with a low time between them of 25 ns, 100 ns, and 225 ns.

Compliance Information

This section lists the EMC (electromagnetic compliance), safety, and environmental standards with which the training board complies.

EMC Compliance

EC Declaration of Conformity – EMC

Meets intent of Directive 2004/108/EC for Electromagnetic Compatibility. Compliance was demonstrated to the following specifications as listed in the Official Journal of the European Communities:

EN 61326-1 2006. EMC requirements for electrical equipment for measurement, control, and laboratory use. [1] [2] [3] [4]

- CISPR 11:2003. Radiated and conducted emissions, Group 1, Class A
- IEC 61000-4-2:2001. Electrostatic discharge immunity
- IEC 61000-4-3:2002. RF electromagnetic field immunity
- IEC 61000-4-4:2004. Electrical fast transient / burst immunity
- IEC 61000-4-5:2001. Power line surge immunity
- IEC 61000-4-6:2003. Conducted RF immunity
- IEC 61000-4-11:2004. Voltage dips and interruptions immunity [5]

EN 61000-3-2:2006. AC power line harmonic emissions

EN 61000-3-3:1995. Voltage changes, fluctuations, and flicker

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United Kingdom

EMC Compliance

Meets the intent of Directive 2004/108/EC for Electromagnetic Compatibility when it is used with the product(s) stated in the specifications table. Refer to the EMC specification published for the stated products. May not meet the intent of the directive if used with other products.

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1 This product is intended for use in nonresidential areas only. Use in residential areas may cause electromagnetic interference.

2 Emissions which exceed the levels required by this standard may occur when this equipment is connected to a test object.

3 To ensure compliance with the EMC standards listed here, high quality shielded interface cables should be used.

4 This product is intrinsically static sensitive and must be handled in a Static Conscious manner. IEC 61000-4-2 is considered not applicable.

5 Performance Criterion C applied at the 70%/25 cycle Voltage-Dip and the 0%/250 cycle Voltage-Interruption test levels (IEC 61000-4-11).

Australia / New Zealand Declaration of Conformity – EMC

Complies with the EMC provision of the Radiocommunications Act per the following standard, in accordance with ACMA:

- CISPR 11:2003. Radiated and Conducted Emissions, Group 1, Class A, in accordance with EN 61326-1:2006.

Environmental Considerations

This section provides information about the environmental impact of the product.

Product End-of-Life Handling

Observe the following guidelines when recycling an instrument or component:

Equipment Recycling. Production of this equipment required the extraction and use of natural resources. The equipment may contain substances that could be harmful to the environment or human health if improperly handled at the product's end of life. In order to avoid release of such substances into the environment and to reduce the use of natural resources, we encourage you to recycle this product in an appropriate system that will ensure that most of the materials are reused or recycled appropriately.

This symbol indicates that this product complies with the applicable European Union requirements according to Directives 2002/96/EC and 2006/66/EC on waste electrical and electronic equipment (WEEE) and batteries. For information about recycling options, check the Support/Service section of the Tektronix Web site (www.tektronix.com).

Restriction of Hazardous Substances

This product has been classified as Monitoring and Control equipment, and is outside the scope of the 2002/95/EC RoHS Directive.