

TLP Test System

Barth Model 4003 TLP+™



The Barth Model 4003 TLP+™

Pulse Curve Tracer precisely characterizes the ESD robustness of silicon chip protection circuitry. Programmed rectangular pulses are applied to the device under test, resulting in a computerized plot of current vs voltage. A leakage measurement can be made after each pulse to obtain the leakage evolution current versus pulse voltage. Set up for packaged device testing; an optional dual wafer probe (Model 45003WP), permits wafer level testing. Other options and accessories are also available.

System Components:

- ⊗ Tektronix 1 GHz, 2 channel, digitizing oscilloscope
- ⊗ High reliability Barth Electronics control box/pulse generator
- ⊗ Keithley Picoammeter/voltage source
- ⊗ Dell Precision Workstation - Test control computer
- ⊗ LabView® runtime control and analysis software
- ⊗ One year warranty on the entire system
- ⊗ One year BSSP Barth Software Subscription Program

How It Works

Operation of the 4003-TLP Pulsed Curve Tracer is very intuitive. The operator adjusts the desired test parameters via keyboard, such as starting voltage, current and voltage limits, voltage step increments, pulse risetime, leakage test voltage, and pulse width. The operator then selects to start a test and the test proceeds automatically, controlled by Barth software developed with National Instruments Labview®. The operator can halt and resume the testing and can view the plotted test data points as the test proceeds.

The operator can also view (during testing or afterward), voltage & current waveforms, single point or multi-point leakage evolution, test set-up parameters, or numerical data information. The active test and several previous tests' data points may be viewed simultaneously on the I/V plot.

Hardcopy printouts listing data point values and showing plotted results using operator selected scaling are immediately available in a presentation ready format at the end of a test.

Accuracy

Special Barth wide bandwidth pulse current and voltage sensors provide a high standard of measurement capability for ESD test equipment.

The complete system has been built with special attention paid to minimizing losses in the test circuitry and the coaxial cable connections. This results in low internal resistance at the device under test (DUT), for high accuracy measurements.

Barth's software allows users to make manual leakage delay adjustments, and allow for leakage test voltages up to 500V. Higher values are available with optional source meter.

The software includes voltage & current waveform capture, automatic calibration / compensation, automatic data save, save / recall operator set-ups, auto or manual axis scaling, single or multi-point leakage testing (configurable), adjustable measurement window, dynamic resistance calculator, recall data function for compare & analyze of multiple tests, 2 channel scope (4 channel optional), save / recall pulsing "profiles", scope auto-SPC (signal path compensation), and numerous other features.

The BSSP (Barth Software Subscription Program) provides periodic software updates and improvements. This assures your system is in peak operating condition. Test speed increases, and efficiency improves. Improve system capability with regard to calibration, reporting, and system diagnostics; all available with BSSP.



TLP Test System

Barth Model 4003 TLP+™

Specifications:

- Ⓢ Pulse current: 30 amps @ short circuit; 0-10 amps @ 50Ω load, 40A options available
- Ⓢ Pulse width: 75ns to 150ns standard; 500 ns option available
- Ⓢ Standard pulse width of 100ns (and 75ns) is supplied with the tester. Pulse width is manually selectable
- Ⓢ Pulse voltage: 0-500 v @ 50Ω load, 1000 v @ open circuit (step increments: ≥0.05v)
- Ⓢ Pulse risetime: (10-90%): 0.2, 2, 10 ns (built-in, software selectable) optional rise time filter values are available
- Ⓢ Pulse rate: Up to 20 test pulses per minute
- Ⓢ Leakage voltage: 0 to +/-500v (Model 6487), +/-200v (Model 2400),
- Ⓢ Leakage current sensitivity: 10-12 to 2.5 x 10⁻³ amps (Model 6487)
- Ⓢ Source impedance: 50Ω
- Ⓢ Load Impedance: any load
- Ⓢ Selectable mains power: 100,120 vac@5amps; 220,240 vac@3amps, 50 to 60 Hz (USA default:120 vac; 60 Hz)
- Ⓢ Switching control for 2 external channels is standard; switching control allows bias voltages to be applied or removed during the leakage test.

Features and Benefits

50 Ohm Test System

Controlled 50-ohm impedance throughout the complete measurement chain of the test system minimizes the measurement errors associated with the usual 500-ohm resistor connections for ordinary TLP testers. Making measurements at 50-ohm impedance minimizes the effects of parasitics.

Just as the Barth 4003 TLP Pulse Curve Tracer connections to the packaged device sockets are constructed with a controlled 50-ohm impedance, the Barth TLP wafer probe also has a controlled 50-ohm impedance throughout its connections to the two needle contacts at any two pads.

Testing the DUT directly from an, inherently low 50-ohm source impedance provides inherently higher pulse currents from a clean test pulse with no ringing or overshoot. A perfect sub nanosecond risetime pulse generator combined with low distortion measurement probes and controlled impedance connections allows the Barth Pulse Curve Tracer test system to gather accurate TLP data either on wafer or on packages.

Data Output

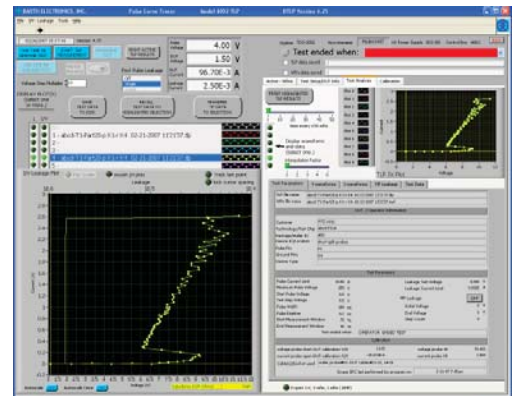
Hardcopy color printouts can be quickly printed that list data point values and show plotted results using operator selected scaling. The numerous software options provide for output of test data, including subsets and comparison printouts containing several tests. User control of scaling and ability to turn on and off leakage data individually for each data set allows the operator to quickly focus in on the important data.

Screen Displays

One of the 8 display screens is shown below.

All 8 screens display the active I-V test data and data for up to 5 recalled tests (on the left half of the screen).

The left side display shows both the I/V curve and leakage evolution. The right side display can also show: V & I waveforms, single or multi-point leakage evolution, operator info, test parameters, numerical test-point data, or calibration values.



Data Storage

Both I-V and waveform data is automatically stored to hard disk in tab delimited format and can be recalled for viewing or transferring to disk. Data is automatically time/date stamped when saved.

Size and Weight

System is approximately 19" x 19" x 19" w/scope. Total weight including Control Box and scope is approximately 75 lbs. (Weight does not include computer.)

Ⓢ Options and Accessories are available.

This Product Features
Barth Designed ZAPLESS®
High Speed Measurement
Components



TLP Test System Options For Barth Model 4003 TLP+™

Barth Model 4003 TLP+™

- ⊗ The Pulse Curve Tracer precisely characterizes the ESD robustness of silicon chip protection circuitry.
- ⊗ Programmed rectangular pulses are applied to the device under test, resulting in a computerized plot of current vs. voltage.
- ⊗ A leakage measurement can be made after each pulse to obtain the leakage evolution current versus pulse voltage.
- ⊗ Set up for packaged device testing; an optional dual wafer probe permits wafer level testing

100ns pulse width - TLP External Charge Line Option Model - 46001-100
125ns pulse width - TLP External Charge Line Option Model - 46001-125
150ns pulse width - TLP External Charge Line Option Model - 46001-150

500ns Wide Pulse Option – Model 4003-02

The Wide Pulse Option extending capability is up to 500ns pulse width and provides one (1) External Charge Line (length of your choice). Note: the control box will need to be returned to factory for modification.

175ns pulse width - TLP External Charge Line Option Model - 46001-175
200ns pulse width - TLP External Charge Line Option Model - 46001-200
250ns pulse width - TLP External Charge Line Option Model - 46001-250
400ns pulse width - TLP External Charge Line Option Model - 46001-400
500ns pulse width - TLP External Charge Line Option Model - 46001-500

40 Amp Option Bundle – Model 4003-15

The 40A Option Bundle provides “True 40 Amp” pulse capability and includes 2,000 volts to an open and 40 Amps through a short. Note: the control box will need to be returned to Barth for modification.

- ⊗ This option also allows user to analyze HBM and/or HMM circuits for operation characteristics and immunity.

Pulsed Bias Option – Model 4003-07

The Pulsed Bias Option is AC Powered and provides an automatic bypass connection to preserve the leakage test capacity that occurs between TLP stress pulses. Note: the control box will need to be returned to factory for modification.

1500ns Wide Pulse Option – Model 4003-08

Requires 500ns Wide Pulse Option (Model 4003-02); extends capability up to 1500ns wide pulses; Includes (1) 1000ns Charge Line (Model 46001-1075) that is used with the external 500ns (425ns actual) Charge Line (Model 46001-500) to achieve the 1500ns pulse width.

Keithley Model 2400 Upgrade Option - 4003-11

Replaces the Keithley 6487 Model.

580-NFT

80 ns Ramp Generator. Call our office for details.

Computer Upgrade BCCU-4003 (Replacement Computer for Existing Systems)

The Computer Upgrade Bundle includes a Dell Precision Work Station, 19” Monitor, WIN 10, National Instruments Interface Control Board: NI PCIE-GPIB w/NI-488 Software, 3 year Dell Pro Support Warranty on Computer, Software Upgrade, Barth Software Subscription Plan Includes 1 year BSSP



TLP Test System Options For Barth Model 4002 TLP+™

Barth Model 4002 TLP+™

- ⊗ The Pulse Curve Tracer precisely characterizes the ESD robustness of silicon chip protection circuitry.
- ⊗ Programmed rectangular pulses are applied to the device under test, resulting in a computerized plot of current vs. voltage.
- ⊗ A leakage measurement can be made after each pulse to obtain the leakage evolution current versus pulse voltage.
- ⊗ Set up for packaged device testing; an optional dual wafer probe permits wafer level testing

20 Amp Option – Model 4002-01

The 20A Option is “True 20 Amp” pulse capability and provides 1,000 volts to an open and 20 Amps through a short. Note: the control box will need to be returned to factory for modification.

- ⊗ This option also allows user to analyze HBM and/or HMM circuits for the operation characteristics and immunity.

500ns Wide Pulse Option – Model 4002-02

The Wide Pulse Option is up to 500ns pulse width and provides one (1) External Charge Line (length of your choice). Note: the control box will need to be returned to factory for modification.

1500ns Wide Pulse Option – Model 4002-08

Requires 4002-02 500ns Wide Pulse Option; Includes (1) 1000ns Charge Line that is used with the external 500ns (425ns actual) Charge Line to achieve the 1500ns pulse width. 1500ns Wide Pulse Option is limited to below 10 Amps max.

Negative Pulse Option – Model 4002-03

The Negative Pulse Option adds an inverter to the pulse circuit; this option is easily installed by user.

30 Amp Option Bundle – Model 4002-05

The 30A Option Bundle provides “True 30 Amp” pulse capability and provides 1,500 volts to an open and 30 Amps through a short. Note: the control box will need to be returned to Barth for modification.

- ⊗ This option also allows user to analyze HBM and/or HMM circuits for operation characteristics and immunity.

Pulsed Bias Box Option – Model 4002-07

The Pulsed Bias Box Option is AC Powered and provides an automatic bypass connection to preserve the leakage test capacity that occurs between TLP stress pulses. This option is user installed.

Keithley Model 2400 Upgrade Option - 4002-11

Replaces the Keithley 6487 Model.

Computer Upgrade (Replacement Computer for Existing Systems) BCCU-4002

Barth 4002 TLP Computer Upgrade Bundle: Includes a Dell Precision Work Station, 19” Monitor, WIN 10, National Instruments Interface Control Boards: NI PCIE-GPIB w/NI-488 Software, NI DIO control board, DIO Jumper assembly w/custom bracket, 3 year Dell Pro Support Warranty on Computer, Software Upgrade, Barth Software Subscription Plan Includes 1 year BSSP

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TLP Test System Accessories For Barth Model 4002/4003 TLP+™

Pulse Curve Tracer Accessories

20ns Risetime Filter – Model 40010-UC

The 20ns risetime filter provides 20ns up to 30 amp system.

30ns Risetime Filter – Model 40010-WC

The 30ns risetime filter provides 30ns up to 30 amp system.

40ns Risetime Filter – Model 40010-VC

The 40ns risetime filter provides 40ns up to 30 amp system.

Aluminum Test Stand – Model 43002

The aluminum test stand is to stabilize DUT cables during use

DUT Cable for Test Stand – Model 43102

Test stand DUT cable (Section 1; 18" length)

DUT Cable, 2 leads – Model 44202

DUT cable with 2 leads, for 48 pin DIP Zip test fixture (Multiple ground pin)

DUT Cable, 3 leads – Model 44203

DUT cable with 3 leads, for 48 pin DIP Zip test fixture (Multiple ground pin)

DUT Cable, 4 leads – Model 44204

DUT cable with 4 leads, for 48 pin DIP Zip test fixture (Multiple ground pin)

HBM Dual Wafer Probe – Model 45003WP

The HBM dual wafer probe includes 2 DUT cables, needles and accessories

HBM Dual Wafer Probe 3rd Arm Assembly – Model 46010

The 3rd arm assembly is for use with the HBM Dual Water Probe, it is a single probe, and includes a leakage box kit.

- ⊗ Model 47150 = 50 ohm (set of 2), Source Z = 150 ohms
- ⊗ Model 47250 = 100 ohm (set of 2), Source Z = 250 ohms
- ⊗ Model 47450 = 200 ohm (set of 2), Source Z = 450 ohms

Needle: Osmium tipped – Typically used for wafer pad probing (can be used with care for BGA)

Model 45121 - Improved strength Osmium tipped needle (.026" dia. shank, 15 degree included angle to tip, 12.7 micron (0.0005") tip radius. Sold in sets of (4).

Needle: Chisel tipped – Typically used for BGA and other package devices (dead bug style)

Model 45104 - Chisel tipped needle (0.026" dia. shank, wide chisel = .026" ≈660 micron tip width)

Model 45106 - Chisel tipped needle (0.026" dia. shank, narrow chisel = .010" ≈254 micron tip width)

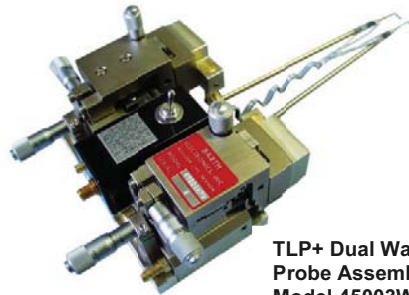
Model 45108 - Chisel tipped needle (0.026" dia. shank, very narrow chisel = .006/.008" ≈152-203 micron tip width)



Dual Wafer Probe, 3rd Arm Accessories Barth Model 45003WP, Model 45010

Specifications:

- ⊗ Dual Wafer Probe High Z Set; each set includes three (3) resistor sets for each Model of High Z.
- ⊗ Needle: Osmium Tipped - Model 45121
- ⊗ Needle: Chisel Tipped - Model 45104
- ⊗ Controlled 50 ohm impedance throughout the complete measurement chain of our test system minimizes the measurement errors associated with the usual 500 ohm resistor connections for ordinary TLP testers. Making measurements at 50 ohm impedance minimizes the effects of parasitics.



**TLP+ Dual Wafer
Probe Assembly
Model 45003WP**

The Barth Model 45003WP Dual Wafer Probe accessory is designed to be used with the Barth Model 4003 TLP+™ Pulse Curve Tracer for pulse testing of the ESD protection circuit I/V characteristics at the wafer level.

It has two separate needles and isolated probe connections that can be independently positioned with no interaction between them.

Accuracy

The Barth Model 45003WP Dual Wafer Probe accessory has been specially designed to provide the same accuracy as when testing packaged devices in a socket. Testing the TLP characteristics of the device on wafer and later when it is packaged, can provide significantly more information than is available with pass or fail testing with human body model or machine model. Either manner of connecting to the DUT allows very repeatable measurements at high pulse currents.

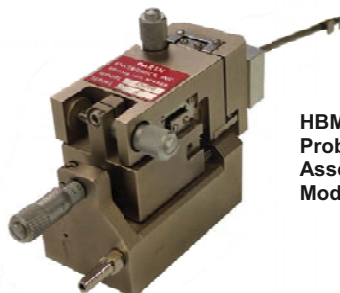
To minimize the mechanical problems of crossed needles in connecting to the pads to be tested, a specially designed constant impedance-reversing switch allows easy selection of the TLP pulse polarity at the pads. A user selectable magnetic or vacuum base allows this TLP probe to be easily moved while maintaining a secure position on the table.

Just as the Barth TLP Test System connections to the packaged device sockets are constructed with a controlled 50 ohm impedance, the Barth Model 45003 Dual Wafer Probe accessory also has a controlled 50 ohm impedance throughout its connections to the two needle contacts at any two pads.

Testing the DUT directly from an inherently low 50 ohm source impedance provides inherently higher pulse currents from a clean test pulse with no ringing or overshoot. A perfect sub nanosecond risetime pulse generator combined with low distortion measurement probes and controlled impedance connection allows the Barth Model 4003 TLP+™ Pulse Curve Tracer test system to gather accurate TLP data either on wafer or packages.

3rd Arm Probe Model 45010

The Barth Model 45010 3rd. Arm Probe has been specially designed for applying additional grounds or bias voltages to your devices.



**HBM Dual Wafer
Probe 3rd Arm
Assembly
Model 45010**

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