HYPERLABS

Innovation at Hyperspeed since 1992

HYPERLABS ZCOUPON™

User Manual and Technical Guide

Applies to Model Numbers
HL22xx and HL32xx Series

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Introduction

These consolidated reference materials apply to the Zcoupon™ software included with all HL200S and HL300S Controlled Impedance Test Systems and HL32xx Controlled Impedance Analyzers from HYPERLABS.

The software package is also compatible with all HL22xx Signal Path Analyzers purchased after January, 2015 (serial numbers beginning with "F", e.g. FA01). For older instruments, please contact HYPERLABS to determine the software that should be used.

Please note that some features referenced below, including channel switching, require instruments with at least two ports (two differential channel pairs). Where this is the case, it will be clearly noted.

For further technical support, please visit our website: www.hyperlabsinc.com/support.aspx

Table of Contents

Section 1: Changelog

Below is a list of major software improvements and features added in various releases of Zcoupon™. To ensure that you are always using the most recent version of Zcoupon™, please bookmark our website:
http://www.hyperlabsinc.com/Zcoupon.aspx

Version 2.7

- External calibration is once again required to be performed using the load resistors on the HL9600 Calibration Standards Substrate, rather than the HL9600 coupons.

Version 2.6

- External calibration is now performed using the Coupons on the HL9600 Calibration Standards Substrate. In previous versions, external calibration was performed using Load Resistors on the HL9600. For more information about this feature, see *Section 20.2* below.

- Zcoupon™ is now compatible only with HYPERLABS HL22xx and HL32xx instruments. Support for the HL52xx series has been deprecated.

Version 2.5

- Multiple boards can be assigned to the same Session ID, with all session data logs grouped together. Coupon definitions and logs now also track trace width and spacing.

- The *LOG* button will now automatically save full X/Y coordinates of every logged waveform.

- Cursors can be toggled to snap to the 50/70% points upon every waveform acquisition.

Version 2.0

- Multithreading has greatly improved software performance. The user interface no longer lags during instrument recalibration or waveform acquisition, even when waveform averaging is used.

- External calibration to an external calibration standard offers improved measurement accuracy. For this feature, we recommend the HL9600 Calibration Standard Substrate from HYPERLABS. For more information about this feature, see *Section 20.2* below.

- During Session Logging, a Word® report is automatically generated and saved to disk at the end of the session. See *Section 18.7* below for more information.

Version 1.5

- A robust session logging feature has been added, allowing the user to organize session test results more easily. Zcoupon™ saves PNG files, a CSV log summary, and a formatted Word® report to disk.

Section 2: Instrument Operation

HYPERLABS instruments are controlled via USB. The included Zcoupon™ software and drivers are compatible with all versions of Windows XP®, Windows Vista®, Windows 7®, and Windows 8®. At this time(r), there are no plans for OS X, Linux, or other operating system support.

The instrument should always be plugged into the PC prior to running the Zcoupon™ software. A green LED on the back panel of the instrument will indicate that it is plugged into a working USB port.

Section 3: Static Sensitivity and Protection

The level of static protection required depends on the instrument model. Please read this section carefully.

High-speed instruments (model numbers HL22xx and HL200S) are sensitive to electrostatic discharge (ESD), so appropriate protection should be used at all times. An anti-static wrist strap is included with these models.

Instruments in the HL32xx series are compliant with Class 2 of ESDS Component Sensitivity Classification (ESD STM5.1-1998). Additional static protection is not required to use these instruments in most applications. However, a grounded port for an anti-static wrist strap is found on these instruments as well.

Section 4: Driver and Software Installation

HYPERLABS instruments utilize third-party drivers from FTDI. On internet-connected computers, the latest signed drivers will be automatically downloaded and installed as soon the instrument is plugged in to a working USB port.

If the computer is not connected to the internet or not configured for automatic driver installation, the FTDI drivers must be manually installed. Please visit the following page to download the latest version of the FTDI drivers: http://www.ftdichip.com/Drivers/D2XX.htm

If the program states it cannot find "FTD2xx.dll", download the driver package at the address above, extract the .ZIP file, and copy the FTD2xx.dll file into the installation directory listed below.

Once the FTDI driver is installed, the Zcoupon™ software can be installed by running "setup.exe" in the included installation package. The latest software version will also be available on our website. If the package is in compressed (.zip) format, all files must be extracted prior to installation.

By default, the software will install to the following directory: "C:\HYPERLABS\Zcoupon\"

We recommend installing to the default directory in most situations. However, the user may elect to install to a different directory during setup. No other user options are available during the installation process.

Section 5: Running the Zcoupon™ Software

The instrument is initialized and calibrated at startup, a process that takes a few seconds. The software will not be responsive to user input during that time. When this process is complete, the operator will see the user interface shown on the following page. A message box on the right of the main panel will say: *Initializing… DONE!*

NOTE: For optimal results, the instrument should be plugged in for a 5 minute "warm up" period prior to use. After warmup, the operator should enable auto calibration or periodically recalibrate manually (see *Section 16* below).

If any error messages are shown, please make sure that the instrument is plugged in and the drivers installed (see *Sections 2-4* above) before contacting HYPERALBS for additional support.

Section 6: Overview of Zcoupon™ Software and Display Controls

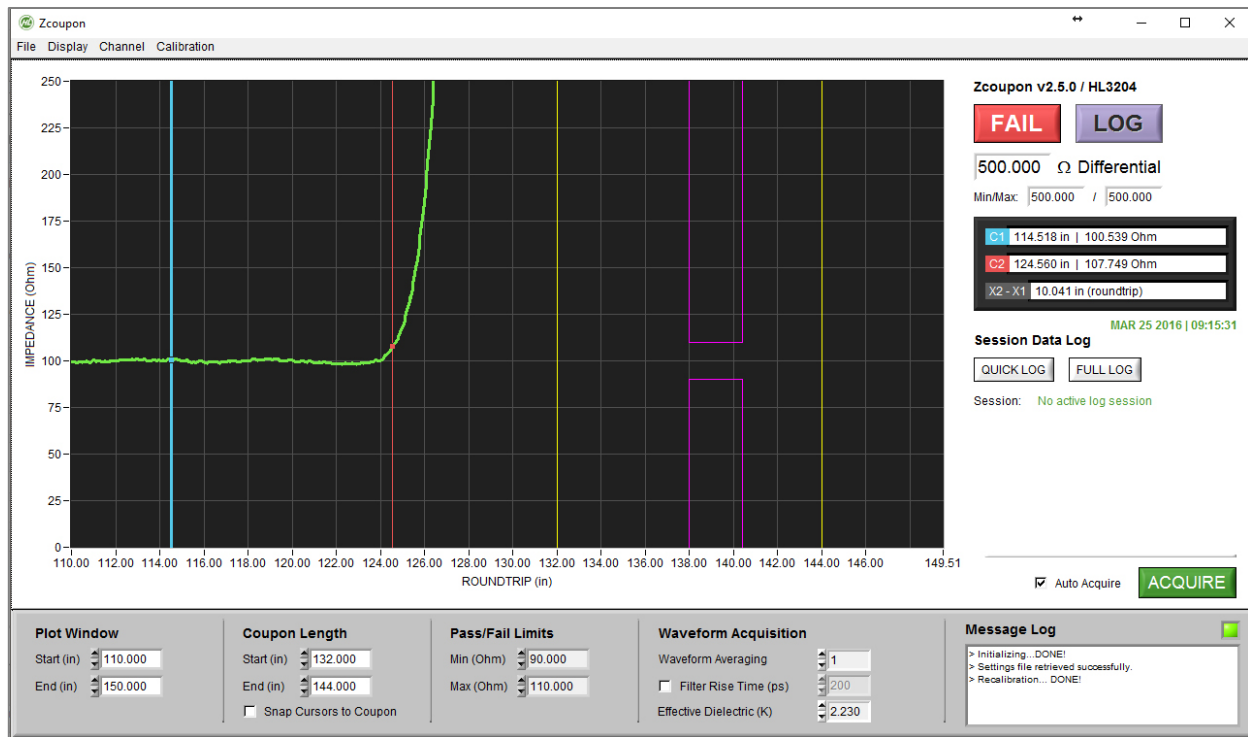When the Zcoupon™ software is running, the user will see a screen similar to *Figure 1* below.

Figure 1: Zcoupon™ default startup screen after initialization and calibration (no coupon connected)

This User Manual is organized according to Zcoupon™ control functionality. Please see the Table of Contents for a list of the controls covered in the sections below.

NOTE: Not all software features are available on all instrument models. The interface and options will vary slightly based on the number of ports of each instrument.

Section 7: Waveform Display

Zcoupon™ displays waveforms using time domain reflectometry (TDR). Impedance (in Ohms) is displayed as a function of distance (in inches). Because TDR utilizes a reflected impulse, distance is always **ROUNDTRIP**. That is, the software will show a 6" test coupon as having a length of 12" **ROUNDTRIP**.

The operator can also position the cursors on the waveform using drag-and-drop (see *Section 11* below). No other actions can be performed directly on the Waveform Display.

For further help reading the actual waveform output, please review the Application Guides on our website, or contact HYPERLABS for assistance.

NOTE: To simplify the process of PCB coupon testing, X and Y units cannot be changed from inches and Ohm, respectively. If measurements in other time domain units (mV, normalized, Rho) is required, the cross-compatible XTDR™ software should be used. XTDR™ is compatible with most HL22xx and HL52xx instruments, and is available on our website.

Section 8: Pass/Fail Coupon Analysis

Zcoupon™ is designed to comply with IPC-2141A Standards. As per these Standards, a **PASS/FAIL** assessment is based on the average of impedance measurements taken between the 50-70% points of the coupon (hereafter called the **50-70% test** in this document).

Figure 2 below shows a screenshot of an HL5208 using Zcoupon™ to perform a 50-70% test on a 6" PCB test coupon specified to 100 Ohm. This coupon meets the conditions of the test, so the software indicates a **PASS** in the top-right corner of the software. Impedance is measured as **98.30 Ohm Differential**.
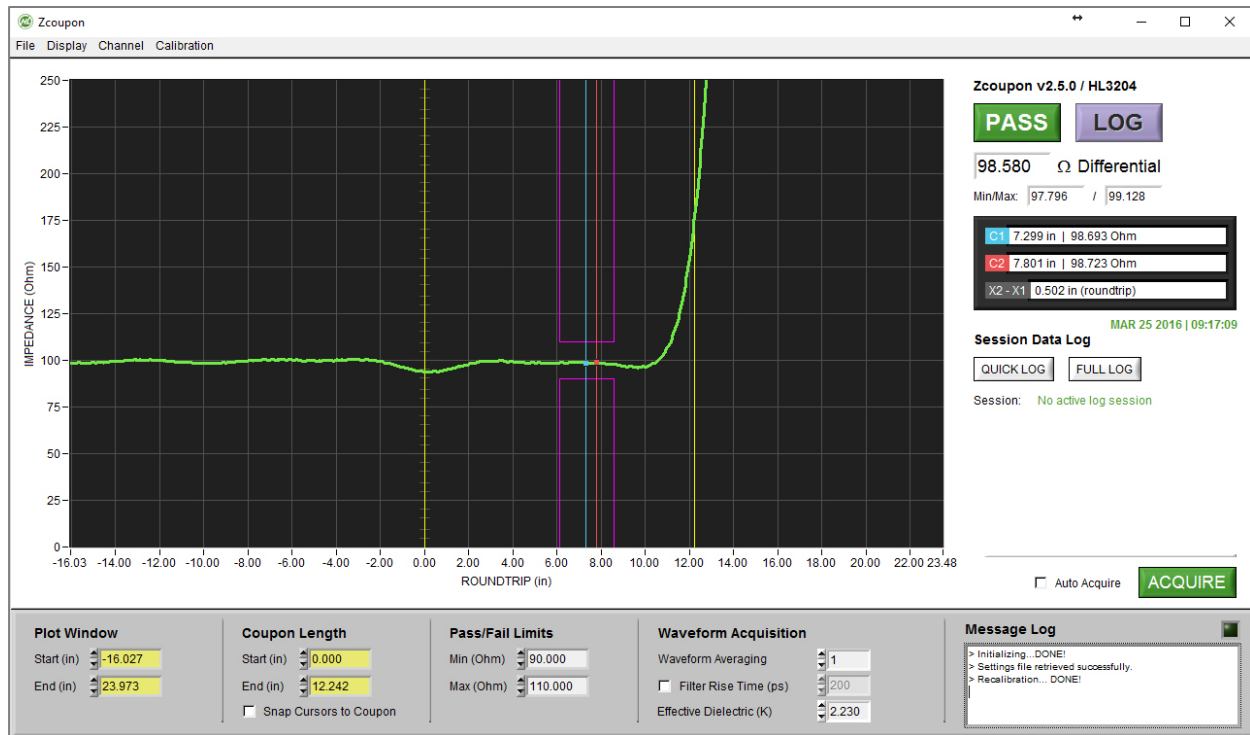

Figure 2: Pass/Fail analysis of a 6" test coupon specified to 100 Ohm

Figure 3 at right shows a close-up of the Pass/Fail analysis feature of the Zcoupon™ software. The **PASS/FAIL** indicator is accompanied by an impedance measurement (either **Single-ended** or **Differential** depending on the test mode) and a **Timestamp**.

The purple **LOG** button is used to store the Pass/Fail analysis to a CSV file. For information on this and other data logging features, see *Sections 18-19* below.

NOTE: An accurate Pass/Fail analysis requires that the 50-70% test region be correctly aligned with the coupon. See *Section 8* below for details on how to ensure proper coupon alignment.

Figure 3: Close-up of the results of 50-70% test

Please also see *Section 15* below for information how to switch between **Differential** and **Single-ended** measurement modes.

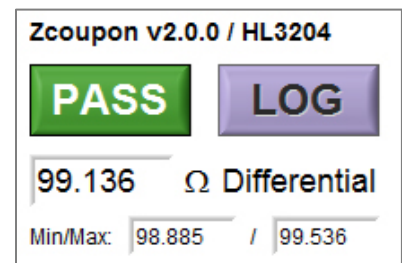## Section 9: Coupon Window Placement

To provide accurate impedance measurements, it is vital that the test region is aligned properly with the 50-70% point of the test coupon. The Zcoupon™ software provides several tools to assist with this task.

Zcoupon™ shows two sets of guidelines, one yellow and one red. These are shown in *Figure 4* at right, positioned correctly on a 6" test coupon.

The yellow guidelines should be positioned at the beginning and end of the test coupon. The red guidelines represent the pass/fail impedance conditions, and are described in more detail in *Section 9* below.

The easiest way to ensure a proper window is to derive the start/end values using the **Set Zero Reference** and **Find Coupon End** commands in the **Calibration** menu. A close-up of this menu is shown in *Figure 5* below.

The **Set Zero Reference** option is used to set the reference point where the probe ends and the coupon begins. This also sets the distance reference to 0" right at the probe tip.

To perform **Set Zero Reference**, click the appropriate command from the **Calibration** menu. The software will instruction the user to connect a probe, but not a coupon, and click **OK**.

When this action is complete, the left yellow guideline will be repositioned to 0.0". Everything before the probe tip (i.e. the instrument, probe, and any adapters) will be shown as a negative distance relative to the probe tip.

Once the start of the coupon is properly set, use the **Find Coupon End** feature, also found in the **Calibration** menu, to specify the end of the coupon. Simply connect the probe to the coupon, select the menu command, and follow the on-screen instructions.

To reset the coupon window to the defaults, simply click the **Reset Zero** and/or **Reset Coupon** options from the menu.

NOTE: The coupon window settings are valid for subsequent tests of coupons of the same length and dielectric constant. HYPERLABS recommends running the **Set Zero Reference** and **Find Coupon End** commands again every time a new type of coupon is place under test.

The yellow guidelines can also be set manually, using the **Coupon Length** numerical controls below the waveform as shown in *Figure 6* at right.

Proper **Coupon Length** settings should have the **Start (in)** point placed at the end of the probe tip, and the **End (in)** point placed at the end of the coupon where it goes to open.

For additional assistance in setting the proper coupon window, please contact HYPERLABS or see the Application Guides on our website.
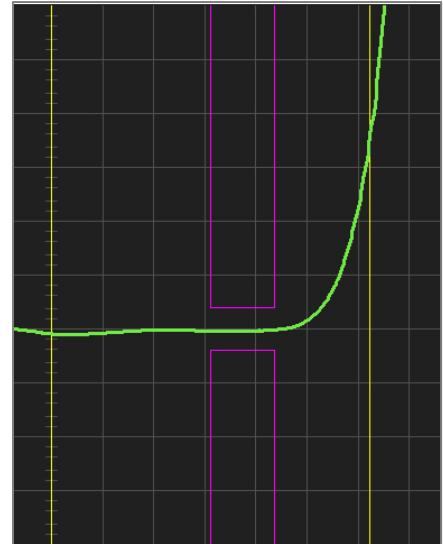

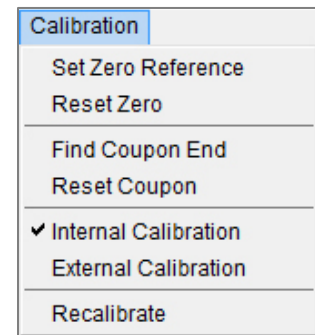*Figure 4: Test window positioned on 6" coupon using Set Zero Reference and Find Coupon End*

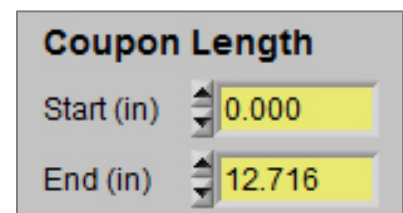*Figure 5: Calibration menu with Set Zero Reference and Find Coupon End*

Figure 6: Coupon window adjusted for zero reference

Section 10: Impedance Limits

Zcoupon™ allows the user to set acceptable impedance levels for every 50-70% test. To do this, simply adjust the values in the **Pass/Fail Limits** section of the user interface, located immediately below the main waveform.

The **Min (Ohm)** field stipulates the minimum impedance level a coupon must have to pass the 50-70% test. The **Max (Ohm)** field sets the maximum allowable impedance.

Section 11: Cursor Readings

Zcoupon™ has two cursors which can be used to take spot measurements on the Waveform Display. **C1** is blue, and **C2** is red. These cursors can be positioned by dragging and dropping them on the waveform.

Cursor readings are found in the right-hand panel of the Zcoupon™ software, as shown in *Figure 2* at right. The grey **+/-** box displays the horizontal and vertical difference between the two cursors, in inches.

NOTE: The cursors always snap to the closest point on the waveform. If the software is in **Auto Acquire** mode (see *Section 16* below), the cursors will jump slightly as each waveform is acquired. For the most accurate cursor readings, HYPERLABS recommends switching to manual acquisition before positioning the cursors or logging the results.

Figure 7: Example Cursor readings in inches, Ohms

As of Zcoupon™ Version 2.5, the user can Snap Cursors to Coupon using the toggle box shown at right in *Figure 8*. When this option is enabled, the cursors will automatically snap to the 50/70% points upon every waveform acquisition.
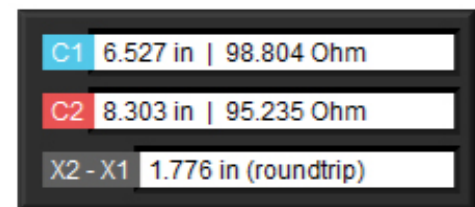

Section 12: Display Options

In the **Display** menu found at the top of the Zcoupon™ interface, the operator can control the looks of the Waveform Display. These options are aesthetic, and do not impact the way in which the waveform is acquired.

Figure 8: Cursor snapping toggle

When the **Dark Background** option is selected, a bright green waveform is displayed on a dark grid, similar to most test and measurement instruments. An alternative **Light Background** can be selected to show a darker waveform on a white background.

Section 13: Effective Dielectric Constant

Because electrical signals propagate at different speeds through different materials, Zcoupon™ gives the operator the ability to change the **EFFECTIVE DIELECTRIC (K)**. This value is dependent on many factors, including the circuit board substrate used and whether the line is in air or within the substrate.

NOTE: The dielectric constant affects distance readings in inches. For the most accurate readings, ensure that the Dielectric Constant is correct in addition to setting the coupon window as illustrated in *Section 8* above.

In the future, this User Manual will contain a table of common dielectric values. For now, please contact HYPERLABS if assistance is required in setting this field.

Section 14: Rise Time Filtering

In Zcoupon™, the user may apply a software-level rise time filter to the waveform. To change the size of the filter, enter a value in the **Filter Rise Time (ps)** dialog box located in the **Waveform Acquisition** portion of the controls. A larger filter value renders a cleaner waveform because more aberrations are filtered out. The filter can also be disabled completely by unchecking the box.

In coupon testing, a filter function is primarily applicable to the HL22xx Series of Signal Path Analyzers. For coupons of 4" or longer (actual distance), including IPC-standard 6" coupons, HYPERLABS recommends using a filter of 100 ps. Coupons shorter than 4" should not be filtered.

HL32xx Series instruments are already optimized for testing IPC-standard 6" coupons, and no filter should be used in most applications.

NOTE: the rise time filter value is applied **in addition to** the rise time of the instrument itself. It does not represent the total width of the filter.

Section 15: Channel Selection

Zcoupon™ allows both single-ended and differential impedance tests. Channels can be changed using the **Channel** menu bar.

NOTE: when performing single-ended impedance tests, it is important to terminate the channel opposite the active channel to 50 Ohm. Failure to do so will cause impedance readings to be inaccurate.

As of Version 1.0, the software labels correspond to the label of the HL3204 Controlled Impedance Analyzer. Please use the table in *Figure 9* below to determine which channels to use on other instruments.

Instrument Model	Differential Measurement	Single-ended Measurement
HL2202	Probe on **PORT 1**, both channels	Probe on **PORT 1**, **CH 1+** 50 Ohm termination on **PORT 1**, **CH 1-**
HL3204	Probe on both **DIFFERENTIAL CHANNELS**	Probe on either **SINGLE-ENDED CHANNEL** Termination on opposite **SINGLE-ENDED CHANNEL**
HL5208	Probe on **PORT 1**, **CH 1+** and **CH 1-**	Probe on **PORT 2**, **CH 1+** 50 Ohm termination on **PORT 2**, **CH 1-**

Figure 9: Probe placement for different instrument models

Section 16: Waveform Acquisition and Averaging

The operator can control the number of waveforms to acquire and toggle between automatic and manual acquisition. This is done using the controls in the right-hand panel and shown at right in *Figure 10*.

Figure 10: Waveform acquisition controls

By default, Zcoupon™ operates in **Auto Acquire** mode. In this mode, waveforms are acquired and displayed at regular intervals.

By unchecking the box, the software can be set to manual mode. In manual mode, the software acquires and displays a single waveform whenever the operator clicks the green **ACQUIRE** button. The instrument also re-calibrates itself when **ACQUIRE** is pressed*.*

Multiple waveforms can be combined and averaged using the **Waveform Averaging** control, found in the **Waveform Acquisition** controls below the main waveform, and shown in *Figure 11* at right.
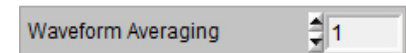

Figure 91: Waveform averaging control

On each acquisition, the software acquires the desired number of waveform and displays the average values as a single waveform. The default value of this control is 1, which indicates that a single waveform is acquired.

NOTE: In Zcoupon™ 2.0, software multithreading has eliminated the performance impact of waveform averaging in **Auto Acquire** mode. HYPERLABS no longer recommends disabling automatic acquisition while using waveform averaging.

Section 17: Message Log

Zcoupon™ displays messages and status updates to the user in a dialog box in the right-hand panel of the instrument, shown in *Figure 12* at right.

As of Zcoupon™ v1.5.0, error messages are shown here, along with messages related to instrument calibration and data logging. This functionality will expanded in future versions.

Figure 102: Message including log file location and calibration information

The software also displays a timestamp for each waveform acquisition. This is displayed in green text immediately below the message pane.
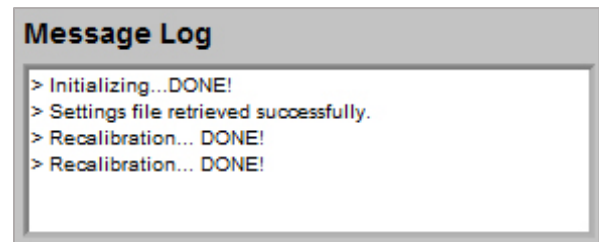
Section 18: Coupon Testing and Session Logging

Version 1.5 of Zcoupon™ includes a variety of new features to simplify PCB testing and logging. Two types of *Test Session Logs* allow the user to easily organize data related to individual PCBs as well as test batches.

Section 18.1: Session Data Logs

Introduced in Zcoupon™ 1.5, *Session Data Logs* are a collection of related numerical and graphical test results. These logs can be used to organize the results of a batch test, multiple tests on the same PCB, or any other associated data. The data can then be compiled into a Microsoft Word® report that is easy to store or share (see *Section 18.7* below).

There are two types of session logs available in Zcoupon™. *Quick Logs*, detailed in *Section 18.2* below, log a minimal amount of data about each coupon and allow for faster testing. *Full Logs*, covered in *Section 17.3*, allow the operator to define additional information about each coupon and/or batch. Both log types can be used to generate reports, as outlined in *Section 17.7*.

When either a *Quick Log* or *Full Log* is active, the purple *LOG* button at the top-right corner of the screen (and shown in *Figure 13* at right) becomes active. The data that is stored depends on the type of active session.

NOTE: As of Version 1.5 of Zcoupon™, the *LOG* button is no longer available without an active *Session Data Log*, and will be greyed out until a session is initiated.

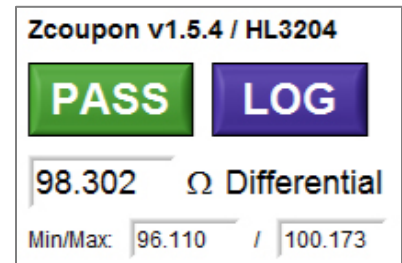Zcoupon v1.5.4 / HL3204

PASS   **LOG**

98.302   Ω Differential

Min/Max: 96.110 / 100.173

Figure 113: LOG button active and ready to store data

Section 18.2: Quick Session Log

In a *Quick Session Log*, the user can specify a *Serial / ID* to identify the coupon, but no other identifying information is required. Specifications and tolerances for the test are derived from the user controls found under the waveform plot.

To initiate this type of session, simply click the *QUICK LOG* button when no other session is active. The timestamp of when the session began will also be the session name and log file location.

Figure 14 at right shows an example of an active *Quick Session Log*.

When a *Quick Session Log* is active, clicking the *LOG* button in the top right of Zcoupon™ will save the following information to the active file:

- Serial Number (if supplied)

- 50-70% test results, limits, and tolerances active control values found beneath the waveform plot

- Timestamp of the measurement

- PNG screenshot of the measurement

- CSV with full X/Y coordinates of the measured waveform (new to Version 2.5)

Session Data Log

END SESSION

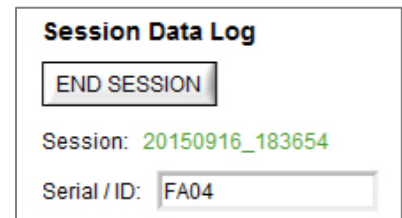Session: 20150916_183654

Serial / ID: FA04

Figure 124: Controls for Quick Session logging

The CSV log file, along with any PNG screenshots, can be found in the following location in the Zcoupon™ installation directory: " \sessions\[session timestamp]\"

Section 18.3: Full Session Log

A **Full Session Log** allows the operator to store more details about the coupon in the data log. When the user clicks the **FULL LOG** button, a separate **Session Parameters** panel pops up to allow the entry of this extra coupon information.

In the **Session Parameters** panel, the operator may include batch or session information, customer or manufacturer name, and part and revision numbers. The operator may also define up to 16 coupons per session, with different labels, specifications and tolerances for each coupon.

The only mandatory fields are **Session ID** and at least one full coupon definition (label, specification, tolerances, and whether the coupon is differential or single-ended). If fewer than 16 coupons are defined, Zcoupon™ will automatically ignore the empty fields when the session starts.
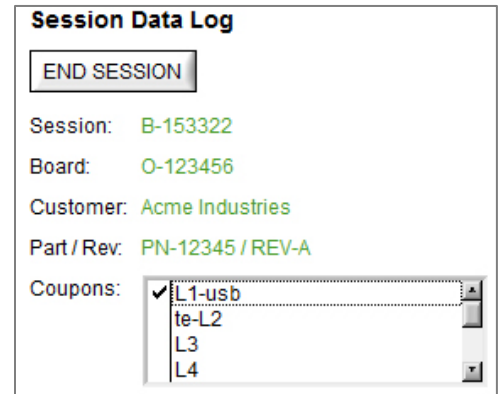
Advanced coupon data can also be read in from an external formatted text file by clicking **Load Definitions File** in the **Session Parameters** panel. See **Section 18.4** below for more information about using external coupon definitions.

Once the coupon definitions are complete, click **Start Session** to begin logging. Once the session begins, the right panel of Zcoupon™ will look similar to **Figure 14** at right.

When a **Full Session Log** is active, each defined coupon can be tested individually. Clicking on a coupon name in the list (item "L1-usb" in **Figure 14** at right) will automatically load the specification and tolerances for that coupon. The software will also automatically switch to the appropriate channel (differential or single-ended) as appropriate.

With an active **Full Session Log**, clicking the **LOG** button in the top right of Zcoupon™ will save the following information to the active log file:

Figure 14: Controls for Full Session logging, with "L1-usb" marked as having already been logged

- Session ID

- Board ID, Customer, Part, and Revision (if supplied)

- Coupon label for each measurement

- 50-70% test results, limits, and tolerances of tested coupon

- Timestamp of the measurement

- PNG screenshot of the measurement

- CSV with full X/Y coordinates of the measured waveform (new to Version 2.5)

The CSV log file, along with any PNG screenshots, can be found in the following location in the Zcoupon™ installation directory: " \sessions\[sessionID]\"

After a coupon is logged, a checkbox will appear next to its name in the list, indicating that this test is complete. If you re-test a given coupon, a separate log entry will be created, allowing the operator to test each coupon multiple times if desired.

NOTE: Data is only stored for the active coupon when the **LOG** button is clicked. To ensure that all coupons are logged in the same session file, the operator must take care to test every coupon in the list.

Section 18.4: Loading External Coupon Definitions

When starting a new **Advanced Session Log** (see *Section 18.3* above) the operator may read in an external, pre-formatted text file to auto-populate the coupon definitions in the **Session Parameters** panel. To do this, simply click the **Load Definitions File** button to see show the panel shown in *Figure 14* at right.

An external definitions file must be formatted in a specific fashion to work with Zcoupon™. A sample definitions file, called "**sampleCouponsDefinitions.txt**" is available in the Zcoupon™ install package.

NOTE: In these definitions files, fields are delimited by the "|" (pipe) character. Individual fields with multiple possible values, such as coupon names and specs, are further separated with the "," (comma) character.

In the below examples, fields are color-coded for emphasis only. Do not include color-coding in an actual definitions file.

Section 18.5 below contains an example of a properly-formatted definitions file.
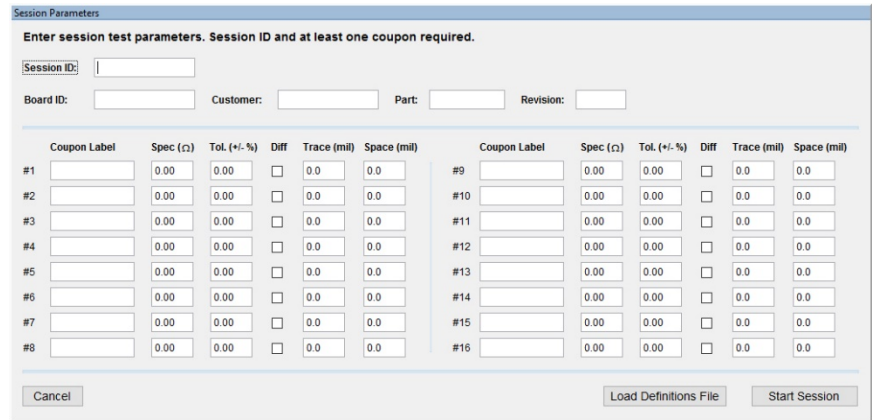

Figure 15: Example of empty Session Parameters panel, prior to definitions file being loaded

If you need further help in formatting these files, please contact HYPERLABS directly for assistance: www.hyperlabsinc.com/contact-us.aspx

Section 18.5: External Coupon Definition File Formatting

The first row of the definitions file contains field names, and should be formatted exactly as shown here:

SessionID|BoardID|CustomerName|Part|Revision|coupons|specZ|mode|tolerance|trace|space

NOTE: the specZ field contains the target impedance for each individual coupon. The mode field indicates whether a coupon is differential (1) or single-ended (0). Tolerance is expressed in percentage from specification.

The second row of the definitions file contains field values. Some fields (coupons, specZ, mode, tolerance, trace, space) can have up to 16 values per field. In this example, only 8 coupons are defined:

O-153322|B-5538|AcmeIndustries|PN-12345|REV-A |L1-usb,te-L2,L3,L4,L5,L6,L7,L8 |100,100,100,100,50,50,50,100|1,1,1,1,0,0,0,1|5.0,10.0,15.0,20.0,25.0,30.0,35.0,40.0|8,8,8,8,7,7,7,7|2,3, 2,3,4,2,3,2

NOTE: As of Version 1.5, fields cannot be left totally empty, or the software may fail to load the definitions file. That is, a valid field must contain at least one character or a blank space.

Section 18.6: Closing a Session

Once a session log is complete, click the **END SESSION** button. This action will close the session file, and store the session results in a Word® report.

The **Message Log** box will indicate when the session is closed, and remind the user of the location where the saved session files and report can be found.

NOTE: As of Zcoupon™ 1.5, it is not possible to re-open a session once it has been finalized. All subsequent tests must be performed on a new session

Section 18.7: Test Session Reports

Once a session is closed (see *Section 18.6* above), the user can view a Word® report of the generated numerical data and screenshots. As of Zcoupon™ 2.0, the report is automatically saved to disk when the test session is closed by the user. As the report is auto-saved, the user will see Word® flash open and closed.

To show the report, click the **VIEW REPORT** button after a session is complete.

NOTE: As of Version 1.5, Microsoft Word® must be installed on the computer used for testing, or else the report cannot be displayed. If Word® is not available, the report functionality will not work and an error message will be displayed in the message log.

All reports will contain a screenshot of the measurement (with a light background for easy printing), along with text and numerical data about the device under test.

NOTE: Only the most recent session report is available with this feature. Once a new session is started, the report can no longer be auto-created. However, the associated log files, saved report, and screenshots will still be available on the operator's computer.

Section 19: Additional Data Logging and Storage

Zcoupon™ has a variety of additional logging features to simplify the storage of data obtained during testing. These controls are found in the *File* menu in the main program menu bar.

Section 19.1: Printing

When the user selects the *Print* menu option, Zcoupon™ formats the waveform acquisition for printing. To save ink, the color scheme is automatically switched to Light Background, and switched back once printing is complete.

Section 19.2: CSV Logging

The *Save CSV* menu item in Zcoupon™ saves the waveform data to a comma-separated values (.csv) file. This raw data can be used for data storage or post-processing in other software.

The structure of the CSV file is simple. The first column contains the horizontal values, and the second contains the vertical values. The header row shows the horizontal (inches) and vertical units (Ohm) used to acquire the waveform.

For simplicity of post-processing, the CSV file does not include a timestamp or serial number. We recommend that the user store this data in the filename for later reference.

Section 19.3: Saving to PNG

Using *Save PNG* feature, the operator can save the waveform and Zcoupon™ window to a PNG image file. The user can select the directory to save the file, but no other options are available.

Section 19.4: Storing and Retrieving Waveforms

In Zcoupon™, waveforms can be stored and retrieved later as an on-screen reference for subsequent tests.

The *Store Waveform* menu item, located in the *File* menu, captures the waveform on the screen and saves it to a waveform file (.zcoupon). The *Recall Waveform* option is used to load old waveforms into the Waveform Display as a magenta plot. The *Clear Waveform* menu option removes the stored waveform from the screen.

NOTE: When a waveform is loaded, most controls are lock to the parameters used for the original measurement. These cannot be changed until the stored waveform is cleared.

Section 20: Instrument Calibration

All HYPERLABS instruments have an internal calibration feature, and the instrument automatically calibrates at software startup. Calibration can also be performed on demand during data collection. To use these features, see the **Calibration** menu located in the main program menu bar.

Section 20.1: Automatic and Manual Calibration

Zcoupon™ performs an automatic recalibration every 30 seconds unless **External Calibration** is enabled (see **Section 20.2** below). As of Version 2.0, automatic calibration can no longer be disabled by the user, as software multithreading has eliminated the performance impact of recalibration.

To recalibrate the instrument manually, choose the **Recalibrate** option in the same menu.

Section 20.2: External Calibration

NOTE: In Version 2.7.0 of Zcoupon™, **External Calibration** now must performed against the load resistors on the HL9600 Calibration Standard Substrate. In previous versions, it could be performed against any calibration-quality load resistors.

External calibration is performed on an external calibration standard, which improves the accuracy of coupon measurements. For best results, we recommend using the HL9600 Calibration Standard Substrate from HYPERLABS, which is manufactured to within 0.5% of 50 Ohms.

To initialize this feature, select the **External Calibration** option from the **Calibration** menu. The software will then guide the user through a process of connecting the differential and single-ended probes to the appropriate resistors on the HL9600 substrate. Once this is complete, calibration settings are stored by Zcoupon™ until the software is closed.

While **External Calibration** is active, automatic recalibration is disabled. To manually recalibrate the instrument to the external standard, click the **Recalibrate** menu option again and the calibration routine will be restarted.

To return to **Internal Calibration** mode, simply select the appropriate option from the **Calibration** menu.

Section 20.3: NIST Certification

Each instrument, including the internal reference cable, is calibrated by HYPERLABS using NIST-traceable equipment at the time of initial shipment.

If regular NIST re-certification is required, the instrument can be sent to HYPERLABS periodically for calibration and certification. At the time of service, HYPERLABS will verify the unit using NIST-traceable instruments and provide a certificate of calibration. Please see our website for current pricing and RMA procedures.

Section 21: Save, Load, and Reset Settings

Zcoupon™ will automatically remember test environment settings (e.g. coupon location, impedance limits, time window, dielectric constant) between program sessions.

Users can also manually save settings for later use. To store the settings, select the *File* menu and then *Save Settings*. To retrieve the settings later, simply choose *Load Settings*.

To reset to the default test environment settings, select *Reset Defaults* from the *File* menu. Note that this does not delete any saved settings; it merely reverts the active environment to the default.

The default folder for saved settings is: C:\HYPERLABS\Zcoupon\settings

Section 22: Additional Resources

This manual for HYPERLABS Zcoupon™ is primarily intended to cover instrument setup and familiarize the user with the major features of the hardware and software. The applications for these instruments are too many and varied to cover fully in this User Manual.

Accordingly, we have made a wide variety of Application Guides and other reference materials on our website. A full listing of Application Guides can be found at: http://www.hyperlabsinc.com/application-guides.aspx

If help for your application isn't shown in our Application Guides, HYPERLABS is always happy to provide unlimited technical support to our customers. For up-to-date telephone or email support options, please see our webpage: http://www.hyperlabsinc.com/contact-us.aspx

Section 23: Copyright Information

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