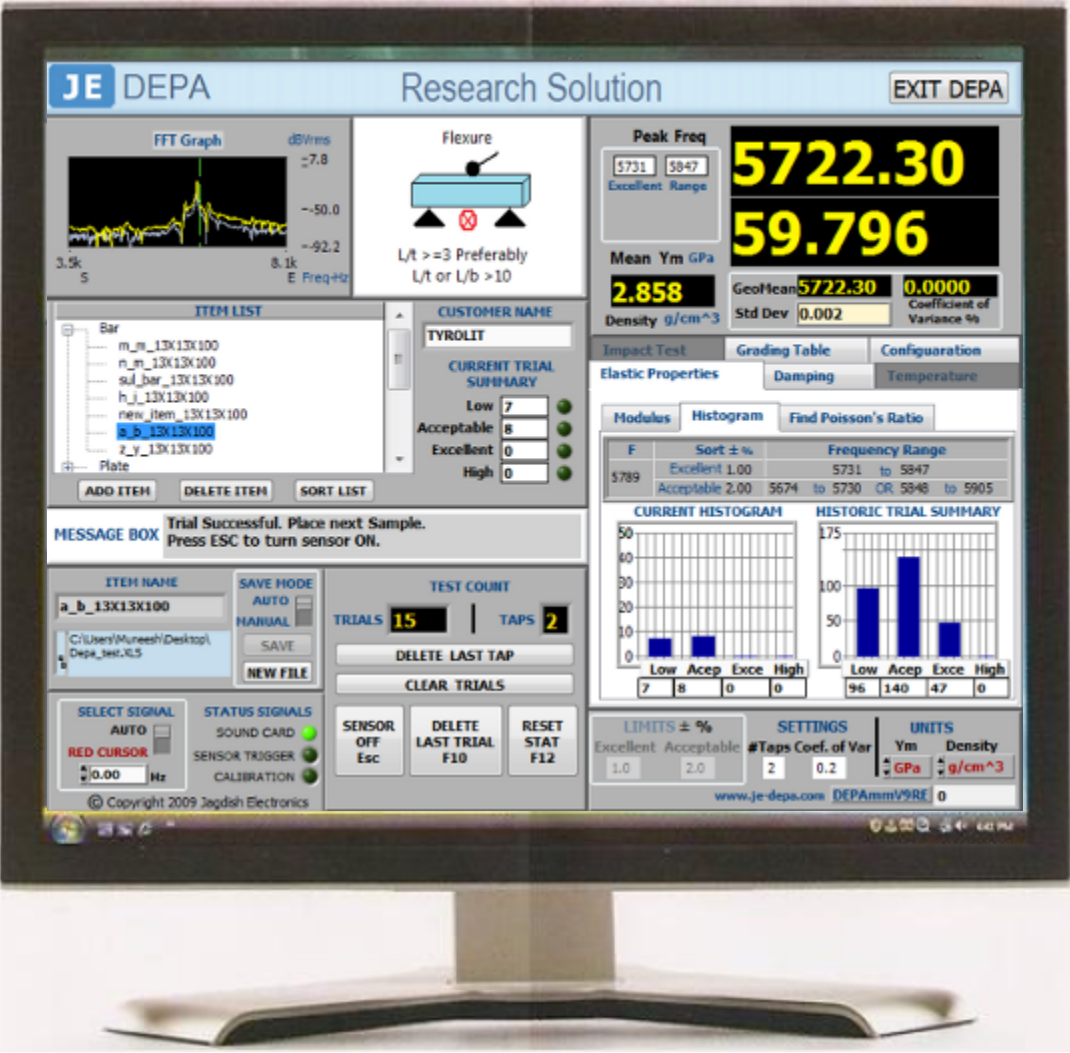


DEPA V9 Quick Reference

"The most comprehensive suite of Non Destructive Testing Solutions"



Quick Reference

je-depa.com
91-80-28376267

JE Jagdish Electronics

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DEPA Version	DEPA Edition	Doc. Version	Date Created	Last Modified
V9	Extended	V 1.1	Jan 12, 2010	Jan 26, 2010



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Quick Reference

V9 Introduction

Welcome to Jagdish Electronics (JE) DEPA V9 – The most Comprehensive Suite of Non-Destructive Testing Solutions.

This Quick Reference Guide provides information which will help you get started with DEPA V9 quickly. We recommend that you take a printout of this document for your future reference.

The core technology behind DEPA V9 is based on the American Society of Testing and Materials (ASTM) approved methodology called the Impulse Excitation Technique (IET). IET has found wide acceptance in industry and research due to its non-destructive nature, extreme accuracy, cost effectiveness and high result repeatability.

The simplicity of testing with the DEPA V9 software is one of its biggest selling points. The test sample is placed over a sonic sensor and excited with a small tap. The sound emanated by the sample is then broken down by the DEPA software into its component frequencies. The fundamental frequency intrinsic to the material is then analyzed to accurately reveal the material's characteristics.

Numerous Industries and Research Organizations currently use DEPA V9, including:

1. Abrasives and Industrial Ceramics

- Abrasive Grinding Wheels
- High Finish Polishing Stones
- Ceramic Tiles
- Thermal ceramics applications

2. Metal and Metal Alloys

- Aluminum (Aluminium) Alloys
- Copper and copper alloys such as Brass and Bronze
- Nickel
- Steel Alloys – Mild steel, Stainless steel, Cast iron

3. Space Age Materials

- Titanium and Titanium Alloys
- Carbon and high strength Nano Carbon Composites
- Industrial Diamond
- Powder Metals

4. Cement, Concrete and Structural Materials

5. Silica and Silicone Composites

6. Graphite Electrodes and Rods

7. Plastics and Polymers

8. Refractory Linings and High Temperature Materials for Refractories

9. Rubber and Rubber Composites

10. Wood and Wood Composites

11. Construction Industry

In our continuous efforts towards product evolution, the new DEPA V9 software showcases numerous enhancements:

- Launch of a new JE Brand
- Solution Bundles targeting specific customer requirements
- Enhanced e-commerce capable online customer support and web presence
- Completely modernized user-friendly User Interface (UI)
- Advanced Dynamic Performance testing features
- Item Database capability and Automated Testing Functionality



V9 Installation

Welcome to the DEPA V9 Installation. Please follow these simple steps to Install DEPA V9.

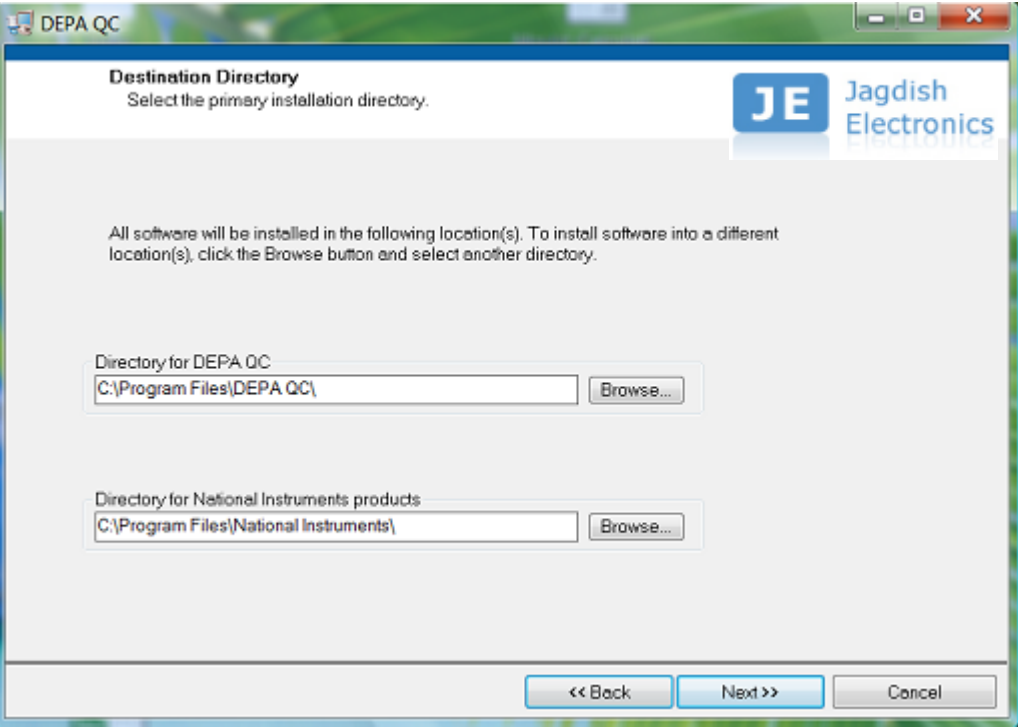
1 Insert the DEPA Installation CD into your CD ROM drive. Microsoft Installer should start automatically guiding you through the rest of the Installation Process.

2



Click Next

3



Browse to File Locations

Click Next

V9 Installation

4

License Agreement
You must accept the license(s) displayed below to proceed.

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INSTALLATION NOTICE: THIS IS A CONTRACT. BEFORE YOU DOWNLOAD THE SOFTWARE AND/OR COMPLETE THE INSTALLATION PROCESS, CAREFULLY READ THIS AGREEMENT. BY DOWNLOADING THE SOFTWARE AND/OR CLICKING THE APPLICABLE BUTTON TO COMPLETE THE INSTALLATION PROCESS, YOU CONSENT TO THE TERMS OF THIS AGREEMENT AND YOU AGREE TO BE BOUND BY THIS AGREEMENT. IF YOU DO NOT WISH TO BECOME A PARTY TO THIS AGREEMENT AND BE BOUND BY ALL OF ITS TERMS AND CONDITIONS, CLICK THE APPROPRIATE BUTTON TO CANCEL THE INSTALLATION PROCESS, DO NOT INSTALL OR USE THE SOFTWARE, AND RETURN THE SOFTWARE WITHIN THIRTY (30) DAYS OF RECEIPT OF THE SOFTWARE (INCLUDING ALL ACCOMPANYING WRITTEN MATERIALS, ALONG WITH THEIR CONTAINERS) TO THE PLACE YOU OBTAINED THEM. ALL RETURNS SHALL BE SUBJECT TO NI'S THEN CURRENT RETURN POLICY.

1. Definitions. As used in this Agreement, the following terms have the following meanings:

A. "You." Means you the individual using the SOFTWARE as well as your employer if you are using the SOFTWARE within the scope of your employment.

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☐ I do not accept the License Agreement(s).

<< Back Next >> Cancel

Read & Accept JE License Agreement

Click Next

5

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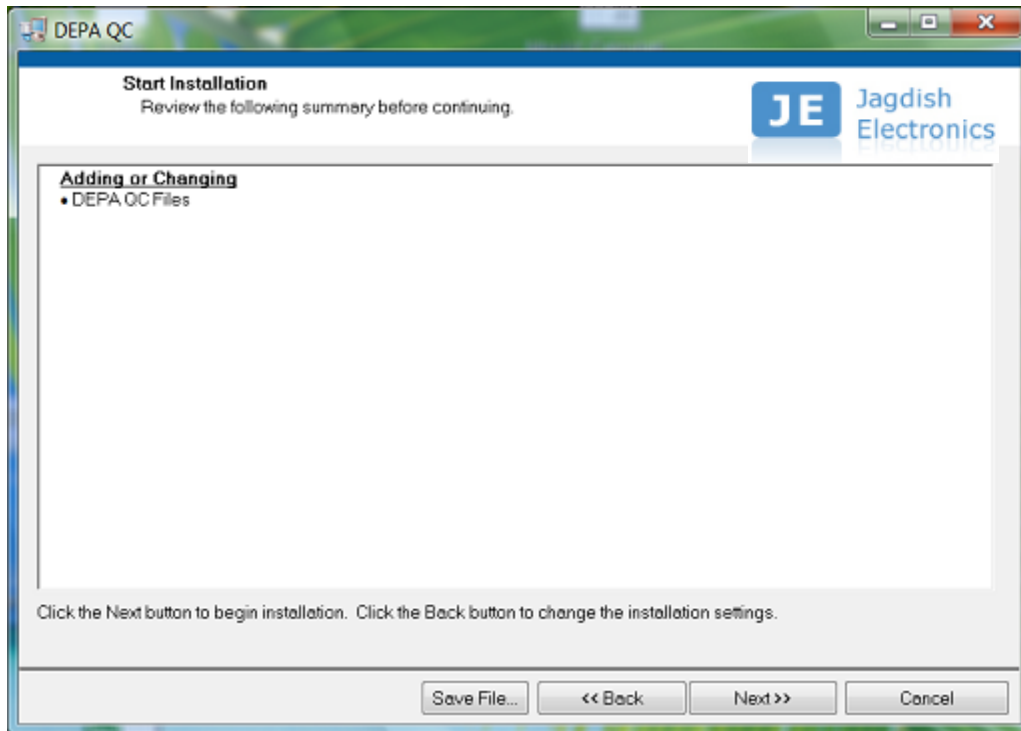
<< Back Next >> Cancel

Read & Accept NI License Agreement

Click Next

V9 Installation

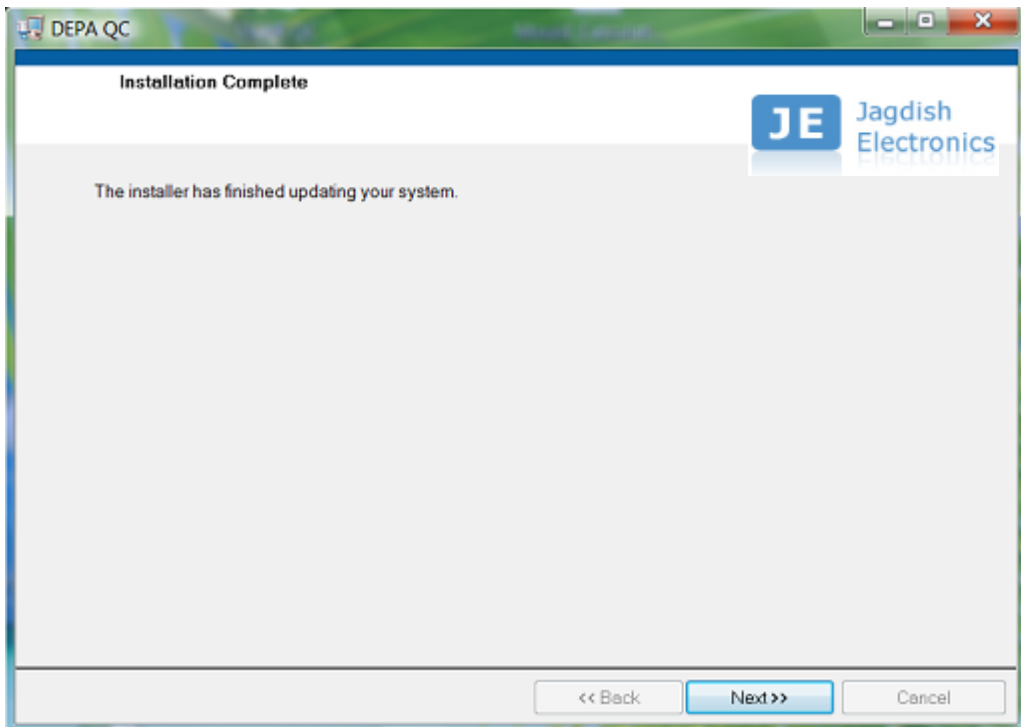
6



Review Installation Progress

Click Next

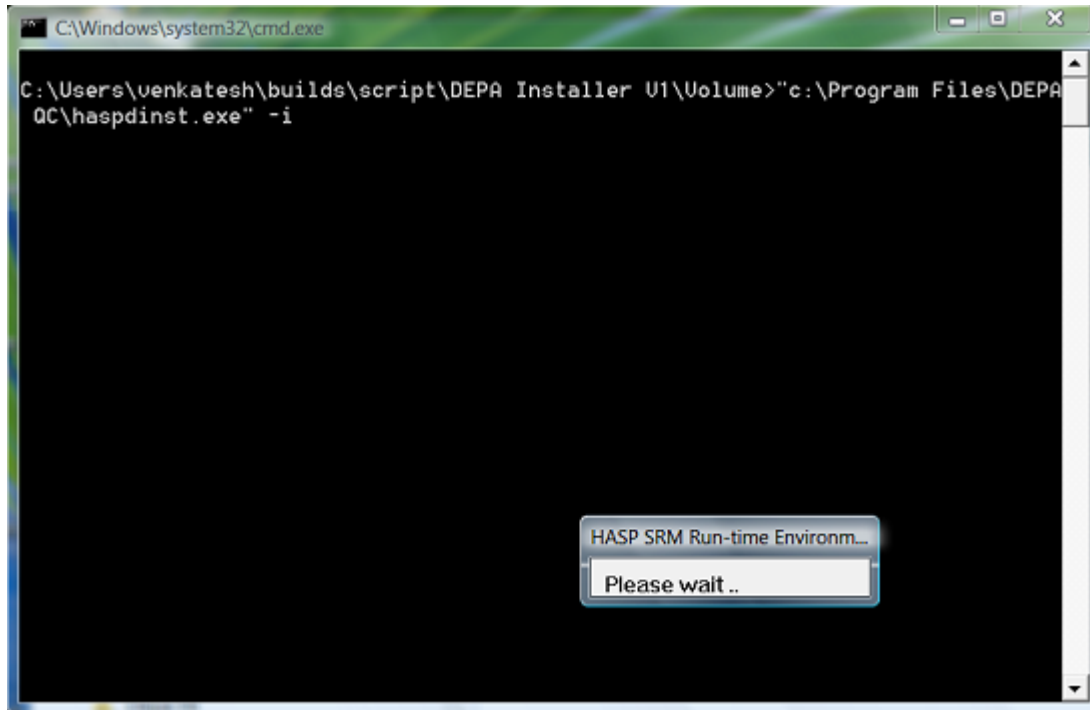
7



Click Next

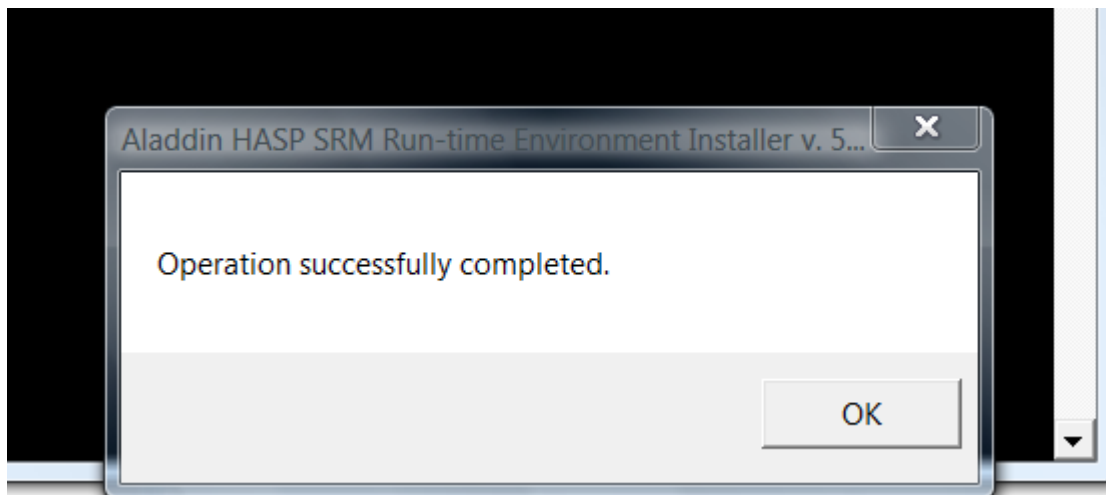
V9 Installation

8



Wait for automated
Run-Time Environment
Setup

9



Click OK

Congratulations! You have successfully installed JE DEPA V9.

V9 Activation

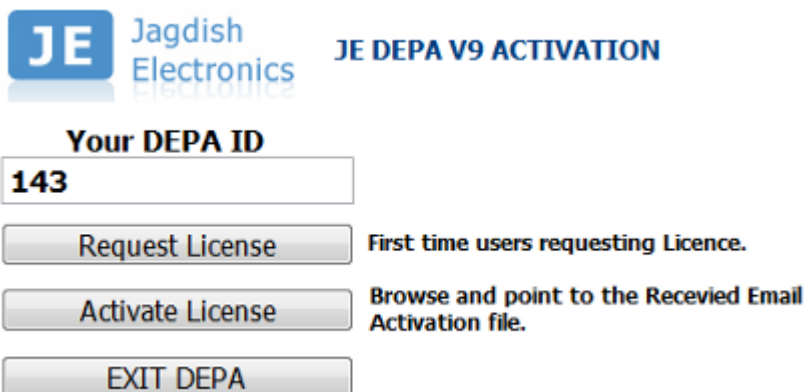
1



Double Click on the DEPA V9 Desktop Icon to launch the application.

2

First time activation attempt opens window below. Click on **REQUEST LICENSE**.

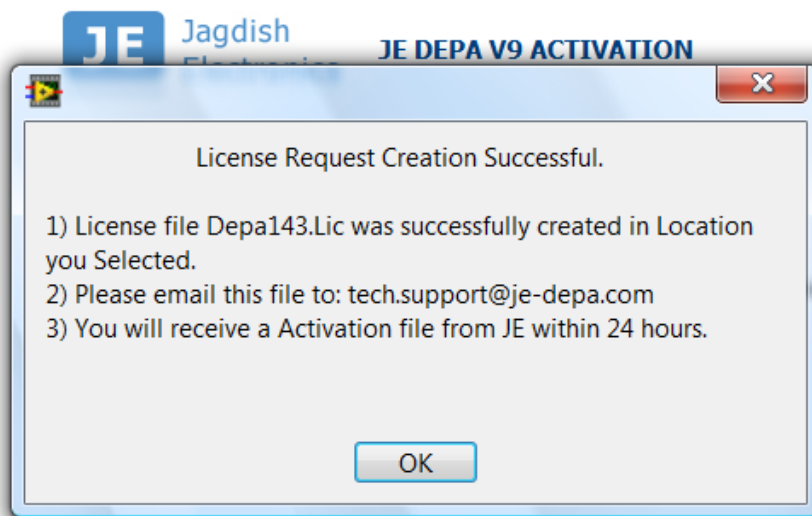


3

Browse to location for storing the License Request file (.Lic). **Click OK**.

4

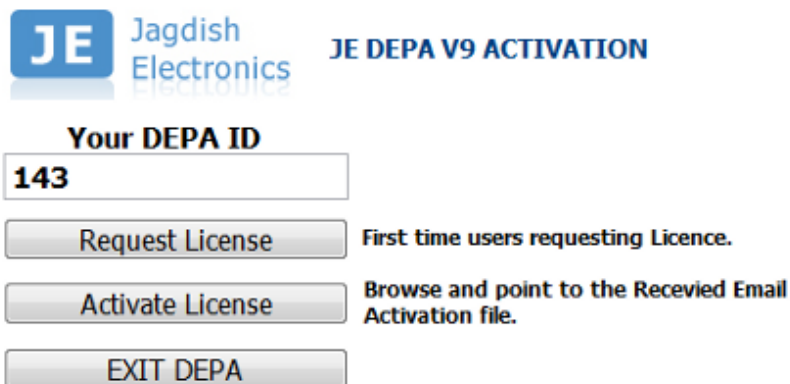
Once License Request file is successfully created. Mail to tech.support@je-depa.com
You will receive a License Activation file (.Act) within 24 hours.



Click OK

V9 Activation

- 5 Download and Save the License Activation file (.Act) mailed to you by JE in any local folder (e.g. Desktop)
- 6 Double click on the DEPA V9 Icon to open window below and click on **ACTIVATE LICENSE**. Browse and point to the downloaded license activation file above. **Click OK**.



JE Jagdish Electronics **JE DEPA V9 ACTIVATION**

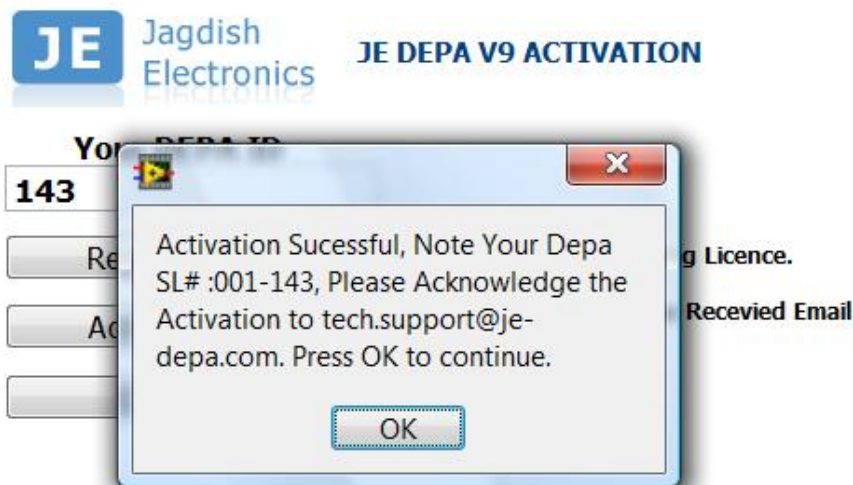
Your DEPA ID
143

Request License First time users requesting Licence.

Activate License Browse and point to the Received Email Activation file.

EXIT DEPA

- 7 DEPA V9 automatically moves the license activation file (.Act) to the appropriate DEPA V9 folder and activates your copy of V9
- 8 The Activation Successful Screen below indicates a successful activation. Please send a conformation email to tech.support@je-depa.com. Please include the **DEPA Serial#** in your email.



Click OK

Congratulations! DEPA V9 is now activated ready for use.

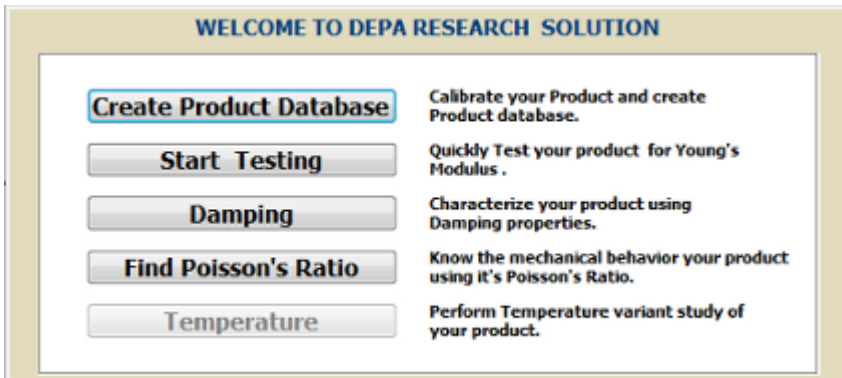


V9 Activation

9



Double Clicking on the DEPA icon brings up the DEPA V9 Welcome Screen that launches the User Interface.

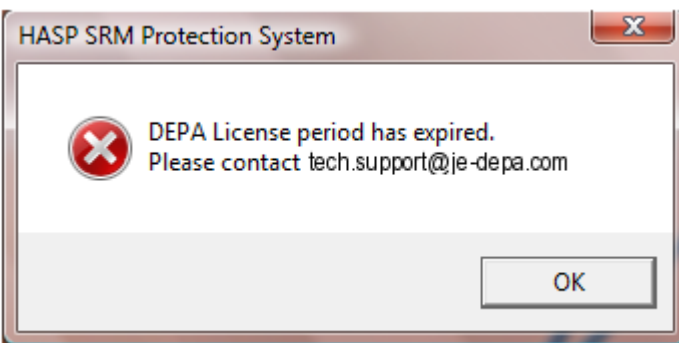


10

If you are unable to activate DEPA or get an error message, please email JE at tech.support@je-depa.com and include the **DEPA Serial#**.

11

Upon License expiry, the following message will be displayed. A new license will be required to re-activate DEPA V9. Please email JE at tech.support@je-depa.com and include the **DEPA Serial#** in your email.



Click OK

Sound Card Configuration (Windows 7)



- 1 Correct setup of your system's sound card is critical step for an error free DEPA V9 experience
- 2 Connect the sensor to the MIC input of your computer (please double check this step as its a common user error)

3



Right Click on the Speaker Icon in the Windows Task Bar

Select "**Recording Devices**" Option

4

Goto the Recording Tab



Ensure that the Microphone is working by a test tap.

Proper sound sensing is indicated by the green indicator bars.

If Microphone is NOT Working



DEPA V9 will not work until Audio Driver is properly installed or Hardware issues with your computer are addressed.

Sound Card Configuration (Windows 7)



1 In the Sound window click on the Microphone button to enable the PROPERTIES Icon and then click on it



3 In the Microphone Properties window, go to the **Levels** Tab

4 Slide and set the **Microphone** sensitivity to 100

Slide and set the **Microphone Boost** settings bar based on the following table:

Normal Settings	Noisy Environment Settings	Very Thin, Small Samples Settings
+10 dB	0 dB	+20dB



Click OK

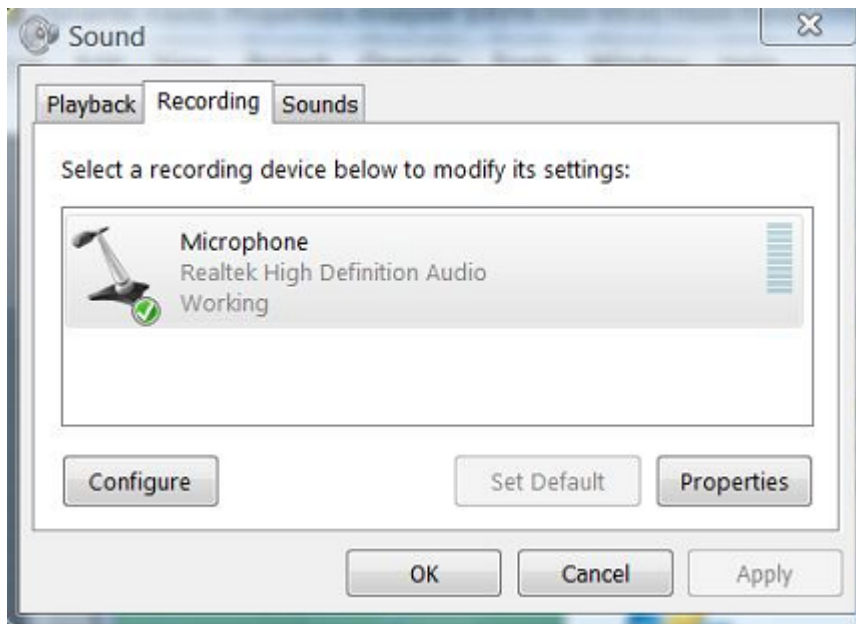
Sound Card Configuration (Vista)



- 1 Correct setup of your system's sound card is critical step for an error free DEPA V9 experience
- 2 Connect the sensor to the MIC input of your computer (please double check this step as its a common user error)



- 4 Goto the Recording Tab



Ensure that the Microphone is working by a test tap. Proper sound sensing is indicated by the green indicator bars.

If Microphone is NOT Working



DEPA V9 will not work until Audio Driver is properly installed or Hardware issues with your computer are addressed.

Microphone Sensitivity Settings (Vista)



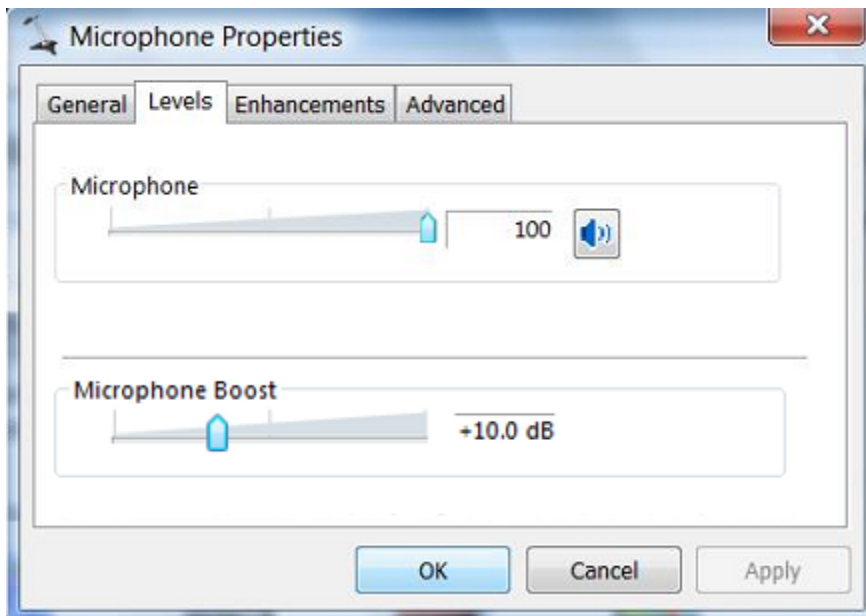
1 In the Sound window click on the Microphone button to enable the PROPERTIES Icon and then click on it



3 In the Microphone Properties window, ensure that the MIC is enabled and sensitivity is set to 100

4 In the Microphone Properties window, slide and set the Microphone Boost settings bar based on the following table:

Normal Settings	Noisy Environment Settings	Very Thin, Small Samples Settings
+10 dB	0 dB	+20dB



Click Apply

Click OK

Sound Card Configuration (XP)



1 Correct setup of your system's sound card is critical step for an error free DEPA V9 experience

2 Connect the sensor to the MIC input of your computer (please double check this step as its a common user error)



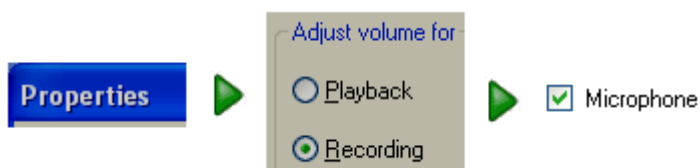
4 In the "Sounds and Audio Devices Properties" window select the "Audio" tab and in the "Sound Recording" Section click on the "Volume" button.



5 In the "Recording Control Window". **Check "Select" box to enable Microphone.** Then click on "Options" drop down menu and then on "Properties"



6 In the "Properties" window under "Adjust Volume for Recording" ensure that the Volume controls for Microphone is checked. This ensures that your Microphone is turned ON and controls will be displayed.



Microphone Sensitivity Settings (XP)

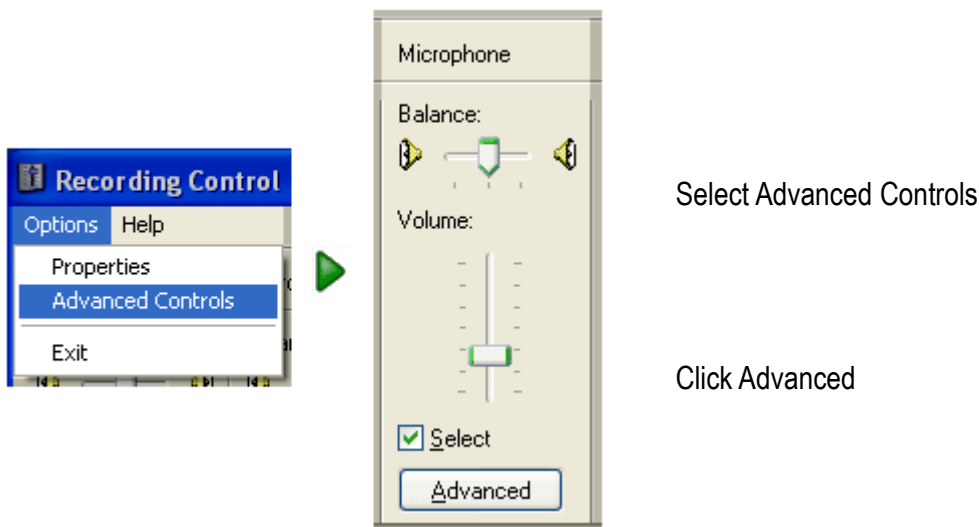


- 1 In the Recording Control Window, set the Microphone Volume to the values based on the table below:

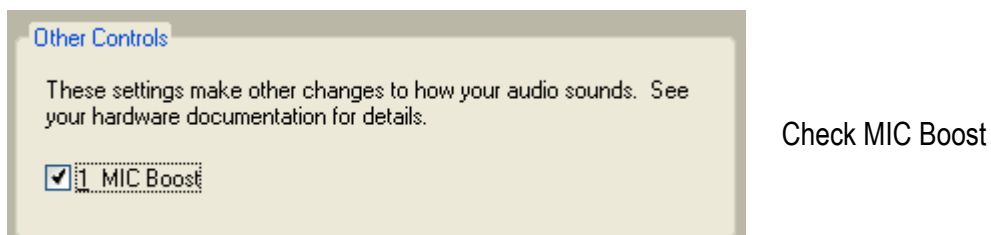
Normal Settings	Noisy Environment Settings	Very Thin, Small Samples Settings
Full Volume	Volume at 2 below full	Full Volume AND <i>Advanced Settings</i>

ADVANCED SETTINGS BELOW ARE FOR VERY THIN SAMPLES OR SMALL SAMPLES ONLY

- 2 In the "Recording Control" Window in the "Options" drop down menu select "Advanced Controls". An "Advanced" button is added and enabled in the Microphone settings Column. Click on the "Advanced" Button.



- 3 In the "Advanced Controls for Microphone" Window in the "Other Controls" section check "MIC Boost". This will amplify the MIC input for the hard to sense samples.



DEPA V9 User Interface

Fast Fourier Transform (FFT) Graph

Shows Peak Frequency of Vibration

Shape Window

Displays current Shape selected, Sensor and Tapping Positions and Ideal Sample Dimensions

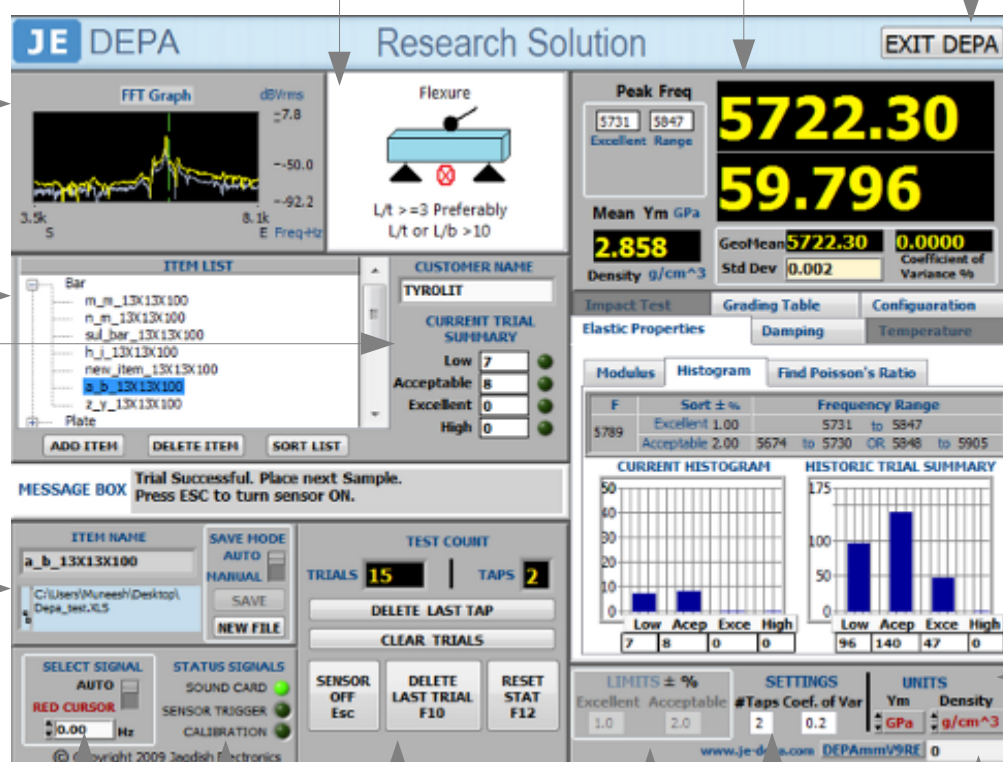
Main Output Window

Displays Current Test Output

- Peak Frequency (or G#) and Young's Modulus (YM)
- Density (p)
- Mathematical Statistics
- Calibrated Excellent Range and Grading Table Placement

Exit DEPA Button

Ensures that application exits after committing all temporary file data



Save Mode Control

Allows Save Mode Settings and displays current Save Item Name and File Path.

Online Status Signals

Displays dynamic status of critical system criteria

Performance Limits Setting

Sets "Excellent" and "Acceptable" % ranges for Calibrated Items

DEPA Serial Number

Unique Serial Number specific to your Installation

Module Display

Display area for Module specific data

Select Signal Window

Enables an advanced "Red Cursor" bulk testing mode

Test Controls

Central console for major test controls

- Sensor ON/OFF
- Tap Controls
- Trial Controls
- Resetting all Statistics
- Current Trial and Tap Counts

Test Settings Window

Allows setting number of Taps per Trial and Coefficient of Variance between the taps for a valid trial.

Units Window

Allows YM and Density to be displayed in MKS or FPS Units

Item Database Interface

Central console for DEPA Testing

- Shape Selection
- Item Calibration
- Online Manipulation of Item Database

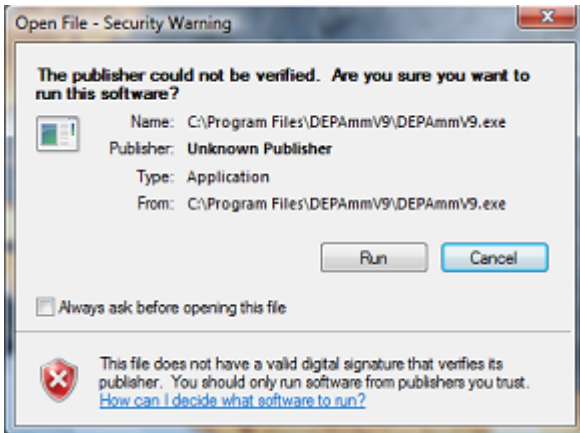
Your First DEPA V9 Test

DEPA V9 ships with a pre-calibrated steel bar and a factory created entry for the bar in the Item Database. In this important first step, we test the proper functionality of DEPA V9 by revalidating the bar against the factory created entry.

RECOMMENDATION: Perform this validation test before starting any DEPA V9 session.


1 Connect the sensor to the MIC input of your computer (please double check this step as its a common user error)

2 Double Click  to launch the DEPA V9 Application

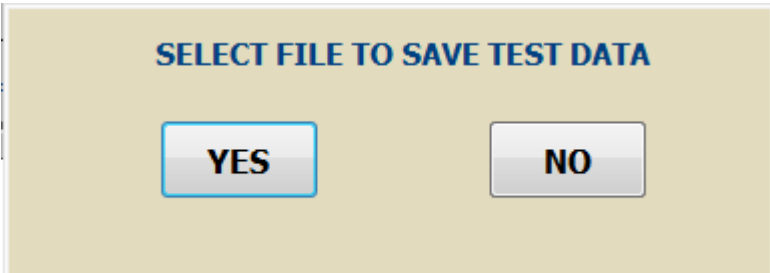
3  Uncheck "Always ask before opening this file"

Click Run

DEPA V9 Welcome Screen launches

4  Click "Start Testing"

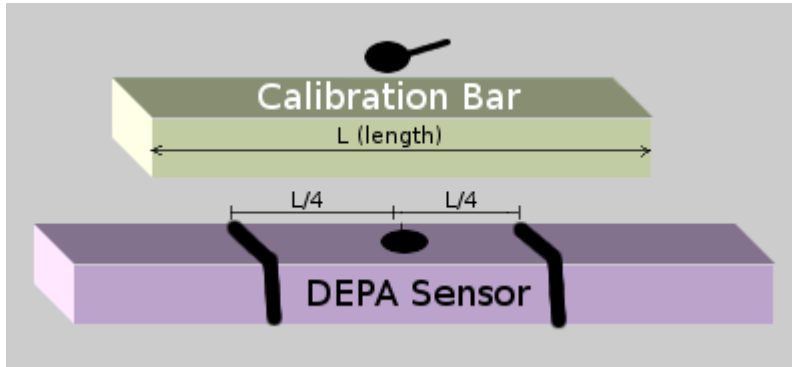
5 Do you want to save the results of the calibration test? For now, select "NO"
The DEPA V9 GUI launches.

 Click "NO"

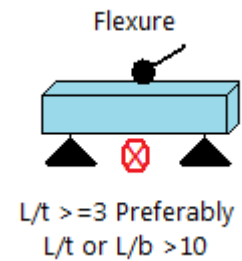
RECOMMENDATION: Create a single file for storing daily DEPA V9 calibration data for a record of every session.

Your First DEPA V9 Test

- 6 Place the rubber band supports on the DEPA sensor at a distance of (L/4) on either side of the sensor microphone

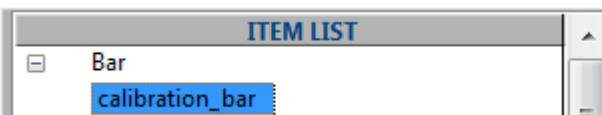


Shape Window Illustration in DEPA V9



- 7 Place the calibration bar on top of the rubber band supports with the center of the bar directly over the microphone. From the top, gently tap the calibration bar in the center to register a Tap.

8 MESSAGE BOX Calibrated Test Mode Select Item.



Expand the “Bar” shape menu in the Item List

Double click “calibration_bar” entry to select it.

DEPA V9 populates all configurations of the calibration bar test done at JE factory.

9 MESSAGE BOX ENTER CUSTOMER NAME

CUSTOMER NAME
calib_08_25_2009

Enter any string in the Customer Name Box
RECOMMENDATION: Enter a string with date of the test. This helps track data with ease if being saved

10 MESSAGE BOX Enter Mass of Sample.

Since correct mass is already populated from the Database,
Press the Tab key to goto the next step.

11 MESSAGE BOX TURN SENSOR ON <Esc>



Turn the Sensor ON by mouse click (or press Esc)

MESSAGE BOX Tap 2 more times

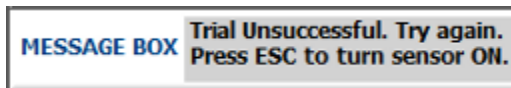
MESSAGE BOX Tap 1 more time

MESSAGE BOX Trial Successful.
1) Place next Sample. 2) Enter Customer Name.

Tap the Calibration bar gently 2 times using the Tapper as shown in **Step 6** to register a successful trial.

Your First DEPA V9 Test

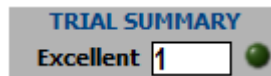
- 12 If you make a mistake with a tap. You can delete it by clicking "Delete Last Tap" or "Reset Stats" (see [Basic Test Controls](#) [Link](#)).
- 13 If you register Trial Unsuccessful (below), since the two taps didn't coincide, Turn the Sensor ON <Esc>, Try again.



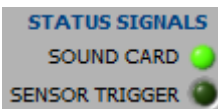
Registering a Successful Trial concludes the Calibration Test.

Results to be Observed

14

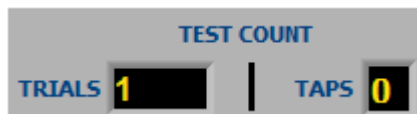


Excellent Count increments to 1
Output signal relay glows momentarily on Increment

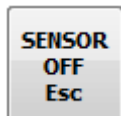


"Sound Card" Status signal should turn ON first time you turn Sensor ON and **REMAIN ON**

"Sensor Trigger" Status Signal flashes momentarily every time a tap is sensed



After two successful Taps:
1. Trials Count increments to 1
2. Taps Count resets to 0



"Sensor" turns off after every Trial (2 registered successful Taps)

15

To retest, repeat from **Step 9** and tap twice.
Excellent Trial Count increments to 2 and so forth

Increment in the Excellent Trial Count indicates successful testing of the Calibration Bar validating the DEPA V9 installation as per JE specifications.

[Table of Contents](#) [Link!](#) **DEPA V9 Item Database Calibration**

DEPA V9, introduces for the first time, a user customizable online Item Database of baseline test entries. Calibration is the process of creating an entry in the database.

Calibration optimizes the use of the DEPA V9 software. During Item Calibration:

- A baseline test entry is created in the Item Database.
- Any similar test sample can be efficiently compared against this baseline.
- Samples are dynamically sorted into user defined **Excellent**, **Acceptable**, **High** and **Low** ranges.
- Histograms of Current and Historical testing sessions are displayed online.
- DEPA V9 automates all software settings greatly improving test speed and reducing user error.

RECOMMENDATION: Create an Item Database of the baseline samples of your entire inventory.

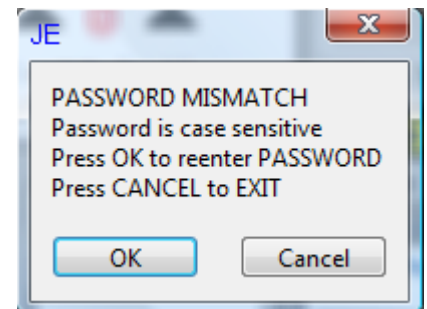
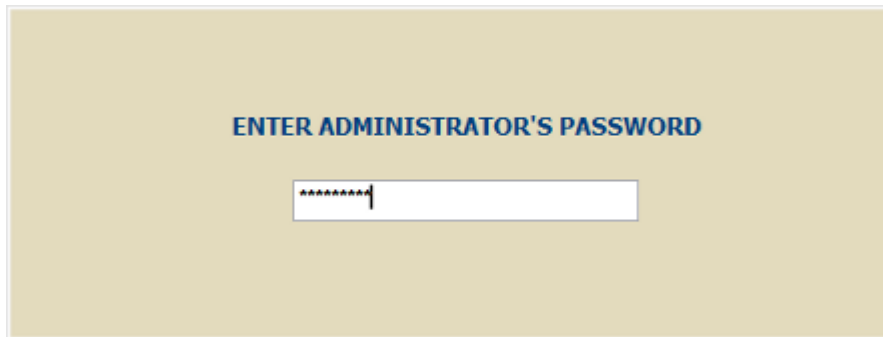
- 1 Initiate a Calibration session by either:
- i) Clicking on **"Create Product Database"** in the Welcome Screen
 - ii) Clicking on **"Add Item"** in the Item Database window of the GUI

Create Product Database

OR

ADD ITEM

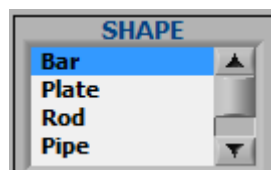
- 2 This section is password protected. Enter the Admin Password. First time users type in **"depa"**. Wrong password entry gives an error message. Click "OK" to reenter or "Cancel" to exit



- 3 **CALIBRATION**  The Calibration Status Signal comes ON

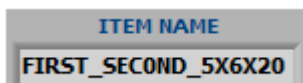
Follow the instructions in the Message Box to guide you through the rest of the process

- 4 **MESSAGE BOX** New Item Calibration Mode, Select Shape.



Select Item Shape

- 5 DEPA V9 uses the following naming convention for new entries in the Item Database
CALL GRADE_INTERNAL GRADE_DIMENSIONS



We enter the CALL GRADE and INTERNAL GRADE fields next.



DEPA V9 Item Database Calibration

6

MESSAGE BOX TYPE CALL GRADE

CALL GRADE
FIRST

Enter Call Grade

Alphanumeric string for 1st half of the name

TIP: Use the External Product name

7

MESSAGE BOX TYPE INTERNAL GRADE

INTERNAL GRADE
SECOND

Enter Internal Grade

Alphanumeric string for 2nd half of the name

TIP: Use the Internal/Factory Product name

8

MESSAGE BOX TYPE DIMENSIONS

Modulus Abrsiv

Thickness(t)
5.000 mm

Breadth(b)
6.00 mm

Length(L)
20.00 mm

Mass (m)
3.000 g

Enter the Dimensions and Mass

This menu will differ based on shape selected

9

4.564

Density g/cm³

UNITS

Ym Density

GPa g/cm³

g/in³
✓ g/cm³
lb/ft³
lb/in³

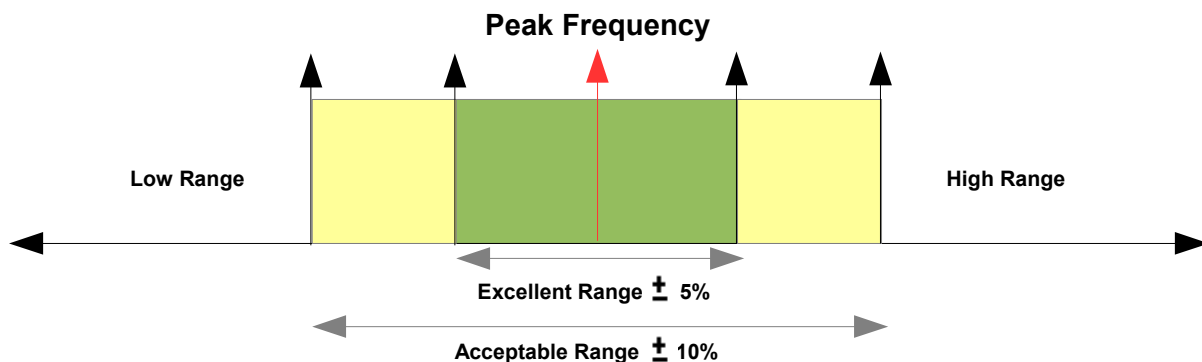
Density is calculated and displayed in the Output Window (top right of GUI under YM).

Use "Units" section (bottom right of GUI) to change Density units if desired.

10

Performance Limits Setting

This is one of the most advanced features of DEPA V9. It allows the User to set custom performance limit % based on which all samples tested against the database entry will be sorted. *E.g. if we set **Excellent limit** = 5% and **Acceptable limit** = 10%:*



MESSAGE BOX TYPE EXCELLENT LIMIT

MESSAGE BOX TYPE ACCEPTABLE LIMIT

LIMITS $\pm \%$

Excellent Acceptable

5.0 10.0

Enter the Excellent and Acceptable ranges (%)

NOTE: Excellent Range% < Acceptable Range%

EXCELLENT if $-5\% < \text{Measured Frequency} < +5\%$

ACCEPTABLE if $+5\% \leq \text{Measured Frequency} \leq +10\%$ OR $-10\% \leq \text{Measured Frequency} \leq -5\%$

HIGH if $\text{Measured Frequency} > +10\%$

LOW if $\text{Measured Frequency} < -10\%$

NOTE: If unsure of what values to set, leave it at the defaults. **Excellent Range = 2.5%, Acceptable Range = 5%**

DEPA V9 Item Database Calibration

11

MESSAGE BOX TURN SENSOR ON <Esc>



Place item on Sensor and turn Sensor ON

The next steps in the test are custom to the Extended Version. There are 3 new additional steps:

- We first generate the complete frequency signature of the sample by an “Ascertaining” Tap. **12**
- Next, the red cursor in the graph is dragged and placed on the Main Frequency (F). **13** & **14**
- Finally, the Filter is turned ON. **15**

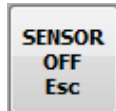
12

MESSAGE BOX Tap once to ascertain Frequency (F).

Place and tap the test item once to determine Main Frequency (F).

Item placement will differ based on shape

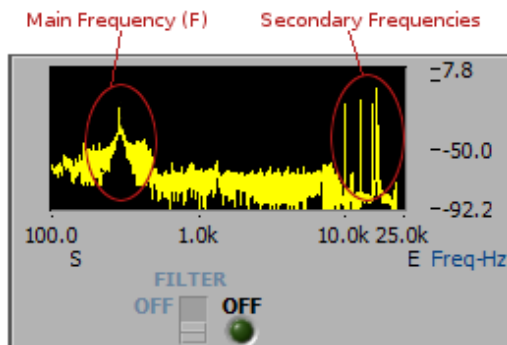
The SENSOR goes OFF.



13

Look at the graph to see the complete Frequency Signature of the sample to find the Main Frequency (F). Two cases are possible:

1) A good Tap in which (F) is identifiable



Continue to **14**

2) A bad Tap in which (F) is not identifiable

If you make an Error or get a Noisy tap you can redo the ascertaining tap to regenerate Main Freq (F) again by:

Turn the Sensor ON <Esc>, Tap Again

This takes you back to **12**

MESSAGE BOX Main Frequency (F) Identifiable? Yes: Drag Red Cursor to F. No: Turn Sensor ON <Esc>, Tap again.

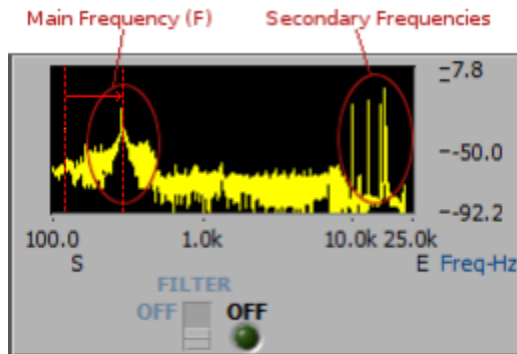
NOTE:

- 1) Main Frequency (F) is present, but some taller secondary frequencies also form “interfering” with the reading (see graph above).
- 2) These secondary frequencies need to be filtered out. This is done in the subsequent steps.

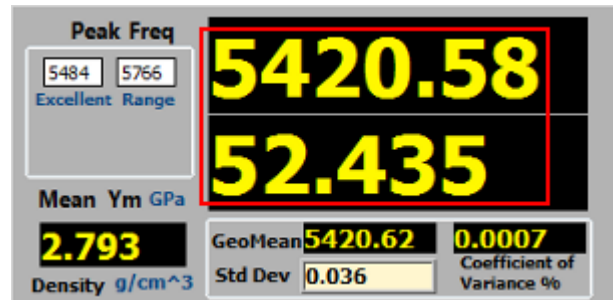
DEPA V9 Item Database Calibration

14

In the FFT Graph, (top left of DEPA V9 screen) click on the **Red Cursor** (the red dashed line) and **with the left mouse button pressed drag the red line towards the right to the Main Frequency (F)**. **Important!**



DRAW & MOVE RED CURSOR TO F



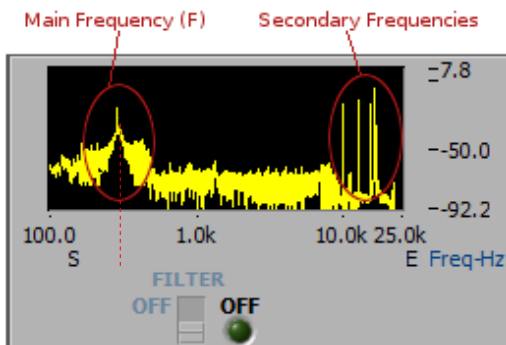
- As you drag the **Red Cursor** and place it on the Main frequency (F) you should see the **YM readings** changing (in the top right window). **Important!**
- These are the readings corresponding to the current position of the **Red Cursor**. **Important!**
- **When you place the Red Cursor on (F) compare the YM reading to see if it falls under the expected range of the type of product you are testing.** **Important!**

Once **Red Cursor** is aligned with the Main Frequency (F) (as shown in the graph on the left below):

NOTE: It doesn't have to be exactly aligned with (F). Anywhere in the close vicinity is fine.

- Two cases are possible:
- 1) YM reading is in the expected range for the product.
 - 2) YM reading is **NOT** in the expected range for the product.

1) Placing Red Cursor on Main Freq (F) gives a YM reading in expected range



Continue to **15**

2) If placing Red Cursor on Main Freq (F) gives a YM reading **NOT** in expected range

Check proper placement of the Sample and Sensor

Just do another re-ascertaining tap and regenerate the frequency signature to find main Frequency (F) again:

Turn the Sensor ON <Esc>, Tap Again

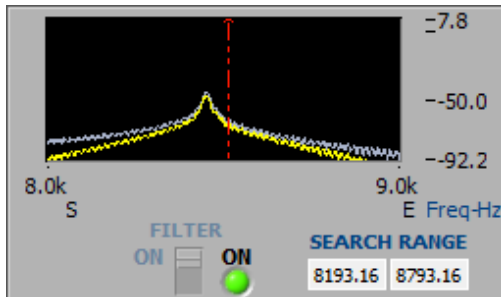
This takes you back to **12**

[Young's Modulus Ranges of Test Materials](#) **Link**

DEPA V9 Item Database Calibration

- 15** If Red Cursor placement is OK, **Turn the Filter ON** by clicking on the filter switch in the graph window.

MESSAGE BOX Turn Filter ON or To re-asertain Main Freq (F):
Turn Sensor ON, and Tap again.



The following should be observed:

- 1) The viewable graph range changes to ± 1000 Hz of the **Red Cursor**
- 2) The Frequency Filter is Turned ON
- 3) A Search Range for the set filter is displayed.
- 4) V9 searches for Main Frequency (F) in this range filtering out all lower and higher frequencies.

The rest of the Damping test is executed as usual with the Filter enabled ensuring:

- 1) Problematic secondary frequencies are eliminated.
- 2) Correct, high accuracy readings within the set search range are picked up.

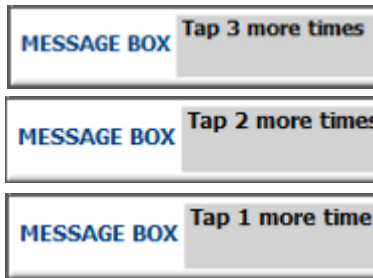
- 16** Turn the Sensor ON

MESSAGE BOX Press <Esc> to Turn Sensor ON.

**SENSOR
ON
Esc**

DEPA V9 Item Database Calibration

17

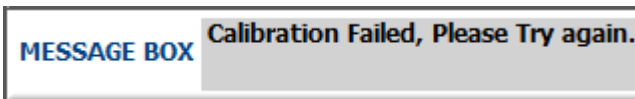


Place tap the test item three (3) times to register a Successful Calibration.

Item placement will differ based on shape

18

If you get an “Calibration Failed” message below, then Turn Sensor ON [Step 16] and try three (3) taps again [Step 17].



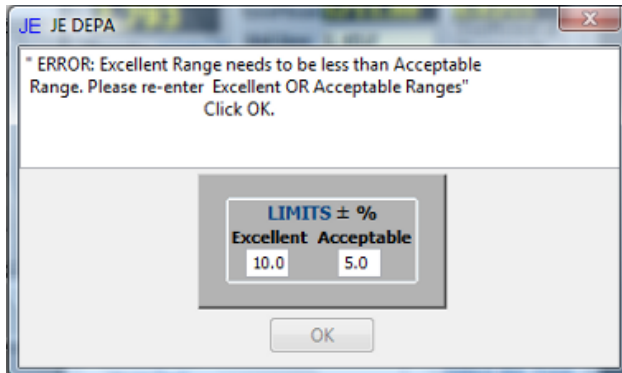
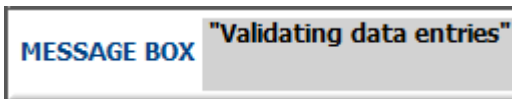
THEN



AND TAP 3 TIMES AGAIN

19

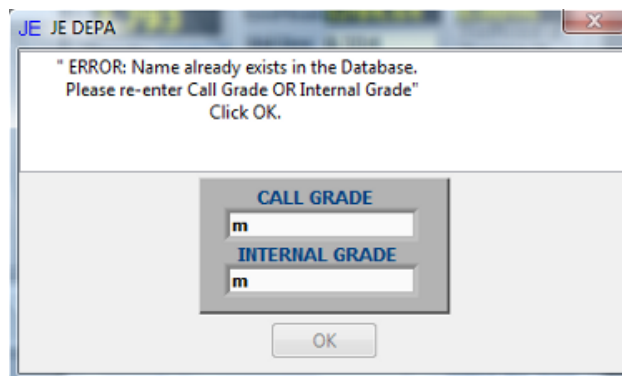
DEPA V9 performs a final validation of the collected data:



If you see this message:

Re-enter the Excellent and Acceptable ranges.

Click OK



If you see this message:

Re-enter the Call Grade and Internal Grade.

Click OK

DEPA V9 Item Database Calibration

20

MESSAGE BOX CALIBRATION SUCCESSFUL
CLICK "SAVE DATABASE"

SAVE
DATABASE

Click "Save Database" to save the entry


THIS STEP IS MANDATORY

21

ADD
ITEM

OR

CLOSE
DATABASE

CALIBRATION 

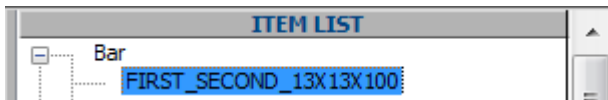
Click on "Add Item" to start another Calibration session

OR

"Close Database" to end Calibration and start testing . Calibration signal goes OFF.

22

CONGRATULATIONS! You have successfully created an entry in the Item Database.

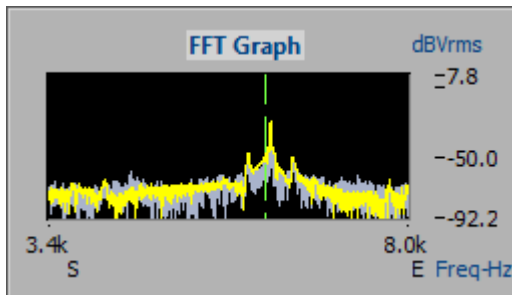


The newly created entry appears in the Item Database Tree under the selected shape

The following information is stored for every entry in the Item Database:

ITEM NAME
FIRST_SECOND_5X6X20

Item Name



Automated range setting for Graph

Peak Freq

1229.28

Peak Frequency (Green dashed line)

Modulus Abrisiv

Thickness(t)
5.000 mm

Breadth(b)
6.00 mm

Length(L)
20.00 mm

Mass (m)
3.000 g

Dimensions and Mass (so in effect also Density)

LIMITS \pm %
Excellent Acceptable

5.0 10.0

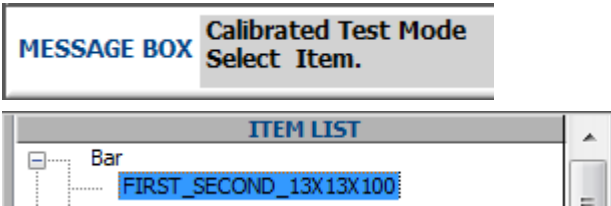
Performance Limits



Table of Contents [Link!](#) Testing Against a Calibrated Item

Test samples are sorted based on comparison against a Baseline entry in the Item Database

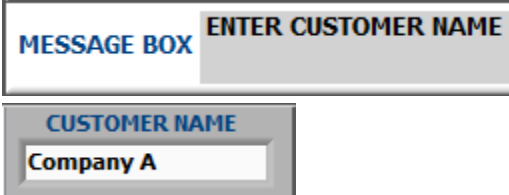
- 1



Expand the shape menu in the Item List

Double click on the Item entry of interest

DEPA V9 populates all configuration details of the Item selected
- 2




Enter a Customer Name

For current sample, the Trial stored in the Output file will reference this Customer

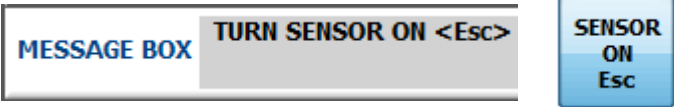
TIP: Use name that uniquely identifies this test
- 3

Place the sample on the sensor as shown in the “**Shape Window**” Top Center of GUI


This will differ based on shape selected
- 4



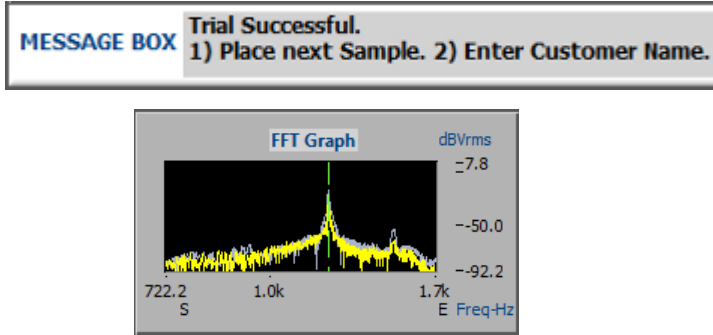
Enter the mass of the Sample
- 5

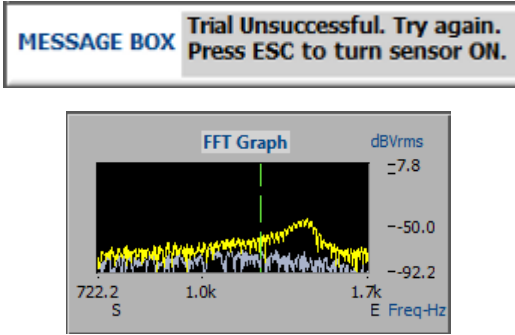


Turn the Sensor ON <Esc>
- 6



You will register either a “Successful” Trial or an “Unsuccessful” Trial. Unsuccessful trials are simply discarded. If you register Trial Unsuccessful (right), since the two taps didn't coincide, Turn the Sensor ON <Esc>, Try again.
- 7




- 8

To test another *identical* sample goto **Step 2**

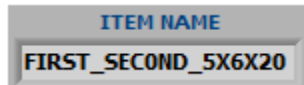
To test against another stored Item in the database goto **Step 1**

Testing Against a Calibrated Item

Calibrated Test Mode – Understanding the Results

When an item is selected from the Database, the following information is auto-populated into DEPA V9:

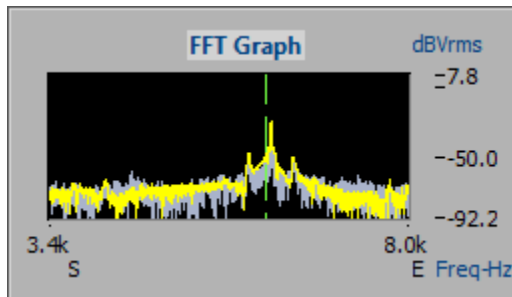
1



ITEM NAME
FIRST_SECOND_5X6X20

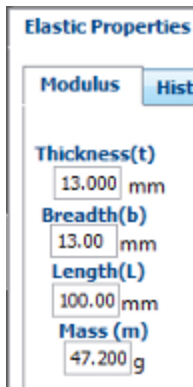
- Item Name

2



- A Green Bar is placed in the FFT graph where the Peak Frequency is expected.
- DEPA resets the graph range to center it around the expected Peak Frequency.
- Blue and yellow superimposed graphs of individual taps on the same test item are displayed.
- Correlation of the taps to each other and the proximity of the highest peak to the value saved in the DB can be seen.

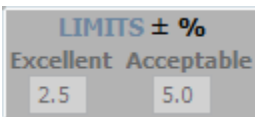
3



Elastic Properties
Modulus Hist
Thickness(t)
13.000 mm
Breadth(b)
13.00 mm
Length(L)
100.00 mm
Mass (m)
47.200 g

- Item dimensions and mass (and density) are auto-populated.
- Of these fields, the **Mass** is editable during regular testing.

4



LIMITS ± %
Excellent Acceptable
2.5 5.0

- Excellent and Acceptable ranges are auto populated.
- These fields are grayed out and not editable.

5

After two successful taps (Trial), the results of the test are displayed in the Output Window (Top right of the GUI)



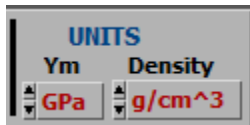
Peak Freq
5484 5766
Excellent Range
Mean Ym GPa
2.793
Density g/cm³
GeoMean 5420.58
Std Dev 52.435
0.0007
Coefficient of Variance %

- Peak Frequency (Hz) and the "Excellent" range
- Mean YM (GPa) between the two taps
- Mean Frequency(Hz) between the two Taps
- Standard Deviation
- Coefficient of variance (%) between the two Taps
- Density (gms/cc)

Testing Against a Calibrated Item

Calibrated Test Mode – Understanding the Results

6

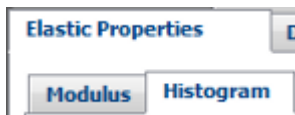


To change the display units of Density and YM click on the UNITS selection window (Bottom Right corner) of the GUI.

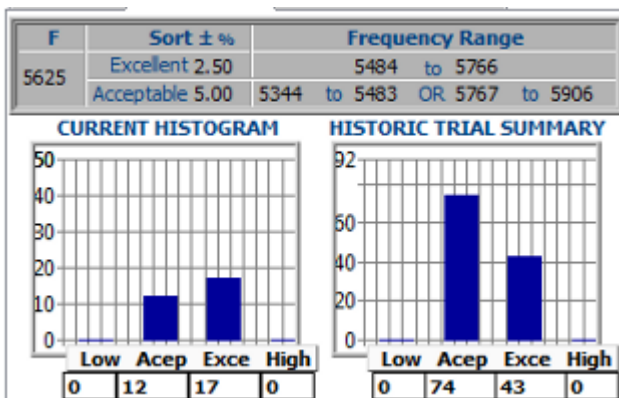
Histogram

7

DEPA V9 introduces an advanced Histogram feature to dynamically display real time test count statistics.



In "Elastic Properties" window goto the "Histogram" tab.



For the Item selected in the Database the table displays:

- Peak Frequency (F)
- Excellent and Acceptable Ranges (%)
- Excellent and Acceptable frequencies as per the ranges

Histograms displayed:

- **Current Histogram:** Test Sort count of the current session
- **Historic Trial Summary:** Aggregate Test Sort count of all tests conducted since the creation of the entry in the DB.

DEPA V9 Single Test Mode

Single item test. In this mode the test is stand alone without being compared to any entry in the Item Database.

- 1

MESSAGE BOX Single test Mode Select Shape.

ITEM LIST
+ Bar

Double Click on the **shape** name to select it.
- 2

MESSAGE BOX ENTER CUSTOMER NAME

CUSTOMER NAME

Select a Customer Name
For current sample, the Trial stored in the Output file will reference this Customer
TIP: Use name that uniquely identifies this test
- 3

MESSAGE BOX TYPE CALL GRADE

CALL GRADE
FIRST

Enter Call Grade
Alphanumeric string for 1st half of the name
TIP: Use the External Product name
- 4

MESSAGE BOX TYPE INTERNAL GRADE

INTERNAL GRADE
SECOND

Enter Call Grade
Alphanumeric string for 2nd half of the name
TIP: Use the Internal/Factory Product name
- 5

MESSAGE BOX TYPE DIMENSIONS

Modulus Absriv

Thickness(t) 5.000 mm

Breadth(b) 6.00 mm

Length(L) 20.00 mm

Mass (m) 3.000 g

Enter the Dimensions and Mass
This menu will differ based on shape selected
- 6

4.564
Density g/cm^3

UNITS

Ym Density

GPa g/cm^3

g/in^3

✓ g/cm^3

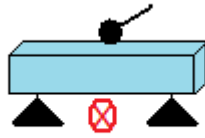
lb/ft^3

lb/in^3

Density is calculated and displayed in the Output Window (top right of GUI under YM).

Use "Units" section (bottom right of GUI) to change Density units if desired.
- 7

Flexure



L/t >=3 Preferably
L/t or L/b >10

Place the sample on the sensor as shown in the "Shape Window"

This will differ based on shape selected

DEPA V9 Single Test Mode

8

MESSAGE BOX TURN SENSOR ON <Esc>



Place item on Sensor and turn Sensor ON

The next steps in the test are custom to the Extended Version. There are 3 new additional steps:

- We first generate the complete frequency signature of the sample by an “Ascertaining” Tap. 9
- Next, the red cursor in the graph is dragged and placed on the Main Frequency (F). 10 & 11
- Finally, the Filter is turned ON. 12

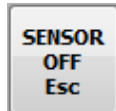
9

MESSAGE BOX Tap once to ascertain Frequency (F).

Place and tap the test item once to determine Main Frequency (F).

Item placement will differ based on shape

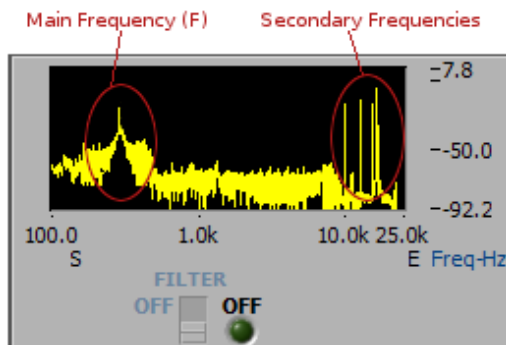
The SENSOR goes OFF.



10

Look at the graph to see the complete Frequency Signature of the sample to find the Main Frequency (F). Two cases are possible:

1) A good Tap in which (F) is identifiable



Continue to 11

2) A bad Tap in which (F) is not identifiable

If you make an Error or get a Noisy tap you can redo the ascertaining tap to regenerate Main Freq (F) again by:

Turn the Sensor ON <Esc>, Tap Again

This takes you back to 9

MESSAGE BOX Main Frequency (F) Identifiable? Yes: Drag Red Cursor to F. No: Turn Sensor ON <Esc>, Tap again.

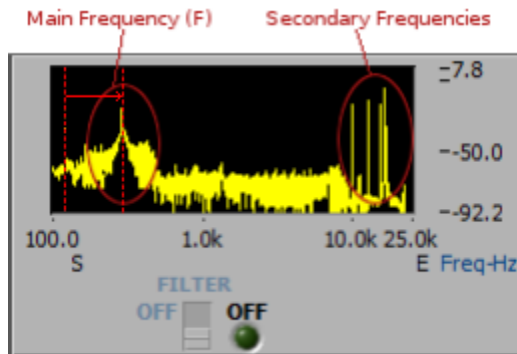
NOTE:

- 1) Main Frequency (F) is present, but some taller secondary frequencies also form “interfering” with the reading (see graph above).
- 2) These secondary frequencies need to be filtered out. This is done in the subsequent steps.

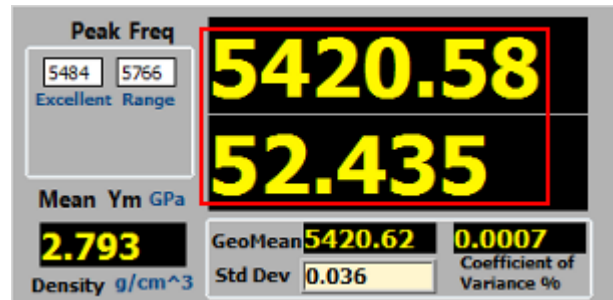
DEPA V9 Single Test Mode

11

In the FFT Graph, (top left of DEPA V9 screen) click on the **Red Cursor** (the red dashed line) and **with the left mouse button pressed drag the red line towards the right to the Main Frequency (F)**. **Important!**



DRAW & MOVE RED CURSOR TO F



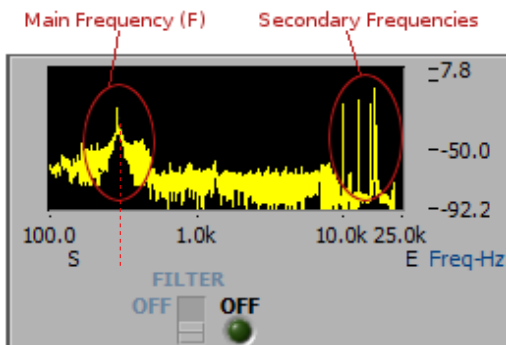
- As you drag the **Red Cursor** and place it on the Main frequency (F) you should see the **YM readings** changing (in the top right window). **Important!**
- These are the readings corresponding to the current position of the **Red Cursor**. **Important!**
- **When you place the Red Cursor on (F) compare the YM reading to see if it falls under the expected range of the type of product you are testing.** **Important!**

Once **Red Cursor** is aligned with the Main Frequency (F) (as shown in the graph on the left below):

NOTE: It doesn't have to be exactly aligned with (F). Anywhere in the close vicinity is fine.

- Two cases are possible:
- 1) YM reading is in the expected range for the product.
 - 2) YM reading is **NOT** in the expected range for the product.

1) Placing Red Cursor on Main Freq (F) gives a YM reading in expected range



Continue to **12**

2) If placing Red Cursor on Main Freq (F) gives a YM reading **NOT** in expected range

Check proper placement of the Sample and Sensor

Just do another re-ascertaining tap and regenerate the frequency signature to find main Frequency (F) again:

Turn the Sensor ON <Esc>, Tap Again

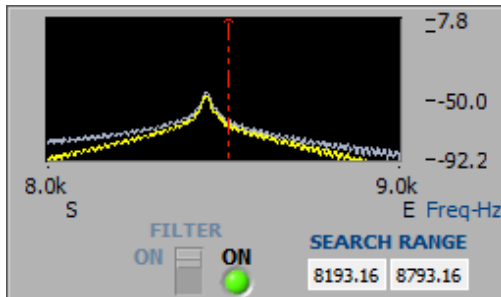
This takes you back to **9**

[Young's Modulus Ranges of Test Materials](#) **Link**

DEPA V9 Single Test Mode

- 12 If Red Cursor placement is OK, **Turn the Filter ON** by clicking on the filter switch in the graph window.

MESSAGE BOX Turn Filter ON or To re-asertain Main Freq (F):
Turn Sensor ON, and Tap again.



The following should be observed:

- 1) The viewable graph range changes to ± 1000 Hz of the **Red Cursor**
- 2) The Frequency Filter is Turned ON
- 3) A Search Range for the set filter is displayed.
- 4) V9 searches for Main Frequency (F) in this range filtering out all lower and higher frequencies.

The rest of the Damping test is executed as usual with the Filter enabled ensuring:

- 1) Problematic secondary frequencies are eliminated.
- 2) Correct, high accuracy readings within the set search range are picked up.

- 13 Turn the Sensor ON

MESSAGE BOX Press <Esc> to Turn Sensor ON.

**SENSOR
ON
Esc**

DEPA V9 Single Test Mode

14

MESSAGE BOX Tap 2 more times

MESSAGE BOX Tap 1 more time

MESSAGE BOX Trial Successful.
1) Place next Sample. 2) Enter Customer Name.

Place and tap the Sample two (2) times using the Tapper as shown in **Step 7** to register a Successful Trial

15

If you make a mistake with a tap. You can delete it by clicking "**Delete Last Tap**" or "**Reset Stat**"
If you register Trial Unsuccessful (below), since the two taps didn't coincide, **Turn the Sensor ON <Esc>**, Try again.

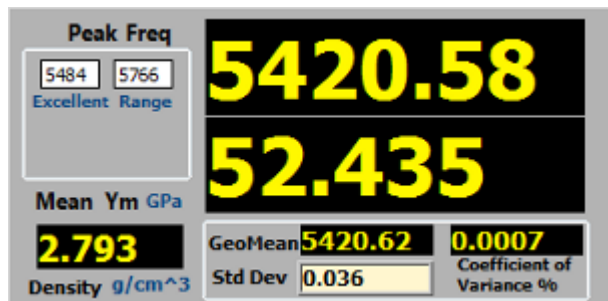
MESSAGE BOX Trial Unsuccessful. Try again.
Press ESC to turn sensor ON.

To test another sample of the same shape goto **Step 2**
To test another new independent shape goto **Step 1**

Single Test Mode – Understanding the Results

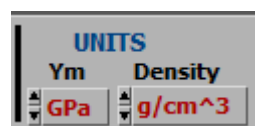
16

After two successful taps (Trial), the results of the test are displayed in the Output Window (Top right of the GUI)



- Peak Frequency (Hz) and the "Excellent" range
- Mean YM (GPa) between the two taps
- Mean Frequency(Hz) between the two Taps
- Standard Deviation
- Coefficient of variance (%) between the two Taps
- Density (gms/cc)

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To change the display units of Density and YM click on the UNITS selection window (Bottom Right corner) of the GUI.

Closing DEPA V9

- 1 Click on "EXIT DEPA" (top right of the GUI) to commit all uncommitted data and exit the application safely. **IMPORTANT!**

EXIT DEPA

Basic Test Controls and Terminology

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MESSAGE BOX

ENTER CUSTOMER NAME

Message Box gives hints on next steps

Main Test Controls

TEST COUNT

TRIALS 0

TAPS 1

DELETE LAST TAP

CLEAR TRIALS

SENSOR OFF Esc

DELETE LAST TRIAL F10

RESET STAT F12

ITEM NAME

new_item_13X13X100

SAVE MODE

AUTO

MANUAL

SAVE

NEW FILE

C:\Users\Muneesh\Desktop\Depa_test.XLS

- Trials ▶ Trial Count of current session
- Taps ▶ Tap Count of current session
- Delete Last Tap ▶ Click to delete wrong tap
- Clear Trials ▶ Soft Reset of Trial Count
Saved data unaffected.
- Sensor ON/OFF ▶ Button turns sensor ON/OFF
Turns OFF after trial success
- Delete Last Trial ▶ Soft delete of previous trial
- Reset Stat ▶ Delete Last Tap+Clearing of all
Mathematical Statistics
- Item Name ▶ Current test item name stored in O/P file
- Path ▶ Path to the O/P file
- Save Mode ▶ AUTO: Successful trials stored automatically
MANUAL: Successful trial stored on pushing SAVE
- New File ▶ Click to create NEW or different O/P file

DEPA V9 Terminology	Details
Tap	Every time a sample is excited and a reading is sensed by the DEPA Software
Trial	Two (2) subsequent taps on the SAME sample with a Coefficient of Variance less than (<) 0.1. DEPA V9 Software stores successful Trials and not individual Taps.
Item Database	User created online Database of baseline test entries against which test samples can be compared.
Calibration	Process of making an entry into the Item Database
Calibrated Test Mode	Mode of DEPA testing in which tested samples are being compared against an entry in the Item database.
Single Test Mode	Mode of DEPA testing in which a stand alone test is being performed.

Young's Modulus Ranges of Test Materials

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[Item Database Calibration \(STEP 14\)](#) [Link](#)
[Single Test Mode \(STEP 11\)](#) [Link](#)

Material	Young's Modulus (GPa)	Young's Modulus lbf/in ² (psi)
Rubber (small strain)	0.01-0.1	1,500-15,000
PTFE (Teflon)	0.5	75,000
Polyethylene (low density)	0.2	30,000
Polypropylene	1.5-2	217,000-290,000
Polystyrene	3-3.5	435,000-505,000
Nylon	2-4	290,000-580,000
Fiber board (medium density)	3.654	530,000
Wood (along grain)	8.963-11	1,300,000-1,600,000
High-strength Concrete (under compression)	30	4,350,000
Glass fiber reinforced plastic (70/30 by weight fibre/matrix, along grain)	40-45	5,800,000-6,500,000
Magnesium (Mg)	45	6,500,000
Aluminium (Al)	69	10,000,000
Abrasive Ceramics (vitrified/bonded)	20-90	2,900,000-13,530,000
Glass	50-90	7,251,000-13,530,000
Mother-of-Pearl (nacre, largely calcium carbonate)	70	10,000,000
Brass and Bronze	100-125	17,000,000
Titanium (Ti) and Titanium Alloys	105-120	15,000,000-17,500,000
Copper (Cu)	117	17,000,000
Carbon fiber reinforced plastic (50/50 fibre/matrix, unidirectional, along grain)	125-150	18,000,000-22,000,000
Wrought Iron	190-210	27,550,000-30,450,000
Steel	200	30,000,000
Yttrium Iron Garnet (YIG)	193-200	28,000,000-30,000,000
Beryllium (Be)	287	42,000,000
Tungsten (W)	400-410	58,000,000-59,500,000
Sapphire (Al ₂ O ₃) along C-axis	435	63,000,000
Silicon Carbide (SiC)	450	65,000,000
Osmium (Os)	550	79,800,000
Tungsten Carbide (WC)	450-650	65,000,000-94,000,000
Single-Walled Carbon Nanotube	1,000+	145,000,000+
Diamond (C)	1220	150,000,000-175,000,000