DAYTONAUDIO

DATS™ V3

DAYTON AUDIO TEST SYSTEM

DATS V3: The best tool ever for accurately measuring loudspeaker driver parameters…in seconds.

When designing speakers, accurate parameters are a requirement for great success. After a decade of widespread use, The Dayton Audio Test System (DATS) has now acquired an impressive reputation for fast and accurate testing in the world of loudspeaker design, production and installation. Wide user praise is revealed in the 91 user reviews of DATS V2 at the Parts Express web site with an average of 4.6 / 5.0 stars.

- **Measure Driver Parameters Quickly**
- **Screen Drivers for Rub and Buzz Issues**
- **Measure Capacitors plus ESR and DF**
- **Measure Inductors plus DCR**
- **Measure Resistors**
- **Measure 70 V Speaker Lines**
- **Generate Various Audio Signals**
- **Print Parameters to Standard Labels**
- **General Audio Impedance Measurement**

Users loved DATS V2 and now V3 is even better. The newest generation of the test system is housed in an aluminum enclosure with both the test leads and USB cable detachable/replaceable. The calibration resistor (0.1% accuracy) is now integrated into the V3 front panel with convenient turret terminals for connecting the test leads. No more searching for or fiddling with a separate calibration resistor. This helps assure that your system is always accurately calibrated even for those "quick look" measurements.

Some of the new features of DATS V3:

- **All New Rugged Metal Enclosure**
- **Detachable Test Leads and USB cable**
- **Double the test signal output level**
- **The DATS Linearity Test**
- **Integrated Front Panel Calibration Resistor (0.1%)**
- **Tightened Tolerances on Internal Components**
- **20X Increased Frequency Resolution**

The system measures impedance and extracts loudspeaker parameters or passive component (R, L, and C) values in just seconds and even includes our unique impedance-based Rub and Buzz test. DATS includes a second test mode featuring a general purpose signal generator and oscilloscope working in tandem. The scope and generator combination provides a powerful general purpose audio test set extending beyond the capability of previous generations of woofer testers. When used with the DATS hardware the oscilloscope monitors the DATS generator output. When standard audio interfaces are available the input to the oscilloscope can be switched to another device to allow the monitoring of arbitrary input signals in addition to the DATS generator output.

DATS V3 features a redesigned audio interface unit with integrated calibration resistor and convenient front panel calibration terminals. The new DATS V3 system uses the default Windows settings so that no adjustments are normally required.

Loudspeaker Parameter Measurement with DATS:

Dayton Audio's DATS makes measuring loudspeaker driver parameters easier, faster and more accurate than ever before. While competitive woofer testers take around 6 minutes to measure just 30 impedance points, DATS measures over 30,000 data points in just a few seconds using a unique swept sine technique. The result is a very high-resolution impedance measurement that allows the extraction of highly accurate driver parameters, suitable for the finest loudspeaker design work. Free air parameters are measured in just a few seconds. V_{AS} can be measured by the test box method, added mass method or more conveniently by just specifying the SPL of the driver (either 1W/1m or 2.83V). No other loudspeaker impedance tester is as fast, versatile or as easy to use as DATS. Here is the main DATS screen when measuring speaker driver parameters:

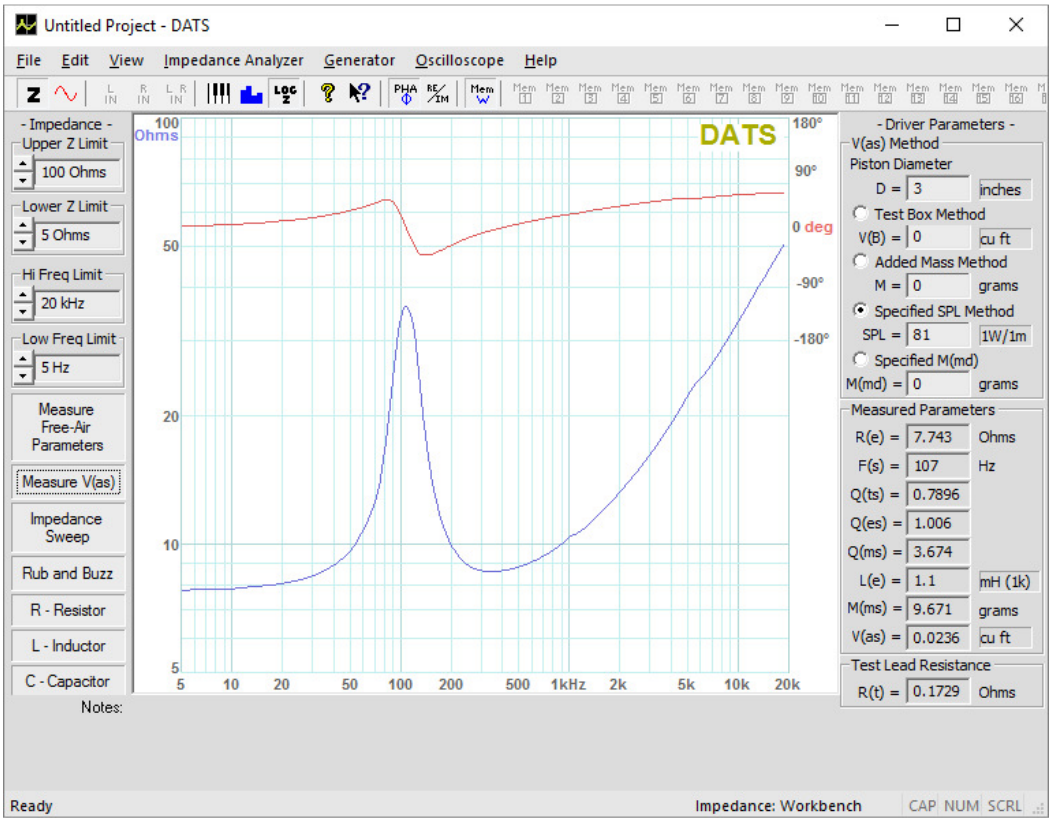


Figure 1: A typical DATS measurement screen

Figure 2 shows the Parameters page of the DATS Driver Editor. Because space on the main screen is limited, only select parameters can be displayed there. The additional measured parameters can be viewed at the Driver Editor pages. The Driver Editor pages provide space for additional user entered data beyond that which is measured by DATS. User entered data could include such things as the driver manufacturer, model number, etc.

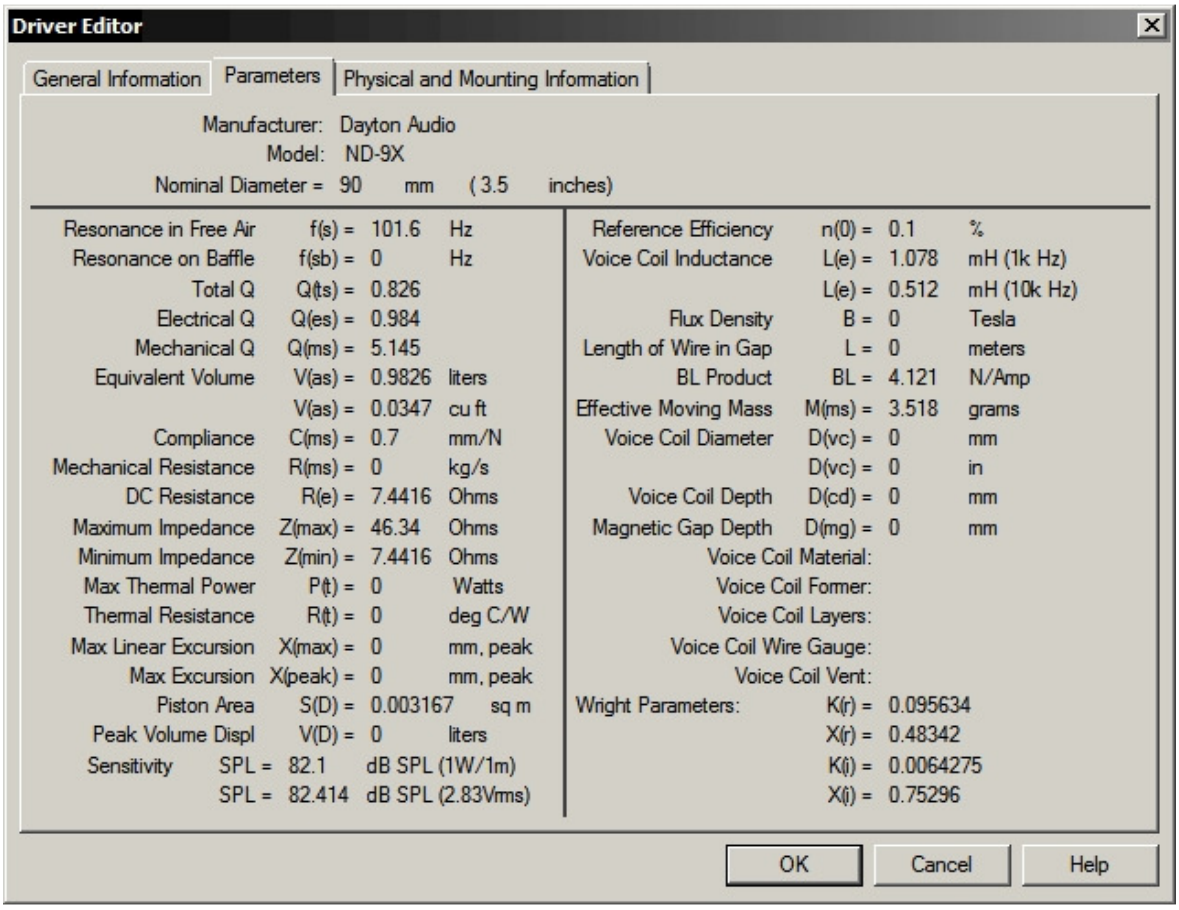


Figure 2: The DATS Driver Editor parameters page

Advanced features of DATS V3:

- **Wright Parameters Measurement:** Loudspeaker parameter measurement has been expanded to include the Wright parameters which are especially useful for precision simulation. The Wright parameters allow for the accurate reproduction of a driver's high frequency inductive impedance from the four new parameters: **K_R X_R K_I and X_I**.

- **Log Impedance Scale:** A user setting allows easy switching between linear and logarithmic impedance scales. Often it is convenient to view impedance on a log scale because the impedance of a pure capacitor or inductor becomes a straight line and any non-linearity is seen at a glance. The log impedance scale has adjustments for both upper and lower impedance plot limits.

Rub and Buzz Testing with DATS:

Finally, the loudspeaker industry has a rub and buzz test that is affordable enough to allow routine testing of all types and sizes of speakers! DATS includes loudspeaker rub and buzz testing at a price point unheard of until now. This is made possible by our discovery that impedance measurements can reveal that rubbing is occurring in a loudspeaker. Up to this time rub and buzz problems could be detected only by resorting to acoustic measurements using expensive and specialized distortion measurement systems. Our new rub and buzz test relies on precision low level impedance measurements to detect rubbing problems. This greatly simplifies rub and buzz testing. Using the new method DATS can detect the slightest rubbing even in noisy production environments. The sensitivity of the rub and buzz test is easily customizable for efficient and adaptable production testing. Figure 3 shows the Rub and Buzz Test setup screen showing the default settings and an overview of the rub and buzz test procedure:

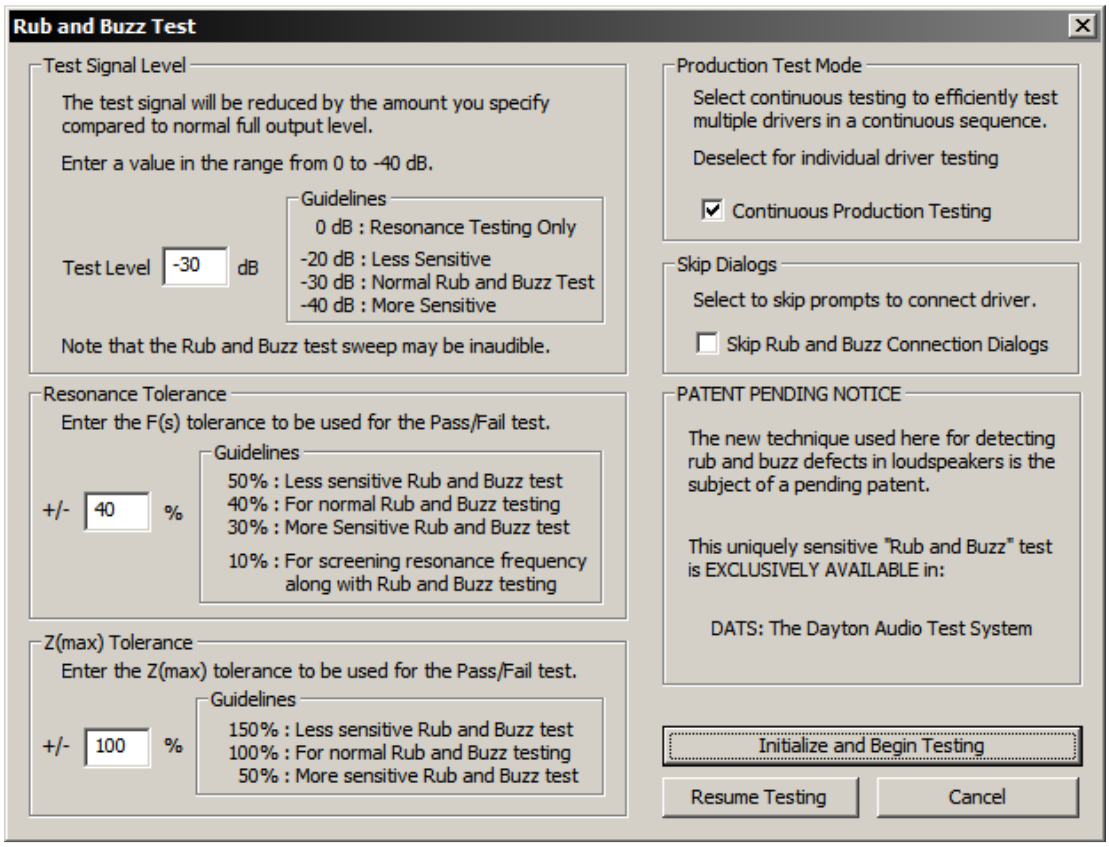


Figure 3: The DATS Rub and Buzz setup page

At the top left of the test setup window the user can adjust the signal level used for the test which (by default) is set to 30 dB below the standard test level or -30 dB. The other edit fields allow the user to adjust the pass/fail tolerances for F_S and Z_{MAX}. Together, these three settings give the user total control over the sensitivity of the test and are saved along with the reference sweep and other memories as part of each DATS project file. Guidelines are provided on screen for each test setting with the default values being at the center of the useful range.

Figures 4 and 5 show typical test results for passing and failing drivers respectively. The green plot in each screen is the reference plot made at full signal level. The second plot is the test plot made at the reduced signal level. The test compares the F_S and Z_{MAX} of the reference unit at full signal level to the same parameters of a test unit measured at the reduced signal level. In addition to indicating the pass/fail status of the unit just tested the pass/fail dialogs also show the percent deviation from the

reference unit. This information can be helpful for production technicians when fine tuning the thresholds to be used to reject test units.

Figure 4 shows a unit that passes the run and buzz test. We see that the low level impedance of the test unit is a good match to the response of the reference unit at full level.

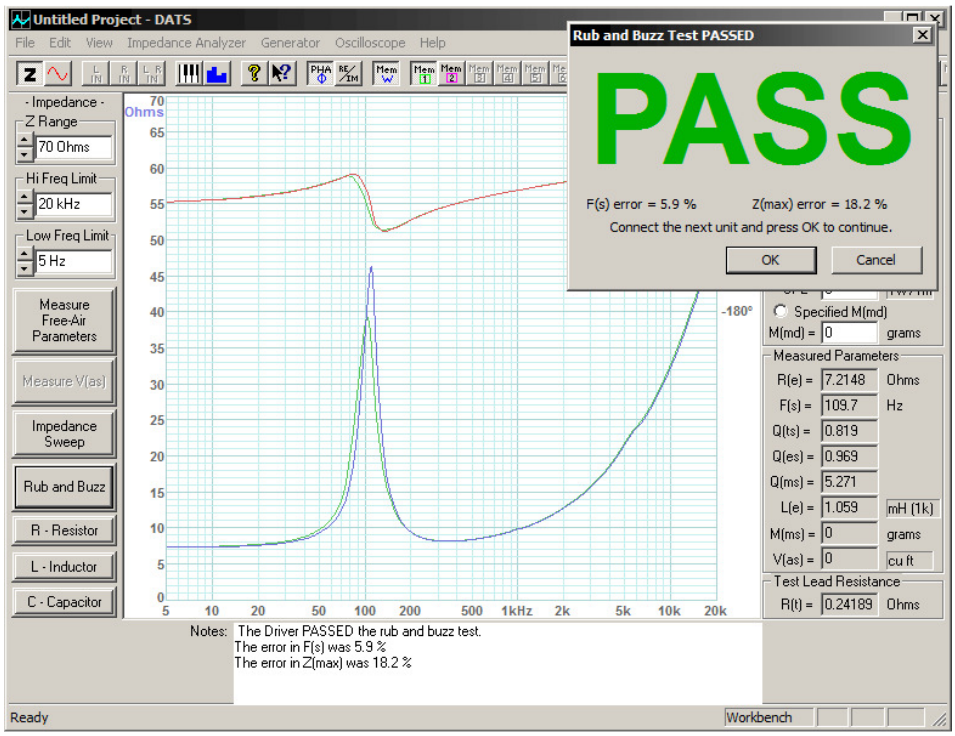


Figure 4: Rub and Buzz results for a good driver

In Figure 5 we see a speaker that has failed the Rub and Buzz Test by exceeding both the F_S and Z_{MAX} tolerance limits.

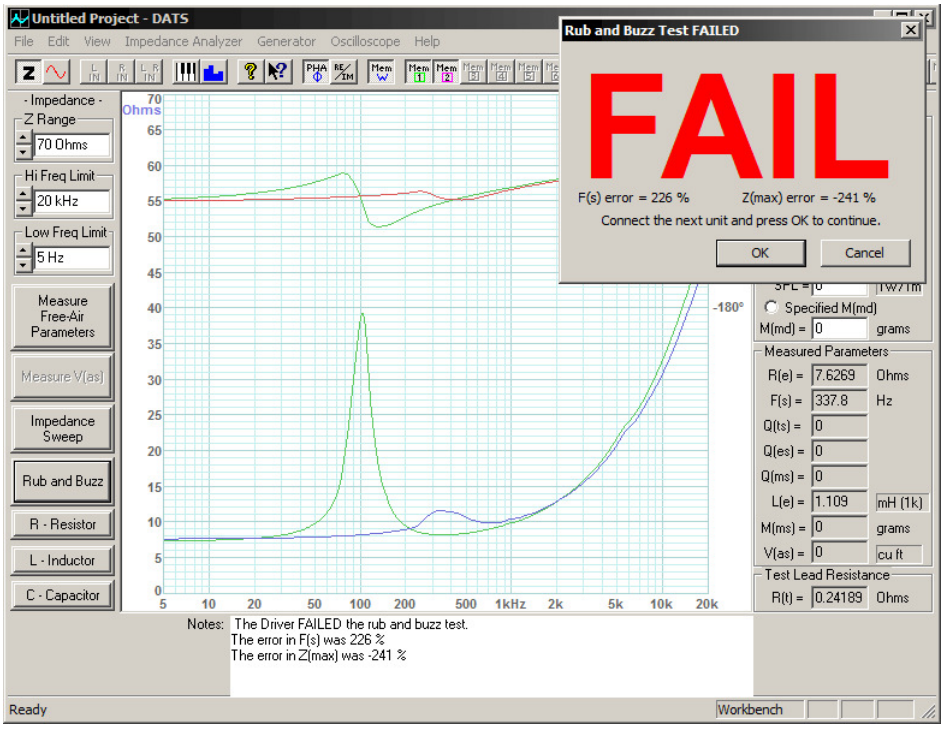


Figure 5: Rub and Buzz results for a defective driver

The F_S is in error by 226% with a tolerance setting of ±40% so it fails the F_S test. The Z_{MAX} is in error by -241% which exceeds the 100% tolerance setting for Z_{MAX} causing the driver to also fail this second aspect of the rub and buzz test. The shifted and miss-shaped resonance of the failed test unit is indicative of rubbing and is readily detected by the software. Good units and rubbing units are distinguished by comparing the F_S and Z_{MAX} of the test unit to that of the known good reference unit. Only if both parameters are within their tolerance settings does a unit pass the rub and buzz test. An individual (single) driver can be tested by letting it serve as its own reference in the Rub and Buzz test.

Measuring Resistors, Capacitors and Inductors with DATS:

The resistor, inductor and capacitor measurements employ a unique adaptive measurement procedure to assure highly accurate measurements. The R, L and C values are measured at many frequencies and then the most accurate data is identified and used to obtain the final values. This results in highly accurate and repeatable measurements of resistors, inductors and capacitors and their extended parameters.

Figure 6 shows the R, L and C measurement windows following typical measurements. Note that the inductors DC resistance is measured in addition to its inductance value. For capacitors DATS provides a number of measurements including: ESR (equivalent series resistance), DF (damping factor), Q and loss angle measured at three different frequencies: 120, 1k and 10k Hz.

- **Enhanced capacitor measurement:** The new capacitor measurement module goes beyond just measuring the capacitor's value and now includes measurement of the capacitor's equivalent series resistance (ESR), dissipation factor (DF), quality factor (Q) and loss angle (δ) at three different frequencies: 120, 1k and 10k Hz.

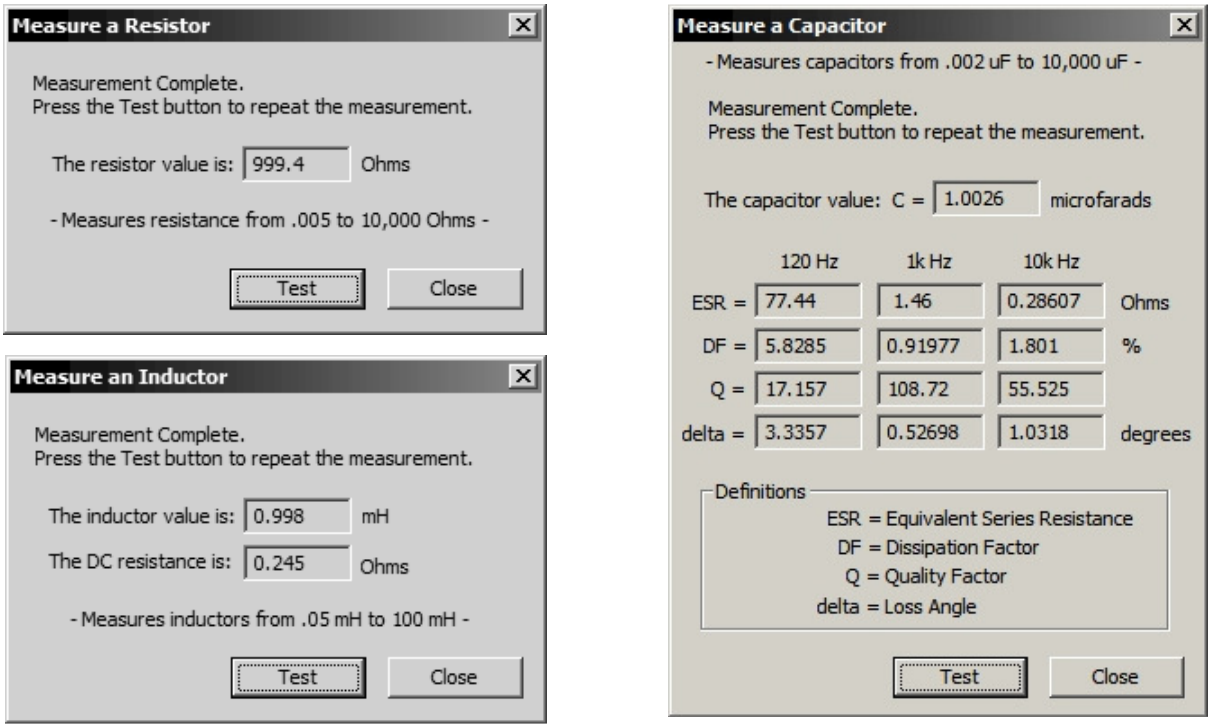


Figure 6: Typical resistor, inductor and capacitor measurement dialogs

System Troubleshooting with DATS:

DATS can also be used to diagnose fault conditions in complete multi-way speaker systems and even large installations with numerous speakers. In Figure 7 we see a comparison of a normal vented box 2-way speaker (lower curve) versus an identical speaker with a tweeter that has failed with an open circuit (upper curve). Most importantly, DATS shows that the impedance is significantly different between the two speakers thereby revealing that a problem exists. An experienced technician can quickly conclude from this comparison that the tweeter is most likely blown.

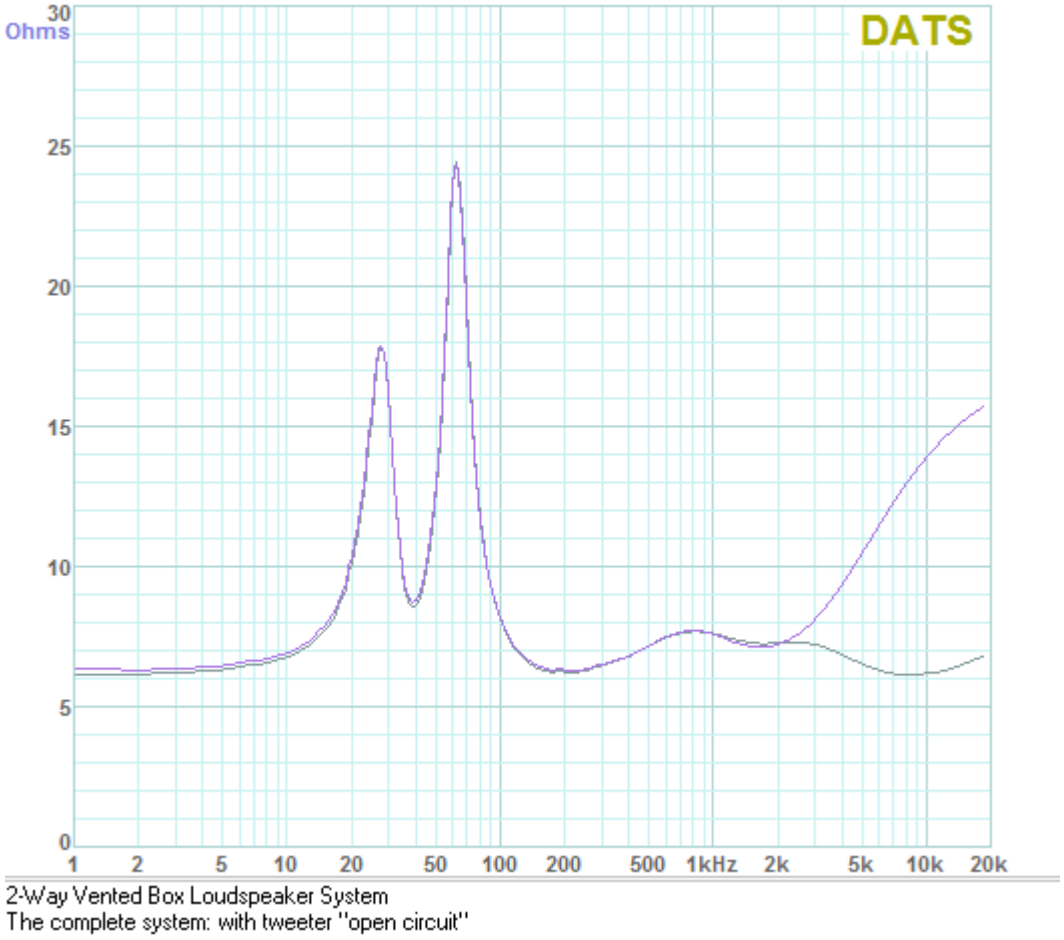


Figure 7: Troubleshooting a complete speaker system with DATS

This same comparative approach can be used for troubleshooting in a wide range of installed audio systems. Large sound system installations often employ 70 V audio distribution systems with long complex wire runs. By disconnecting the amplifier output and using DATS to sweep the 70 V speaker lines it is possible to compare different cable runs and quickly identify problems such as incorrect tap settings and open or shorted lines. Microphone cable runs (with microphones disconnected) can be tested in the same way as speaker cables.

The DATS Signal Generator and Oscilloscope Monitor:

The DATS signal generator produces a low-distortion sine wave adjustable from 5.0 Hz to 20 kHz. The output level is specified in dBu. In addition to the sine wave, the generator can also generate square, triangle, saw tooth and impulse waveforms as well as pink noise and white noise. The duty cycle of the square wave is adjustable**.** DATS also provides three different digitally synthesized logarithmic sine sweeps from 10 Hz to 20 kHz. This digital sweep is a high-resolution alternative to using pink noise or stepped sine methods for system testing. You can also use the repeating sweep as a quick way to identify speaker cables in complex installations.

At the top of the dialog bar is the On/Off button that starts and stops the generator output. Below the On/Off switch is the Frequency field where you enter the frequency for the sine wave generator. The generator can produce fractional frequencies such as 20.5 Hz which is very useful in low frequency testing where integer (whole number) frequencies are too coarse. The up/down buttons allow you to step the sine wave frequency up or down in steps of various sizes. Normally the frequency is stepped in musical half tones or 1/12th octave steps. If the Shift key is held down while stepping then the step size is increased to one octave. If the Ctrl key is held down then the step size is reduced to 1 Hz.

The DATS oscilloscope shows you the input audio waveform with amplitude on the vertical scale versus time on the horizontal scale. The dual-trace oscilloscope displays the input signals in several different modes. The voltage range can be adjusted from 5 V per division down to .001 V per division. The time base ranges from 200 ms/division down to 0.05 ms/division. The traces can be triggered from either the left or right inputs. The oscilloscope trace can be frozen at any time by stopping the generator. Oscilloscope controls are available at both the scope menu and at the dialog bar. The input to the oscilloscope is selected at the main toolbar. The background and trace colors for the scope display can be switched among 5 different color schemes at the View menu. The user's notes are saved along with the trace currently on the workbench with each project file.

In Figure 8 the oscilloscope screen at the left shows a sine wave on the left channel. The screen on the right shows a sweep on both channels. The blue trace shows the sweep at the "far" side of the unit's output sensing resistor whereas the red trace is the reference signal measured at the "near" side of the sensing resistor. The overall envelope of the sweep seen in the blue trace actually reveals the overall shape of the impedance measurement curve.

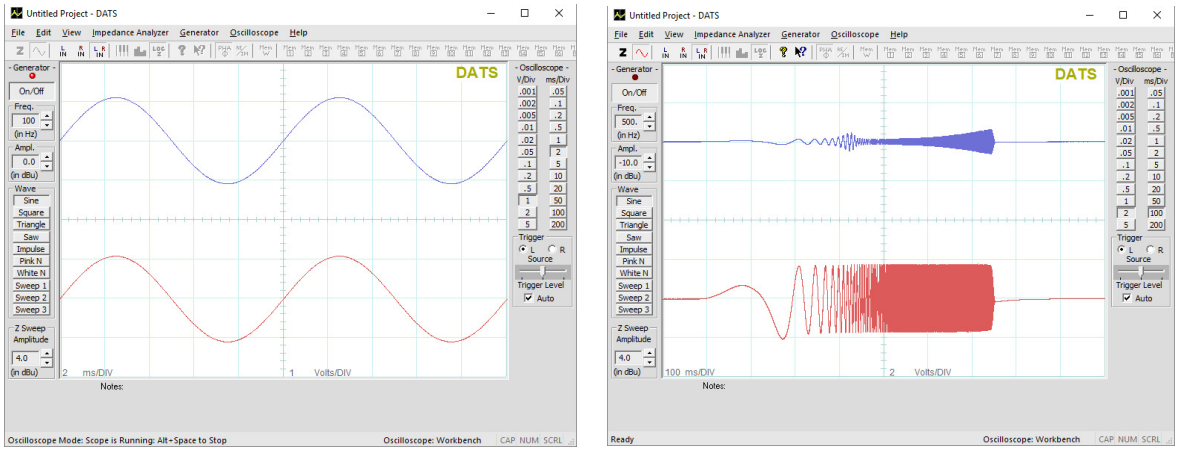


Figure 8: DATS Oscilloscope screens

DATS allows you to:

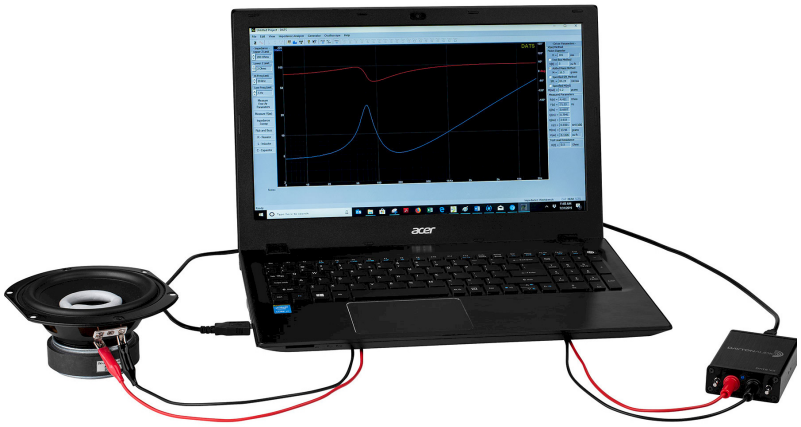
- Measure Speaker Parameters Quickly and Accurately (F_S, Q_{TS}, Q_{MS}, Q_{ES}, R_E, V_{AS}, etc.)
- Perform Rub and Buzz Testing (with Continuous Mode for Production Testing)
- Measure Values of Resistors, Capacitors (also ESR and DF) and Inductors (also R_E)
- Generate Audio Waveforms at Any Frequency or Level up to 20 kHz and +10 dBu
- Generate Sine, Square, Triangle, Saw Tooth and Impulse Waveforms
- Generate Pink Noise, White Noise and Three Different Log Sweeps
- Monitor Generator Output Waveforms On The Dual Channel Oscilloscope
- Design and Verify Impedance Compensation Networks
- Extract Parameters from Imported Driver Impedance Data
- Characterize Complete Loudspeaker Systems (F_{SC}, F_B, etc.)
- Diagnose Loudspeaker Fault Conditions (open or shorted drivers, cables or components)
- Perform General Purpose Impedance Measurements (1Hz to 20k Hz, and 1 Ohm to 10k Ohms)
- Measure Real and Imaginary Parts of the Impedance in Addition to Magnitude and Phase

Additional Features of DATS:

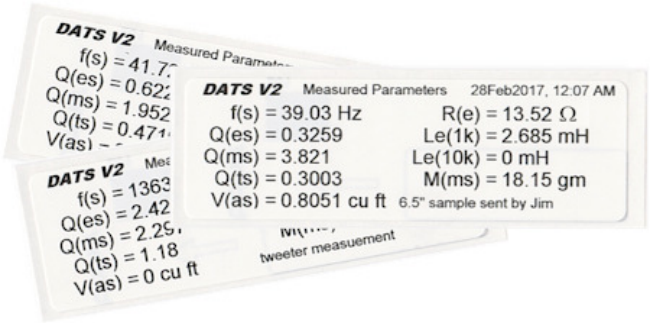
- Straightforward, Easy-to-Use Measurement Software
- Save and Load Project Files (Up to 20 Memories Each) and Print Custom Reports
- 1 Hz - 20,000 Hz Response, Measures any Loudspeaker Driver, Including Tweeters
- USB Connection Provides Power From and Data Transfer to the PC
- Compact USB Interface Includes Molded Test Leads with Large Alligator Clips
- Measured Data Can Be Printed or Saved to Create a Driver Library
- Parameters Can Be Exported to WinSpeakerz and Other Popular Box Design Programs
- Measures V_{AS} Using Added Mass, Test Box, Specified SPL or Specified M_{MD} Methods
- Easily Switch Between Measurement Units by Double-clicking the Units Field
- Manufactured with State-of-the-Art Equipment Using Surface Mount Components
- Blue LED Power Indicator
- Limited Five Year Warranty

Package Contents

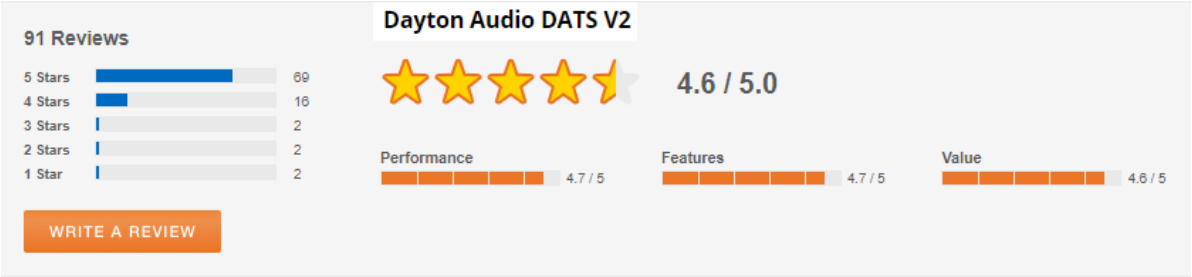
- The DATS V3 USB Speaker Measurement Interface
- Instructions for Downloading the Software and online User's Guide
- USB Cable and Alligator Clip Test Leads
- Quick Start sheet



DATS prints driver parameters to standard address labels:



User's loved the original DATS rating it an average of 4.6 stars out of 5 at the Parts Express product pages:



Here is a sampling of actual user comments from online reviews of DATS:

"I love the DATS"

"Perfect!"

"Very usefull for quick testing speakers"

"A vital tool for the speaker builder"

"Essential equipment for the serious speaker builder"

"outstanding value, a hobbyist MUST-HAVE"

"DATS is BRILLIANT"

"Simply fantastic"

"Excellent purchase choice!"

DATS V3 System Requirements

- ✓ A PC running Windows Vista, 7, 8 or 10
- ✓ At Least One Available USB Port

Buy DATS at Parts Express: http://www.parts-express.com/pe/showdetl.cfm?Partnumber=390-807

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