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HI-END AUDIO LABORATORY

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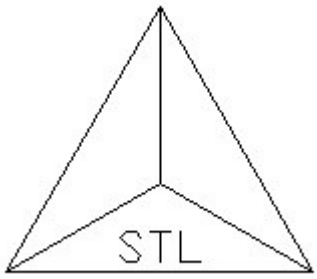
User Manual

Audio Tube Tester

ATT-2.01

Rev. E



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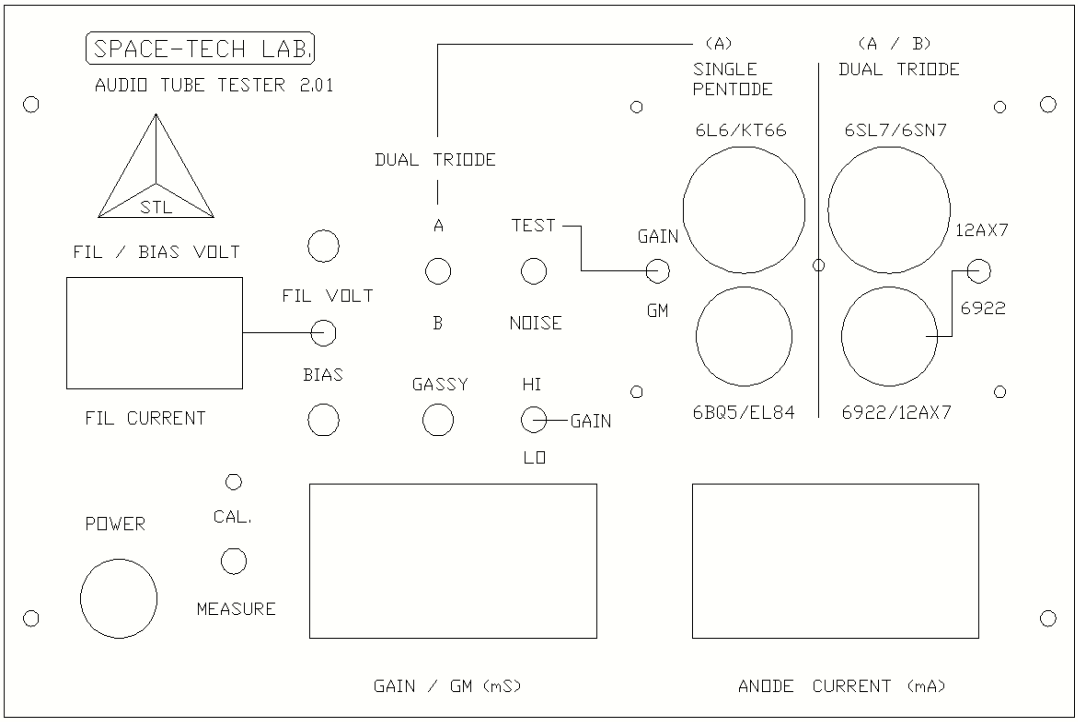
Product description:

This is an universal audio tubes tester with super user friendly human interface, no need for steep learning curve, just plug and play and get a very reliable and repeatable result on 'Gain', 'Gm mutual-conductance (mS)' and 'emission current (mA)' , so that you can select and match them for best audio experience. There are 4 test sockets include single pentode in octal 8 pin + regular 9 pin socket, as well as dual triode in octal 8 pin + regular 9 pin sockets.



Functional description:

For small signal tube testing, the bias setting usually set to max. as standard test point. For high power output tubes, please set bias to minimum as start, then turn to desired test current after tubes warm-up and take the reading. Usually we recommend use bias current between 40-60mA for power tube testing.

Bias – this knob control the bias current, for small to medium size tubes most of the case set to max. (around -0.8 to -1V) , for big size power tubes set to desired mA, most of the case 40-60mA (around max. for Gain test or -5V for GM test) will be proper for power tubes like 6550, EL34, 6L6, KT88...etc as reference point. You can also set to certain desired current to mimic the operation condition of your audio gears.

Test /Noise – this switch select "TEST" (Gain / GM) or "noise test" mode. When set to 'TEST' position, the reading of the Gain/Gm display will show actual Gain or Gm (mS) of the tube . If set to 'noise' position , the test signal will be cut out from the tube, so the display and RCA output is the residue noise of the tube and

the system background noise. When choose “Noise” test, the Gain/GM setting must in “Gain” position in order to have valid noise readings. Please be noted that the reading will be high initially and drop to a stable level of mV. If a tube has significant cracking noise, the readings will not be stabled but jump up and down. You can verify this effect by using finger nail to kick the glass of the tube under test, you should see the reading jumps up right away.

FIL VOLT / BIAS – This switch select between display of filament voltage or bias voltage, make sure set to proper filament voltage for the tube under test, otherwise the tube might be killed in minutes. For most safe operation, preset it to 6V and leave it alone, until other filament voltage needed. The display will show filament voltage supply to the tube under test when set to “FIL VOLT”

When set to “BIAS” position, the meter will show -ve bias voltage (display will not show the minus sign) , max. bias position was factory preset to around 0.8-1V, turn it anti-clockwise will increase the -ve bias voltage and decrease the bias current on the tube under test. Please be noted that this display can only show range between 0 to 10V for bias setting, more than 10V will still show as 10V. Usually when test small signal tubes like 12AX7, 12AU7, 6922, 6SL7, 6SN7 shall set to max. bias (-1V), and when test power tubes like 6L6, EL34, 6BQ5...etc , shall set to bias current around 50-60mA (typical bias V = -5V) in order to get correct readings.

Important : Make sure 12AX7, 12AU7, 12AT7, ECC82, ECC83....and all their compatibles use 6V setting in this tester, do not set to 12V to test those tubes otherwise damage to the tubes might result. The current reading in this meter is always showing the filament current no matter which position it is.

No matter which position, the current shown on the display is always the filament current.

(Note: when testing very high current tubes such as 6AS7G, this meter might be off due to excessive current drawn . Also due to the internal protection circuit, a tube with very high filament current such as KT150 or 6AS7G, you might need to raise the filament voltage from minium to the normal filament voltage for warming up)

GAIN / GM – This switch select between “Gain” test or “Mutual-conductance Gm” test. The relationship between gain and Gm is Gain = Gm x Rp , which Rp is the plate resistance of the tube. Which means in order to practically match tubes in the audiophile world, test the gain is the real deal, because even Gm is matching exactly but the Rp of the tube is different, the end result gain will be different too, and that will reflect in the channel balance. The Gm test is mostly for tube seller or manufacturer, because not all tubes being sold will be used in the audiophile field, in certain equipment circuits, Gm is the most important aspect for tube matching. This switch must set to “Gain” for noise testing. **GAIN/GM –** This switch select between “Gain” test or “Mutual-conductance Gm” test. The relationship between gain and Gm is Gain = Gm x Rp , which Rp is the plate resistance of the tube. Which means in order to practically match tubes in the audiophile world, test the gain is the real deal, because even Gm is matching exactly but the Rp of the tube is different, the end result gain will be different too, and that will reflect in the channel balance. The Gm test is mostly for tube seller or manufacturer, because not all tubes being sold will be used in the audiophile field, in certain equipment

circuits, Gm is the most important aspect for tube matching.

Hi / Lo – This switch select between “High Gain” or regular reading for the gain display. For tubes with gains higher than 30 can set to HG position, so that the gain reading will co-related to the data sheet. Such as 12AX7 with a idea gain of around 100, if use regular reading the tester will only show 30-40, if set to HG position then it can show the idea gain according to the tube datasheet. This setting can also use to enhance the resolution of the noise or gain reading display by multiply the measured reading by a few times, so that a higher reading will be displayed for more precise matching. A tube with gain of x10 might measure as 10.0, if the other tubes under matching shows 10.1, which is a resolution of +/- 0.5%. If set to HG position, then the first tube might display as 30.0, and the other tubes might show 30.1, this is a resolution of +/- 0.16%, much higher resolution than the regular settings.

GASSY – Set “TEST/Noise” switch to Noise position, for normal tubes this LED will not lit up in any bias position, for shorted grid tubes will show lit up when turn the bias pot in certain spots.

A/B – this switch select between different section of dual triode. Set to 'A' position for single pentode testing (6L6 and 6BQ5 socket) .

12AX7/6922 – this switch select between 12AX7 / 12AU7 / 12AT7 / 12AY7 group , and 6922 / 6DJ8 / ECC88/ ECC188/ ECC288 / 6H30 group . Filament voltage should set to 6V. (do not set to 12V otherwise the tubes might be killed)

Anode current meter – this meter shows the real time anode current (or plate current) of the tube under test in mA from 0.1-199.9mA. Due to the current limit protection of this unit, max. current reading will be less than 100mA.

Gain/Gm meter – this meter can shows either gain , Gm , calibrated reference and noise voltage by proper switch combinations. When set to “Gain” + “Test” + “Measure” it shows the amplification factor, when set to “GM” + “Test” + “Measure” it shows the Gm in mS, when set to noise it shows noise in AC mV, when set to calibrate it shows Reference signal in AC mV.

CAL. /Measure – this switch select between calibration mode or measurement mode, when set to “CAL.” position, the Gain/GM meter will show the reference voltage, user should calibrate the reading to between 99-101mV without any tubes in any sockets (thru a small hole with a trim pot right above this switch) , then the test result can be within +/- 1 % accuracy. Switch back to 'Measure' position after calibration for normal testing. Please be noted that the “TEST/Noise” switch has to set to “TEST” position when do the calibration without any tubes in the sockets. Due to temperature sensitive parts in the circuit, for the most accurate repeatable testing result, warm up this unit for at least 1 min before the calibration or testing.

Hi / Lo – This switch select between “High Gain” or regular reading for the gain display. For tubes with gains higher than 30 should set to Hi position, so that the gain reading will be more co-related to the data sheet. Such as 12AX7 with a idea gain of around 100, if use regular reading the tester will only show 30-40, if set to Hi position then it can show the idea gain according to the tube data sheet.

Noise Output – this is noise signal from the tube under test, you can connect to an audio amplifier with volume control and monitor the noise. Just use a noise free tube and set the volume of the amplifier to hear some regular background noise. Then put in a tube for noise test and hear if any different noise shows. You can use finger nail to hit on the body of the tube, the digital readout should indicate certain value, and you should hear the noise when connect to this output. There will always be some more or less stable readings when doing noise test even the tube is noise free, for noisy tubes, you will see the reading jump up and down, the higher the jump then the more noise it indicate. Which is similar to knock the glass of the tube with your fingure nail. The higher the noise reading vary when the nail hits the glass of the tube, the higher microphonics of the tube it is.

Note: 6922 is a very sensitive tubes, to test this tubes should first set the bias to minum, wait for the tube to warm up, then slowly increase the bias voltage untll the anode current shows 10-15mA, then you can take the gain or GM readings. Due to the instability of this tube, the bias current might drift quickly, so should keep close monitor and adjust the bias properly, otherwise the anode current might be too high and killed the tube with an extensive time of unattention.

The following tubes can be tested, as well as all their pin compatible models

(for 6922 / 12AX7 socket) 6V filament tubes set to 6922 position, 12V filament tubes set to 12AX7 position.
12AX7, 12AU7, 12AT7, 12AY7, 12AV7, 12BH7, ECC81, ECC82, ECC83, ECC85, ECC88, 5814, 5751, 6922, 6H30, 6N1P, 6DJ8 and all their pin & filament voltage compatibles..etc

(for 6SL7 / 6SN7 socket)
6SL7, 6SN7, 6SU7, ECC32, ECC33, ECC35, 5691, 5692 all their pin & filament voltage compatibles..etc

(for 6L6 / KT66 socket)
6L6, 6V6, 6Y6, 6G6, 6F6, 6550, EL34, KT66, KT77, KT88, KT99, KT100, KT120, KT150, 6CA7, 5881 all their pin & filament voltage compatibles..etc

(for 6BQ5 / EL84 socket)
6BQ5 , SV-83, EL84 all their pin & filament voltage compatibles..etc (EF86 and 6267 require converter)

Those tubes not in the above listing can still be tested as long as the pin configurations and filament voltage can fit this tester

With the upgrade of our 300B or 845 expansion adapter, the test capability can be further expanded.

Simply plug in the included small adapter cable, with the 8 pin octal end to the 6L6G socket, the 4 pin metal connector to the expansion adapter rear 4 pin input, and set to proper test voltage (between 2.5 to 12V) will do. Please make sure connector orientation must correct otherwise serious damage might happen to either the tube test or the expansion unit.

Example on how to test a 6SN7 (which is a dual triode, typical test current is 9-10mA according to most of the datasheet)

1. put in the 6SN7 tube to the test socket label 6SL7/6SN7
2. set A/B to A (testing for the side A of this dual triode)
3. set measure / cal to measure
4 set test/noise to test
5. 12ax7/6922 switch doesn't matter what position, since it is use to select either of these tubes
6. set Gain / GM to Gain
7. set Hi/Lo to Lo
8. cal. bias to make emission current around 9-10mA (right side meter)
9. wait for tube warm up and the reading on the gain/GM (meter in the center) meter should be the gain
10. set Gain /GM to GM
11. cal. bias to make emission current around 9-10mA (right side meter)
12. the reading on the gain/GM meter is the GM in mS , if you want the reading in uS just multiply it by 1000.
13. set A/B to B (testing for the side B of this dual triode)
14. repeat step 3 to 12
15. set test/noise to noise (test the noise of side B since the A/B is already in B position)
16. the basic noise level of the tube should shown in the gain/Gm meter, if the meter shows a stable reading then it is just the background system noise and no need to concern. If the reading is jumping up and down then this is the noise of the tube, the observation pretty much the same as when you tapping the glass of the tube with your finger.
17. set A/B to A (test the noise of side A this time)
18. after test remember to remove the tube from the test socket. Left the tube in the tester unattented might shorten the lifespan of the tube and the tester.

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Reference Data (different tube manufacturers may vary)

Testing examples on reading of different common audio tubes
Set GM/ Gain , then set Hi/Lo accordingly
Calibrate the Bias knob to make the Anode Current roughly within the range (mA) then you should get the proper GM and Gain readings respectively

	GM (mS)	Bias(mA)	Gain (Lo) / (Hi)
6922/6DJ8	7.0 – 13.0	10-15	20-40
12AX7/ECC83	1.0 - 2.0	0.8-1.0	80-120
12AU7/ECC82	2.0 – 3.0	8-12	15-20
12AT7/ECC81	3.5 - 4.5	5-6	50-100
6SN7	1.5 – 3.0	9-10	15-25
6SL7	1.0 – 2.5	2-2.5	60-90
6SU7	1.5 - 3.0	2-2.5	60-90
6L6G/EL34/6550/KT88	4.0 -12.0	30-40	6 - 10
6BQ5/EL84	11.0 – 14.0	25-35	15-20

for more information about gain and exact Gm of certain models, please search on the web for tube data sheet.

Power input :

AC version : 100-240V AC 50-60Hz (for USA and CANADA orders)

DC version 12V DC 5A (international orders will be built using this option including an external DC 12V adapter)

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Caution: There is high voltage inside this unit and its attached modules , should not open the box unless with qualified technician or under proper instruction at your own risk !!

Disclaimer:

In no event shall our company be liable for any direct, indirect, punitive, incidental, special consequential damages, to property or life, whatsoever arising out of or connected with the use or misuse of our products

Warranty : One year free parts and labor manufacturer warranty apply under normal operation condition , buyer pay shipping. Physical damage or abuse of system will not covered.