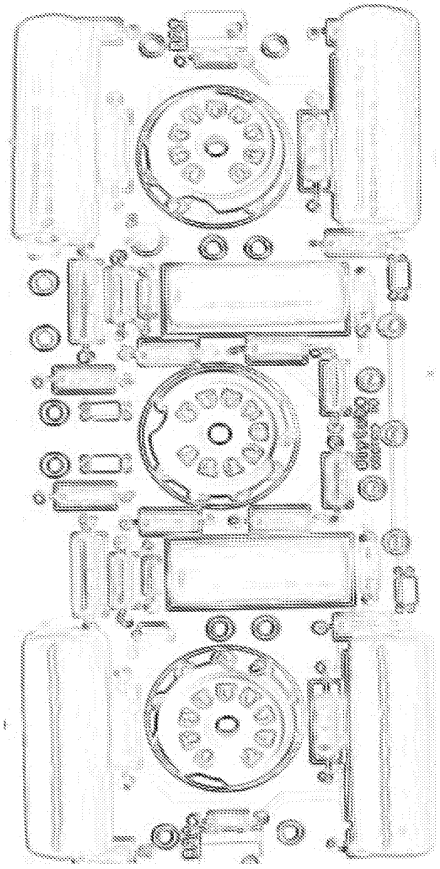
diytube
stereo 70 driver board

INSTRUCTIONS FOR ASSEMBLY AND OPERATION



Assembled version by Tubezone.net Inc, Chicago, USA

diytube ST70 Driver Rev B

TubeZone Assembled Version

Item	QTY	Reference	Part
Resistors (Wattage ratings are minimums)			
0	4	R1, R2, R7, R8	1K, 1/4W
0	2	R3, R4	475K, 1/4W
0	2	R5, R6	100 ohm 1/4W
0	2	R9,R10	2.7K 1/4W
0	2	R11,R12	100K 1/2W
0	2	R13,R14	5.6K 1/4W
0	4	R15,R16,R27,R28	1M 1/8W
0	2	R17,R18	15 Ohm 1/8W
0	4	R19, R20, R21, R22	47K, 2W
0	4	R23,R24,R25,R26	150K 1/4W
0	2	R29,R30	500K Variable Control
Capacitors			
0	2	C1, C2	0.1uF 600v
0	2	C3, C4	220pF
0	2	C5, C6	330pF
	4	C7,C8,C9,C10	0.047uF 600v
Semiconductors			
0	2	Q1,Q2	LM334Z

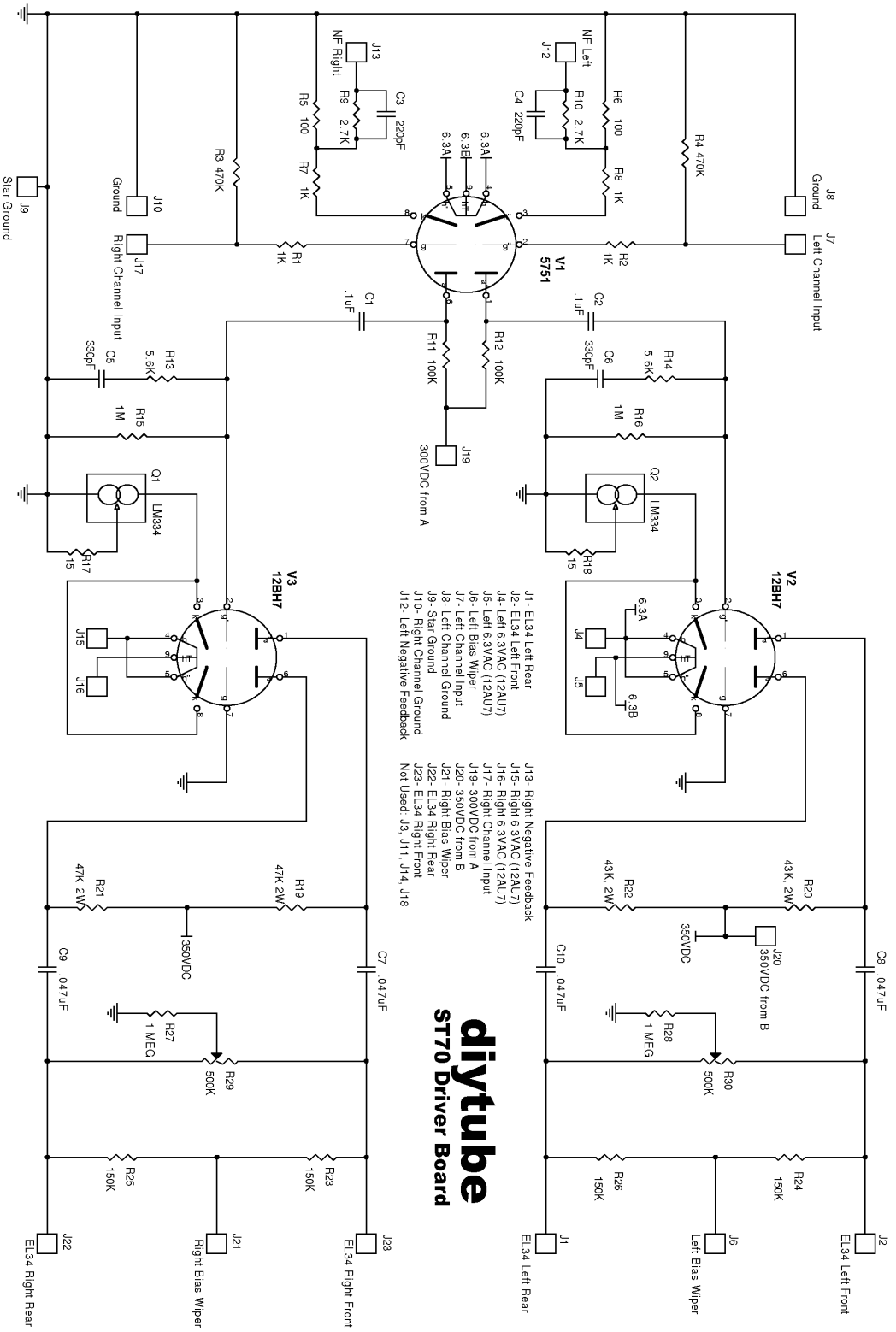
Other Parts

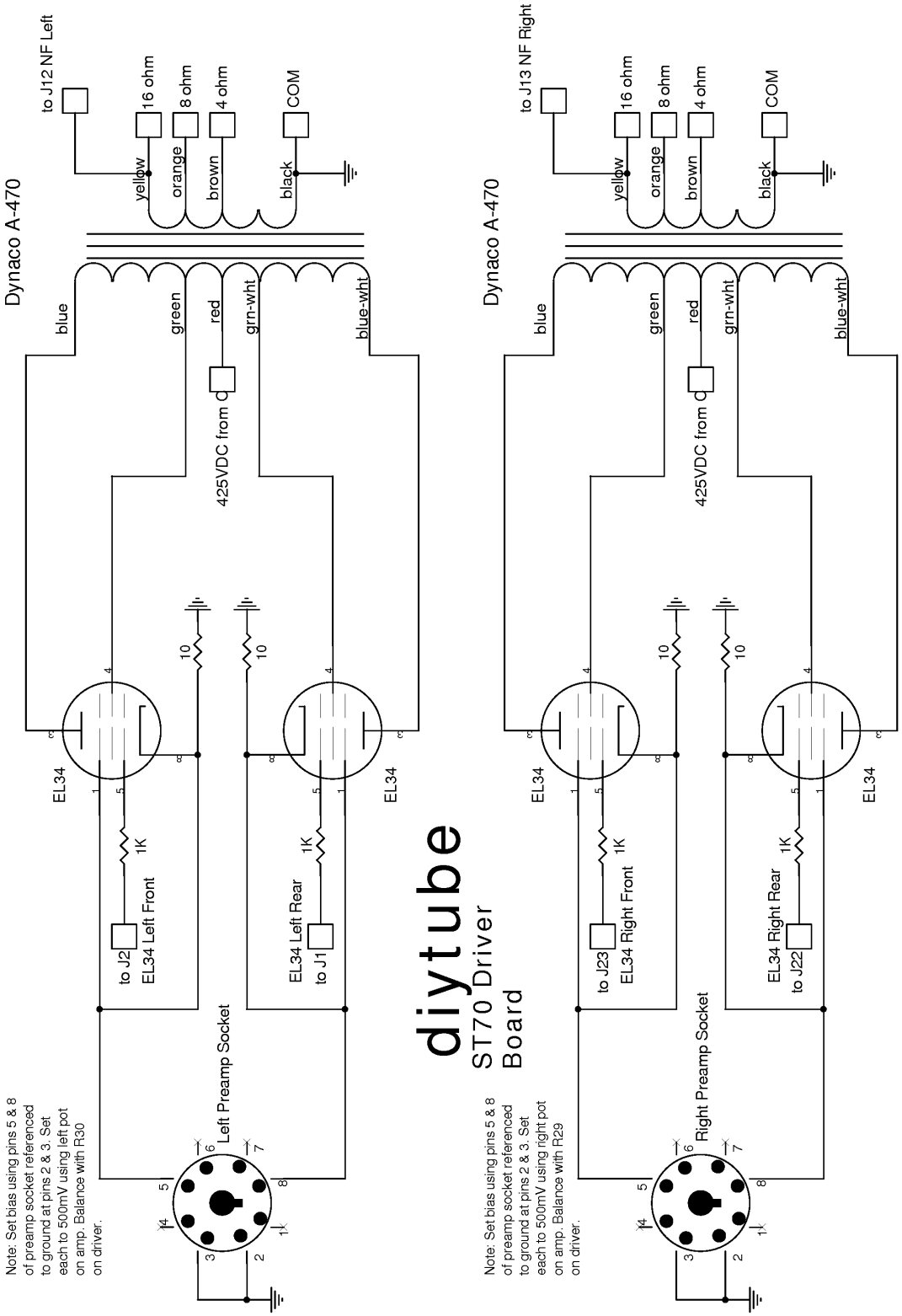
() **Ceramic Gold Plated 9 Pin Sockets**

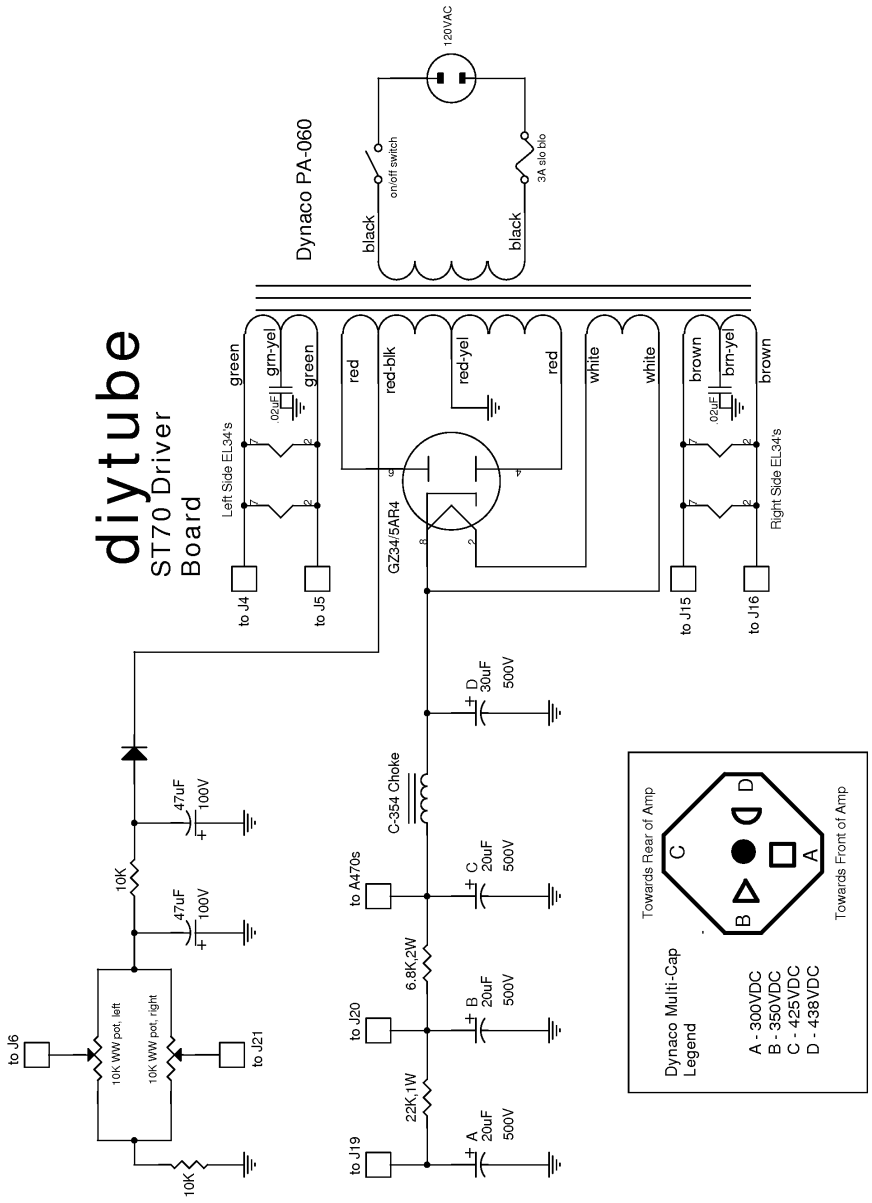
() **V1 5751 Tube**

() **V2,V3 12BH7 Tube**

Additional 10 ohm 1% resistors for bias metering (required for implementation of individual tube bias balancing) and resistors for the EL34 sockets (1K 1/4W) are included. These extra items do not go on the board.


diytube
ST70 Driver Board
V1
5751
V2
12BH7
V3
12BH7
J1- EL34 Left Rear
J2- EL34 Left Front
J4- Left 6.3VAC (12AU7)
J5- Left 6.3VAC (12AU7)
J6- Left Bias Wiper
J7- Left Channel Input
J8- Left Channel Ground
J9- Star Ground
J10- Right Channel Ground
J12- Left Negative Feedback
J13- Right Negative Feedback
J15- Right 6.3VAC (12AU7)
J16- Right 6.3VAC (12AU7)
J17- Right Channel Input
J19- 300VDC from A
J20- 350VDC from B
J21- Right Bias Wiper
J22- EL34 Right Rear
J23- EL34 Right Front
Not Used J3, J11, J14, J18


diytube
ST70 Driver
Board
Dynaco A-470
to J12 NF Left
16 ohm
8 ohm
4 ohm
COM
yellow
orange
brown
black
blue
green
red
grn-wht
blue-wht
425VDC from choke
EL34
EL34
10
10
1K
1K
to J2
EL34 Left Front
EL34 Left Rear
to J1
Left Preamp Socket
Note: Set bias using pins 5 & 8 of preamp socket referenced to ground at pins 2 & 3. Set each to 500mV using left pot on amp. Balance with R30 on driver.
Dynaco A-470
to J13 NF Right
16 ohm
8 ohm
4 ohm
COM
yellow
orange
brown
black
blue
green
red
grn-wht
blue-wht
425VDC from choke
EL34
EL34
10
10
1K
1K
to J23
EL34 Right Front
EL34 Right Rear
to J22
Right Preamp Socket
Note: Set bias using pins 5 & 8 of preamp socket referenced to ground at pins 2 & 3. Set each to 500mV using right pot on amp. Balance with R29 on driver.



Note: This diagram shows the original twist-lock can capacitor. If you have the SDS Labs capacitor board or other power supply upgrade, please refer to documentation for your board or upgrade.

VOLTAGE CHART

- **DC measurements (unless noted)**
  - **Shorted input, no signal**
  - **All measurements +/-5%**

V1	**12AX7**
PIN#	
1	190V
2	0V
3	1.2V
4	6.3VAC ←|
5	6.3VAC ←|
6	190V |
7	0V |
8	1.2V |
9	6.3VAC ←|

V2,V3	**12AU7**
PIN#	
1	245V
2	0V
3	13V
4	6.3VAC ←|
5	6.3VAC ←|
6	245V |
7	0V |
8	13V |
9	6.3VAC ←|

V4-V7	**EL34**
PIN#	
1	500mV
2	6.3VAC ←|
3	418V |
4	421V |
5	-35V |
6	-35V |
7	6.3VAC ←|
8	500mV

V8	**GZ34/5AR4**
PIN#	
1	0V
2	438V
3	0V
4	366VAC
5	0V
6	366VAC
7	0V
8	438V

J1	-35V
J2	-35V
J4	6.3VAC ←|
J5	6.3VAC ←|
J6	-37V
J7	0V
J8	0V
J9	0V
J10	0V
J12	0V

J13	0V
J15	6.3VAC ←|
J16	6.3VAC ←|
J17	0V
J19	300V
J20	350V
J21	-37V
J22	-35V
J23	-35V
Not Used:	J3,J11,J14 & J18

MultiCap Lugs

A	300V
B	350V
C	425V
D	438V

Note: This voltage chart shows voltages on the original twist-lock can capacitor. If you have the SDS Labs capacitor board or other power supply upgrade, please refer to documentation for your board or upgrade for voltage chart and checkpoints.

RESISTANCE CHART

- **Take measurements when unit is OFF and power supply caps are drained**
- **[ ] bracketed numbers are in-circuit values**
- **Consider readings >10 meg to be open**
- **All measurements +/-5%**

V1	**12AX7**
PIN#	
1	open
2	475K
3	1.1K
4	open
5	open
6	open
7	475K
8	1.1K
9	open

V2,V3	**12AU7**
PIN#	
1	open
2	475K
3	open
4	open
5	open
6	open
7	less than 1 ohm
8	open
9	open

V4-V7	**EL34**
PIN#	
1	10 ohms
2	open
3	xxx
4	xxx
5	xxx
6	xxx
7	open
8	10 ohms

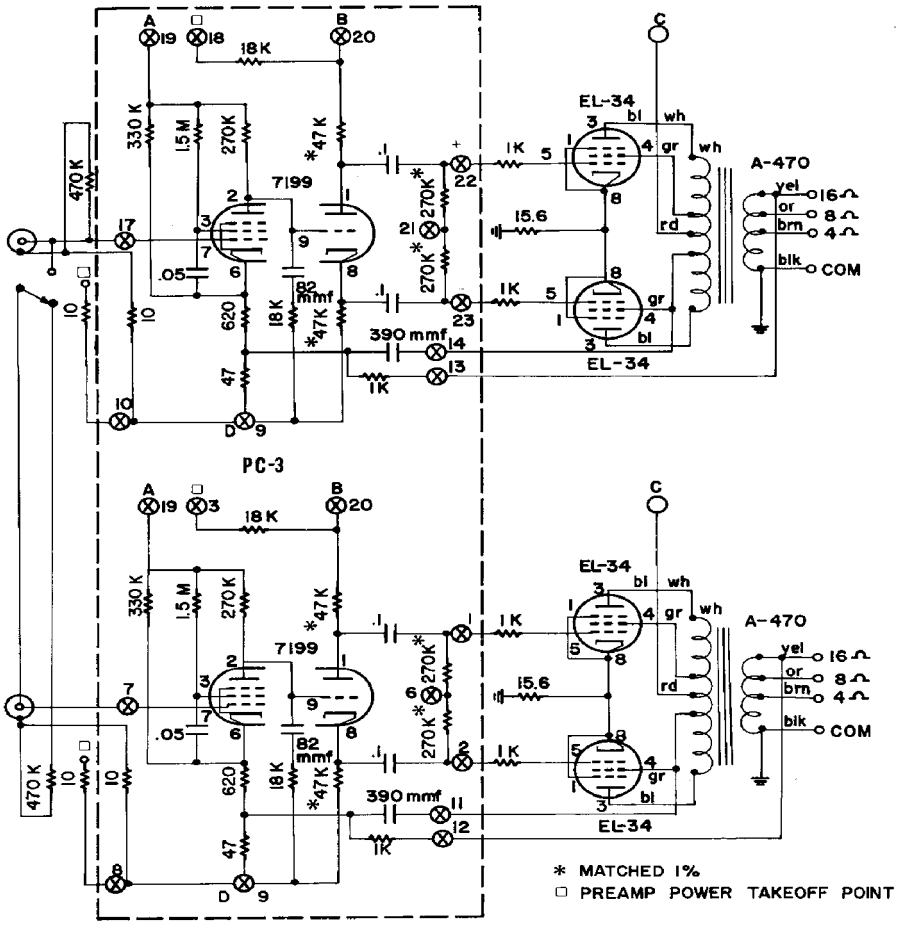
V8	**GZ34/5AR4**
PIN#	
1	open
2	xxx
3	open
4	xxx
5	open
6	xxx
7	open
8	xxx

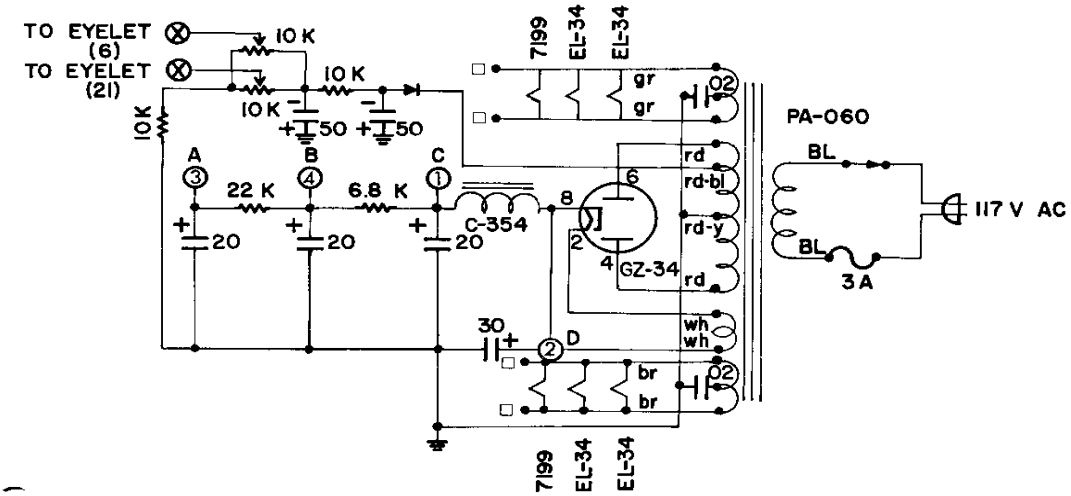
J1	1.2 meg	**J13**	2.84K [1 ohm]
J2	1.2 meg	**J15**	open
J4	open	**J16**	open
J5	open	**J17**	475K
J6	1.2 meg [14K]	**J19**	open
J7	475K	**J20**	open
J8	less than 1 ohm	**J21**	1.2 meg [14K]
J9	less than 1 ohm	**J22**	1.2 meg
J10	less than 1 ohm	**J23**	1.2 meg
J12	2.84K [1 ohm]	**Not Used:**	J3,J11,J14 & J18

MultiCap Lugs

A	xxx
B	xxx
C	xxx
D	xxx

Original ST70 board and power supply schematic





READ ME FIRST!

This is a modified version of the usual disclaimer/warning that comes with most transmitting equipment and parts.
Since similar conditions exist in all tube audio amplifiers we believe it be appropriate here.
Please note prior to beginning construction that there are high(over 400 volts) DC and AC voltages present in the equipment you are about to work on, and in the right situation these voltages could injure or kill you if you contact them. Normally the worst you can encounter is a nasty shock, however you must remember at all times this possibility of a injurious situation.
Follow the same precautions you would with any electrical appliance,including not working with plugged in equipment (including soldering irons) with bare feet on a wet floor, use only insulated probes & tools when working on live high voltage, and if you are working with one hand taking measurements or working in live equipment, keep the other hand off the chassis or other grounded conductive item. Always use the proper size fuse or circuit breaker in the equipment installed when operating amplifiers or any other electronic gear.
In a work situation you would be required to use eye protection when working with tools, soldering, or testing equipment and we strongly recommend you do so also, and remind you that when you fail to use safety glasses or follow recommendations regarding safety or simply do not practice common sense about safe procedures, you do so completely at your own risk.
Failing or defective components in high voltage tube equipment, particularly elderly equipment, when failing may arc, spark,smoke, spit, sputter, get hot enough to burn flesh, catch on fire, rupture or shatter sending shards of possibly hot glass, metal, or plastic at your face or body and may spew possibly hot and injurious goo or fluid, or cause normally harmless pieces of metal to become electrically charged at dangerous voltages.
If you have no previous experience repairing high voltage equipment, we suggest you have a professional repair person to install this modification for you , or obtain competent third party help and a you must have a basic knowledge of electronic components, soldering, and construction techniques prior to proceeding.

A. I'm assuming here that you are replacing the ORIGINAL (Dynaco supplied or copy) board. If you are replacing a NON-Dynaco board, refer to diagram and connection chart in pages 3 , 4 and 5 to verify connections, as some numbers or connections MAY be different.

- 1. Remove bottom cover of amplifier and all tubes.
- 2. Turn Amplifier upside down. Before removing the original Dyna P.C. board, a good idea is to tag a number on each wire that goes to an eyelet or pad with the corresponding number. This will help prevent errors in reassembly. Also at this time, check any of the original wiring that is going to be used, over the years, the wiring may have become unusable. Replace wiring where necessary.
- 3.Unsolder all wires from board, also resistor(s) connecting ground side of input jack(s) to board.
- 4.Unscrew bolts (or drill out rivets in factory-wired unit), remove old PC board.
- 5.Bolt in the new board (use 6-32 screws and nuts if old ones not available)
- 6.Note that all terminal numbers on the conversion board correspond to the original Dyna eyelet numbers, except where the eyelet numbers are not used on the new board.
- 7. Remove any 15.6 ohm resistors found between the pin 8 or pin 1 of the EL34's and chassis ground. Remove wires connecting between pins 8 of the pairs of EL34's if present. Install 10 ohm 1/4 watt resistors between pin 8 of each EL34 and chassis ground (or star ground if you are using star grounding). The small resistors serve a dual function, besides metering cathode current for bias setting, they serve as a fusible link to disconnect the tube in the event of a tube short or failure. **Please avoid the temptation to replace with larger parts.** (and try to politely ignore any well-meaning advice you may hear to the contrary). Wires may be installed from pin 8 of each EL34 to empty lugs on the power takeoff socket or a pin jack, for outboard bias measurements.
- 8.There must be jumpers soldered between pins 1 and 8 on each EL34 socket. **The EL34's will not bias or operate properly without these jumpers installed.**
- 9. Reconnect and solder all other wires (not resistors) to pads as numbered. **See list on next page to double-check your connections.**

- **IMPORTANT: A 1K resistor goes from Pin 6 to Pin 5 on each EL34 socket - the amp won't work without these installed. No other connections should be made to pin 6 or 5 on these sockets.**

Using the original Dynaco schematic as a map, the following list of connections to terminals on the new PC board will help if you have any doubts about which wire goes where:

- 1 : To pin 6 of V2 (EL34 tube)
- 2 : To pin 6 of V3 (EL34 tube)
- 3 : **There is no Terminal 3 or 18** for power for PAM preamps. If you need a power-takeoff for a PAM-1 preamp, you'll need to attach a pair of 18K 1/2 W resistors from Terminal 19 to pin 5 of each of the power takeoff sockets.
- 4 & 5 : To pins 1 & 2 of left power takeoff socket, or pins 2 & 7 on one of the EL34 sockets. This is filament line for left board channel.
- 6 : To center lug of left bias control. (Left channel bias supply)
- 7 : To left channel RCA input jack.
- 8 : 10 ohm resistor to outside (ground) case lug of input jack, 10 Ohm ground isolation resistor to pin 3 of left channel power takeoff socket, if used, other ground connections if needed.
- 9 : To chassis ground lug (near quad section filter capacitor or ground lug on capacitor board).
- 10 : 10 ohm resistor to outside (ground) case lug of input jack, 10 Ohm ground isolation resistor to pin 3 of left channel power takeoff socket, if used, otherwise, other ground connections if needed.
- 11 : **There is no terminal 11.** The original wire to pin 4 of the EL34 tube may be removed.
- 12 : To 16 Ohm tap of left channel speaker terminals.
- 13 : To 16 Ohm tap of right channel speaker terminals.
- 14 : **There is no terminal 14.** The original wire to pin 4 of the EL34 tube may be removed.
- 15 & 16 : To pins 1 & 2 of left power takeoff socket, or pins 2 & 7 on one of the EL34 sockets. This is filament line for left board channel.
- 17 : To right channel RCA input jack.
- 18 : **There is no Terminal 3 or 18** for power for PAM preamps. If you need a power-takeoff for a PAM-1 preamp, you'll need to attach a pair of 18K 1/2 W resistors from Terminal 19 to pin 5 of each of the power takeoff sockets.
- 19 : To lug 3, quad section filter cap, or corresponding lug/pad on capacitor board. (305 volt source)
- 20 : To lug 4, quad section filter cap or corresponding lug/pad on capacitor board.. (375 volt source)
- 21 : To center lug, right bias control.
- 22 : To pin 6 of V7. (EL34 tube)
- 23 : To pin 6 of V6. (EL34 tube)

Before going onto the biasing step, get a large dummy load or a pair of cheap speakers (meaning ones that you won't miss if they are damaged) and hook them up to the proper impedance outputs. Avoid running the amplifier with no output load (even shorted is preferable to open) Note that even if all the voltages check out properly, oscillation (audible, subsonic or ultrasonic) and or intermittent connections can damage speakers. Always check out repaired amplifiers on dummy loads or expendable speakers first. **Dummy loads can get hot, watch out!**

If tubes won't bias, go to "Bias Troubleshooting on Page 13.

Biasing Instructions:

Note: Always use test loads on your speaker terminals, e.g. two 8 ohm power resistors. Be sure to have the RCA inputs loaded or shorted.

The first steps make sure your bias supply is working, is semi-balanced, and won't cause a melt down on first power up. Maintenance biasing can go directly to step #5.

1) Remove your 5AR4 and power the amp. The bias voltage will appear immediately at J6 and J21 on the diytube PCB. Adjust the wire-wound pots on the ST70 chassis so that these voltages go as negative as possible (eg -55VDC), but adjust to have the voltage the same on both test points. You can use the preamp socket pins 2 or 3 as your DMM ground.

2) Turn the unit off. Replace your 5AR4 rectifier. Turn on unit.

3) Because adjusting one side usually changes the bias on the other side, you will now start ping-ponging between the sides adjusting the wire wound pot and measuring one of the bias points on that side unit you near 400mV.

4) Now that you are around 400mV on all the tubes, stick your DMM probes in pins 5 & 8 of the preamp socket. You are measuring the small voltage difference between the biasing of the EL34 pair. Now adjust the respective balance pot (R29 or R30, depending on which side you are adjusting) until the voltage you read is zero or near zero difference. You might end up changing the scale of your DMM to the 300mV region. Do on both sides.

5) Now repeat step #3, but adjust to 500mV (500mV drop across the 10 ohm resistor is 50mA idle current) using the Dynaco wire-wound pots.

6) Now repeat step #4 for push pull perfection.

Simple Bias Troubleshooting:

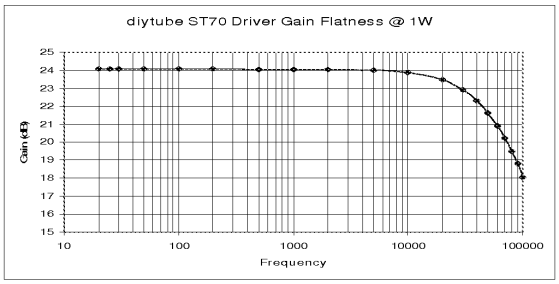
- **1.One set of tubes draws excessive bias current (biaset too high).** Swap the offending pair of tubes with the tubes from the other side/amp. If the problem follows the tubes to the other side indicates probable bad tube. If the problem remains on the side where it was originally, possible bad tube socket or bad connection in grid bias circuit (often open bias control) on that side.
- **2. All tubes (both banks) draw excessive current (biaset too high).** Check voltages in bias circuit. If they appear normal (usually will create negative voltage of 30 to 40 volts at eyelets # 6 and 21 on ST70, 50-60 volts on eyelet 3 on Mk3), then check for excessive voltage drop (use a high impedance voltmeter to check this such as a VTVM) across the 100K (Mk2/Mk3) or 270K (ST70) grid resistors. If a drop of more than a few volts is found on only one, or on one of each pair, indicates severe tube unbalance or possible defective tubes. If found on all tubes indicates that amplifier must be modified for lower DC grid circuit resistance (reduce value of the grid resistors) to accommodate the tubes you have chosen. If no excessive voltage drops found across these resistors, and other bias circuit voltages appear normal, indicates type or brand of tube used requires modification to bias circuit to be used in this amplifier. (ie: 10K or 1K resistor between control & bias diode must be made a smaller value)
- **3.One tube glows red or orange.** Swap the offender with another tube on either side (keep track of which one you swapped!) If condition follows tube, this indicates a probable defective tube or possibly bad solder joint inside the tube pins (which may be fixed by heating the pins/terminals with soldering iron). If condition appears in the same socket with a different tube indicates either a bad or wrong connection to that socket or a bad socket. Try re-soldering connections to socket terminals.
- **4.Biaset won't go high enough.** Generally either means output tubes are worn out, 5AR4 rectifier tube is worn out (or you are using another tube in place of a 5AR4) or the 10K resistor from the bias controls to ground is either defective, not connected or out of tolerance (value too high). This could also be caused by a bad or internally cracked/damaged bias control. Occasionally even new tubes do not draw sufficient current, in this case, either replace the 10K bias controls with a higher value, or reduce the value of the 10K or 18K resistor going to ground from the bias controls (try a 5K or similar in ST70, 10K in Mk3).

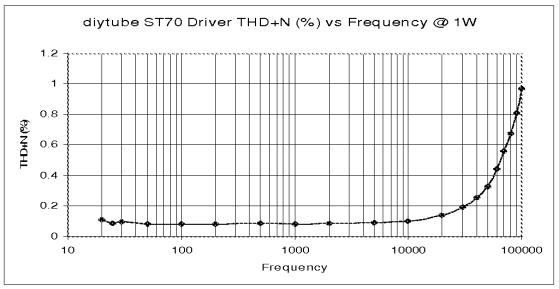
Bias control modifications: Many tubes ,such as 6L6-GC, KT66, KT88 or 6550, which may be installed in the ST70 after completion of the conversion board installation will require negative bias voltages outside the normal range of the bias voltage controls of the original ST70. The following arrangement will allow more bias control range and accommodate most tubes.
A. Locate the original 10K ohm bias control potentiometer.
Remove and replace with linear controls of 20K to 30K.
Use of a 1 or 2 watt control is recommended, however a 1/2 watt unit will work.
B. Locate the two 10K ohm resistors on each side of the potentiometers between the pots and ground on one side and between the pots and the bias diode on the other. Replace these resistors with units approximately 5K ohm (4.7K or 5.6K will do fine), at least 1/2 watt rating.
C. Turn the controls full counterclockwise (left), turn on the amplifier, and re-bias the output tubes by the biasing instructions on the previous page.

For further help, you can contact TubeZone by phone at 773-782-6145, by email at http://www.tubezone.net/contact/index.html ,
or research answers or post a message on the DIYtube ST70 discussion board at: http://www.diytube.com

Test & Measurement Data

20Hz	2.881V	+24.06dB	.111%THD+N	1.04W @ 8ohm
25Hz	2.881V	+24.06dB	.089%THD+N	1.04W @ 8ohm
30Hz	2.88V	+24.06dB	.098%THD+N	1.04W @ 8ohm
50Hz	2.879V	+24.06dB	.084%THD+N	1.04W @ 8ohm
100Hz	2.879V	+24.06dB	.08%THD+N	1.04W @ 8ohm
200Hz	2.88V	+24.06dB	.081%THD+N	1.04W @ 8ohm
500Hz	2.877V	+24.05dB	.088%THD+N	1.04W @ 8ohm
1kHz	2.878V	+24.05dB	.084%THD+N	1.04W @ 8ohm
2kHz	2.877V	+24.05dB	.089%THD+N	1.03W @ 8ohm
5kHz	2.862V	+24.00dB	.091%THD+N	1.02W @ 8ohm
10kHz	2.825V	+23.89dB	.101%THD+N	.997W @ 8ohm
20kHz	2.692V	+23.47dB	.138%THD+N	.906W @ 8ohm
30kHz	2.525V	+22.92dB	.195%THD+N	.796W @ 8ohm
40kHz	2.355V	+22.29dB	.254%THD+N	.694W @ 8ohm
50kHz	2.19V	+21.63dB	.326%THD+N	.6W @ 8ohm
60kHz	2.034V	+20.92dB	.443%THD+N	.518W @ 8ohm
70kHz	1.88V	+20.21dB	.558%THD+N	.442W @ 8ohm
80kHz	1.739V	+19.51dB	.673%THD+N	.379W @ 8ohm
90kHz	1.621V	+18.81dB	.809%THD+N	.329W @ 8ohm
100kHz	1.491V	+18.06dB	.967%THD+N	.278W @ 8ohm

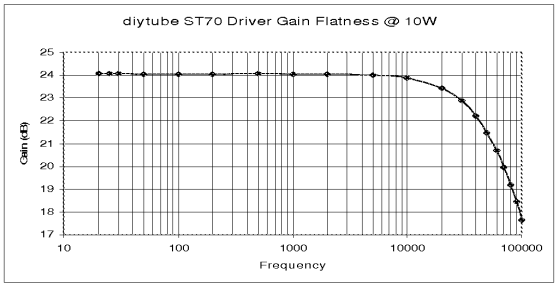


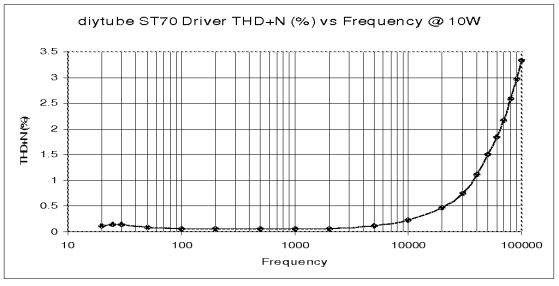


diytube ST70 driver closed loop 1W output

- 180mVrms input

20Hz	9.V	+24.07dB	.111%THD+N	10.15W @ 8ohm
25Hz	8.99V	+24.07dB	.145%THD+N	10.13W @ 8ohm
30Hz	9.V	+24.07dB	.145%THD+N	10.13W @ 8ohm
50Hz	8.97V	+24.05dB	.084%THD+N	10.06W @ 8ohm
100Hz	8.97V	+24.05dB	.059%THD+N	10.08W @ 8ohm
200Hz	8.97V	+24.05dB	.053%THD+N	10.06W @ 8ohm
500Hz	8.98V	+24.06dB	.052%THD+N	10.08W @ 8ohm
1kHz	8.97V	+24.05dB	.053%THD+N	10.04W @ 8ohm
2kHz	8.96V	+24.04dB	.063%THD+N	10.04W @ 8ohm
5kHz	8.93V	+24.01dB	.111%THD+N	9.946W @ 8ohm
10kHz	8.8V	+23.88dB	.229%THD+N	9.658W @ 8ohm
20kHz	8.37V	+23.44dB	.467%THD+N	8.736W @ 8ohm
30kHz	7.84V	+22.87dB	.748%THD+N	7.664W @ 8ohm
40kHz	7.31V	+22.22dB	1.109%THD+N	6.661W @ 8ohm
50kHz	6.71V	+21.48dB	1.505%THD+N	5.611W @ 8ohm
60kHz	6.17V	+20.70dB	1.847%THD+N	4.759W @ 8ohm
70kHz	5.67V	+19.94dB	2.162%THD+N	4.004W @ 8ohm
80kHz	5.21V	+19.17dB	2.588%THD+N	3.393W @ 8ohm
90kHz	4.81V	+18.43dB	2.959%THD+N	2.88W @ 8ohm
100kHz	4.41V	+17.63dB	3.333%THD+N	2.42W @ 8ohm



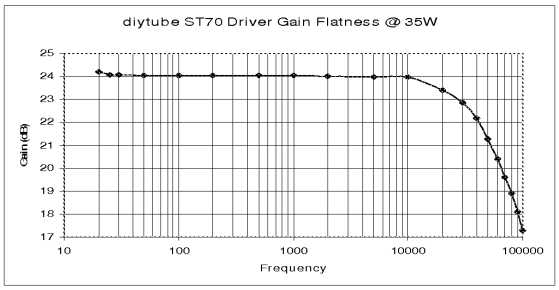


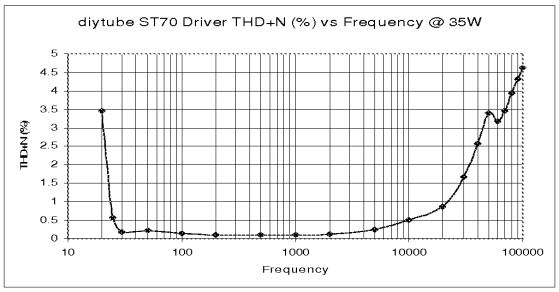
diytube ST70 driver closed loop 10W output

- 560mVrms input

Test & Measurement Data

20Hz	17.31V	+24.21dB	3.444%THD+N	37.45W @ 8ohm
25Hz	17.06V	+24.08dB	.568%THD+N	36.3W @ 8ohm
30Hz	17.V	+24.06dB	.174%THD+N	36.17W @ 8ohm
50Hz	16.94V	+24.04dB	.223%THD+N	35.83W @ 8ohm
100Hz	16.94V	+24.04dB	.134%THD+N	35.87W @ 8ohm
200Hz	16.94V	+24.04dB	.099%THD+N	35.83W @ 8ohm
500Hz	16.96V	+24.04dB	.092%THD+N	35.96W @ 8ohm
1kHz	16.92V	+24.03dB	.094%THD+N	35.79W @ 8ohm
2kHz	16.9V	+24.02dB	.12%THD+N	35.7W @ 8ohm
5kHz	16.84V	+23.98dB	.24%THD+N	35.45W @ 8ohm
10kHz	16.58V	+23.84dB	.5%THD+N	34.36W @ 8ohm
20kHz	15.76V	+23.40dB	.872%THD+N	31.01W @ 8ohm
30kHz	14.79V	+22.84dB	1.667%THD+N	27.27W @ 8ohm
40kHz	13.75V	+22.18dB	2.57%THD+N	23.63W @ 8ohm
50kHz	12.4V	+21.26dB	3.4%THD+N	19.22W @ 8ohm
60kHz	11.28V	+20.41dB	3.177%THD+N	15.93W @ 8ohm
70kHz	10.33V	+19.60dB	3.445%THD+N	13.52W @ 8ohm
80kHz	9.54V	+18.88dB	3.932%THD+N	11.4W @ 8ohm
90kHz	8.77V	+18.10dB	4.31%THD+N	9.658W @ 8ohm
100kHz	8.03V	+17.29dB	4.617%THD+N	8.1W @ 8ohm

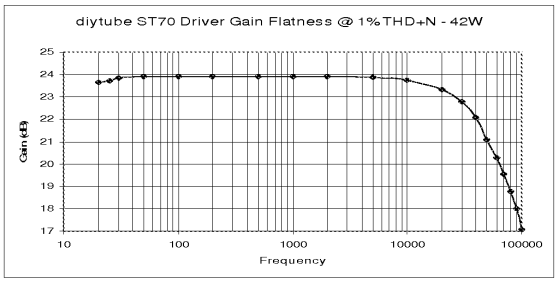


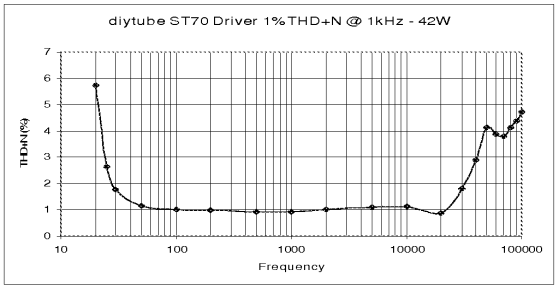


diytube ST70 driver closed loop 35W output

- 1.06Vrms input

20Hz	17.85V	+23.66dB	5.744%THD+N	39.96W @ 8ohm
25Hz	18.V	+23.73dB	2.64%THD+N	40.77W @ 8ohm
30Hz	18.24V	+23.85dB	1.784%THD+N	41.68W @ 8ohm
50Hz	18.37V	+23.91dB	1.164%THD+N	42.04W @ 8ohm
100Hz	18.38V	+23.92dB	1.022%THD+N	42.18W @ 8ohm
200Hz	18.38V	+23.92dB	.976%THD+N	42.23W @ 8ohm
500Hz	18.35V	+23.90dB	.937%THD+N	42.14W @ 8ohm
1kHz	18.39V	+23.92dB	.922%THD+N	42.23W @ 8ohm
2kHz	18.36V	+23.91dB	.999%THD+N	42.14W @ 8ohm
5kHz	18.28V	+23.87dB	1.088%THD+N	41.72W @ 8ohm
10kHz	18.04V	+23.75dB	1.117%THD+N	40.64W @ 8ohm
20kHz	17.21V	+23.34dB	.871%THD+N	36.94W @ 8ohm
30kHz	16.18V	+22.79dB	1.797%THD+N	32.64W @ 8ohm
40kHz	14.93V	+22.08dB	2.902%THD+N	27.79W @ 8ohm
50kHz	13.32V	+21.07dB	4.14%THD+N	22.01W @ 8ohm
60kHz	12.23V	+20.28dB	3.868%THD+N	18.7W @ 8ohm
70kHz	11.27V	+19.54dB	3.795%THD+N	15.9W @ 8ohm
80kHz	10.36V	+18.77dB	4.131%THD+N	13.47W @ 8ohm
90kHz	9.5V	+17.98dB	4.389%THD+N	11.33W @ 8ohm
100kHz	8.62V	+17.08dB	4.726%THD+N	9.267W @ 8ohm



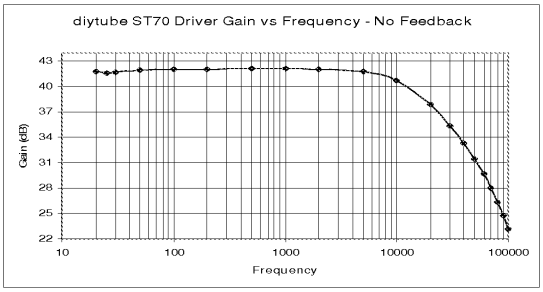


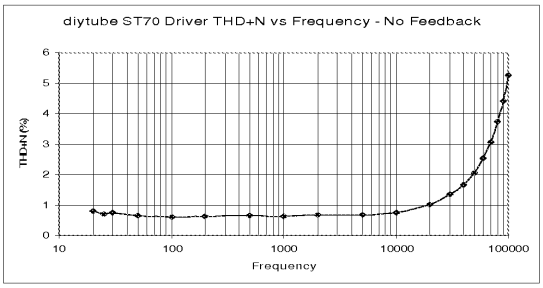
diytube ST70 driver closed loop 1%THD at 1kHz

- 1.165Vrms input

Test & Measurement Data

20Hz	2.446V	+41.75dB	.787%THD+N	.682W @ 8ohm
25Hz	2.398V	+41.58dB	.699%THD+N	.721W @ 8ohm
30Hz	2.439V	+41.72dB	.744%THD+N	.744W @ 8ohm
50Hz	2.507V	+41.96dB	.658%THD+N	.784W @ 8ohm
100Hz	2.538V	+42.07dB	.598%THD+N	.804W @ 8ohm
200Hz	2.547V	+42.10dB	.615%THD+N	.812W @ 8ohm
500Hz	2.553V	+42.12dB	.649%THD+N	.812W @ 8ohm
1kHz	2.553V	+42.12dB	.631%THD+N	.814W @ 8ohm
2kHz	2.542V	+42.08dB	.663%THD+N	.807W @ 8ohm
5kHz	2.448V	+41.76dB	.665%THD+N	.749W @ 8ohm
10kHz	2.178V	+40.74dB	.737%THD+N	.592W @ 8ohm
20kHz	1.583V	+37.97dB	1.017%THD+N	.312W @ 8ohm
30kHz	1.173V	+35.37dB	1.349%THD+N	.172W @ 8ohm
40kHz	.926V	+33.31dB	1.668%THD+N	.107W @ 8ohm
50kHz	.75V	+31.48dB	2.057%THD+N	.07W @ 8ohm
60kHz	.611V	+29.70dB	2.524%THD+N	.047W @ 8ohm
70kHz	.503V	+28.01dB	3.07%THD+N	.032W @ 8ohm
80kHz	.415V	+26.34dB	3.74%THD+N	.022W @ 8ohm
90kHz	.354V	+24.74dB	4.41%THD+N	.016W @ 8ohm
100kHz	.294V	+23.13dB	5.25%THD+N	.011W @ 8ohm





diytube ST70 driver open loop 20mV input

- 20mVrms input

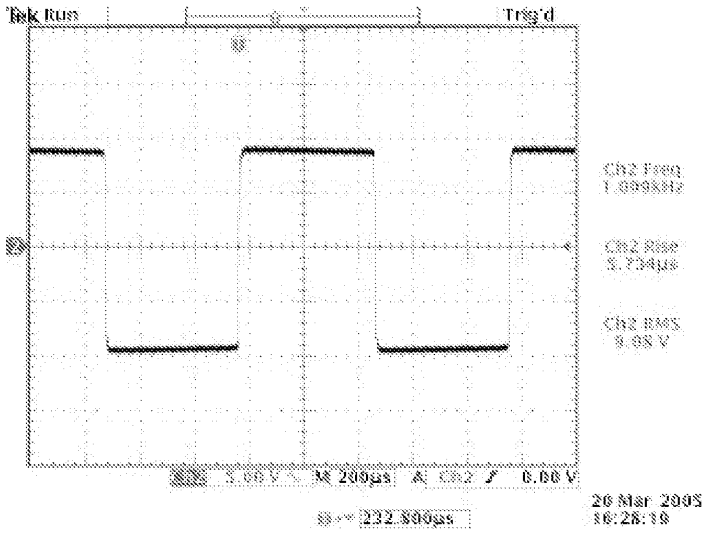
03/25/05

Tests were conducted using:

- Hewlett-Packard 8903B Audio Analyzer
- diytube Audio Acq v1.0 software
- Hewlett Packard 3455A Voltmeter
- Tektronix TDS3012B DPO
- BK Precision 5390 .025% DMM
- No-name garbage signal generator

Test & Measurement Data

1 kHz Square Wave at 10W Output



10 kHz Square Wave at 10W Output