STA-70 Amp PCB Part List

Reference	Value 1	Value 2	Qty
C1,C3,C4,C8,C10,C11	.22uF	400V	6
C2,C9	33p	400V	2
C5,C12,C15	220uF	100V	3
C6,C7	100p	100V	2
C13,C14	.1uF	100V	2
R1,R14	100K	1/2W	2
R2,R15	150k	1/2W	2
R3,R16	1k	1/2W	2
R4,R17	220K	1/2W	2
R5,R18	390k	1/2W	2
R6,R19	1M	1/2W	2
R7,R8,R20,R21	27K	1W	4
R9,R10,R22,R23	270K	1/2W	4
R11,R24	10	1W	2
R12,R13	47K	1/2W	2
R26,R27	10K	1/2W	2
RV1,RV2	10K	1/4W	2
U1,U2	6GH8A	Tubes	2

STA-70PS Power Supply PCB Part List

Reference	Value 1	Value 2	Qty
C1,C2,C3,C4,C5	100uF	550V	5
C6	220uF	100V	1
D1,D2,D3	1N4007	1000V	3
R1,R2	47	3W	2
R3	6.8K	2W	1
R4	22K	2W	1
R5	10	1/2W	1
R6	4.7K	1/2W	1

This popular Dynaco-style stereo tube amplifier DIY kit is an excellent choice for both beginners and experienced enthusiasts, with extensive documentation available online. By selecting different output tubes, it can deliver up to 35 watts per channel with excellent sound quality.

It supports traditional EI or toroidal power transformers and toroidal output transformers, offering efficient power delivery, low magnetic leakage, and excellent audio performance. Its simple design makes assembly, servicing, and modifications easy.

The following suggestions may be helpful, especially for beginners:

1. Resistor Selection

We do not recommend automatically choosing expensive "audio-grade" carbon-composition resistors. Carbon-composition resistors can generate more noise, and their resistance can change significantly with voltage and temperature. Although they may have a particular sonic character, they are generally not the best technical choice for a low-noise amplifier.

2. High-Power Resistors

For high-power applications, especially in the power supply and screen circuits, metal-oxide or wire wound resistors are generally a better choice because of their higher power-handling capability and better stability.

3. Component **Value 2**

The **Value 2** shown in the component chart may be increased if desired, as long as the physical size of the component fits within the available space on the PCB.

4. Output Tube Selection and Bias Adjustment

When using different output tubes, the values of RV1 and RV2 must be adjusted as necessary to set the bias current to the proper level for optimal tube operation. Always verify the bias current and operating conditions against the specifications for the tube being used.

5. B+ Voltage Adjustment

If the B+ voltage changed, the value of R3 must be adjusted as necessary to keep the supply voltage for the B2 to close to the value indicated on the circuit diagram.

6. Tube Socket Installation

When soldering the tube socket onto the PCB, plug a tube into the socket first to make sure the socket pins are properly aligned. This will help prevent misalignment and ensure that the tube can be easily inserted and removed after the socket is soldered in place.

7. Grounding

We recommend connecting the chassis ground (the ground pin of the IEC socket) to one of the GND points next to IN. Proper grounding is important for minimizing hum and noise. If the grounding is done correctly, the amplifier should produce very low hum or no audible hum from the speakers.

Safety Note: Tube amplifiers contain high voltages that can be dangerous even after the power is turned off. Always discharge the power-supply capacitors and follow proper electrical safety procedures before servicing or making any changes to the amplifier.

R & C Selection Guide

Application	Recommended resistor	Why
Resistors:		
Signal path / plate load	Metal film	Low noise, stable, low distortion
Cathode resistor	Metal film or metal oxide	Low noise and good stability
Grid stopper	Carbon film or metal film	Good performance; avoid wirewound
Screen-grid resistor	Metal oxide	Handles heat and pulse energy well
Power supply dropping resistor	Wirewound or metal oxide	High power capability
Cathode bypass / high-current areas	Metal oxide	Robust and heat resistant
Grid leak resistor	Metal film	Very low noise and stable
Feedback network	Metal film	Good precision and low noise
Bleeder resistor	Metal oxide / wirewound	Handles continuous power
Capacitors:		
Coupling capacitor	Polypropylene film	Low loss, stable, excellent linearity
Tone-control / signal filtering	Polypropylene film	Low distortion and stable
Feedback network	Polypropylene film	Low dielectric absorption and good stability
Cathode bypass	Electrolytic	Large capacitance, compact and inexpensive
Power-supply filter	Electrolytic	High capacitance and good ripple-current capability
Screen supply filtering	Electrolytic	Large capacitance and suitable for DC filtering
Small-value bypass	Ceramic C0G/NP0 or film	Very stable and low loss
AC line / safety capacitor	Class X2/Y2 safety capacitor	Designed specifically for mains applications
Snubber / high-voltage pulse	Polypropylene film	Good pulse handling and low loss
Output-transformer compensation	Polypropylene film	Stable at high frequency

Bias Settings for Push-Pull Class AB Tube Amplifiers

Reference bias current range vs plate voltage, with approximate P-P Class AB output power

Tube Type	Bias	250	300	350	400	450	500	550	600	Pᴅ Max [W]	Approx. PP Output Power [W]
6550 SED	Min.	98	82	70	61	54	49	45	41	35	35–45
	Max.	140	117	100	88	78	70	64	58		
6550 EH	Min.	118	98	84	74	65	59	53	49	42	40–50
	Max.	168	140	120	105	93	84	76	70		
EL34	Min.	70	58	50	44	39	35	32	29	25	25–35
	Max.	100	83	71	62	56	50	45	42		
KT77 JJ	Min.	70	58	50	44	39	35	32	29	25	25–35
	Max.	100	83	71	62	56	50	45	42		
6L6 25 W	Min.	70	58	50	44	39	35	32	29	25	20–25
	Max.	100	83	71	62	56	50	45	42		
6L6 GC 30 W	Min.	84	70	60	52	47	42	38	35	30	25–30
	Max.	120	100	86	75	67	60	55	50		
6V6 JJ	Min.	39	33	28	24	22	20	18	16	14	12–18
	Max.	56	47	40	35	31	28	25	23		
6V6	Min.	28	23	20	18	16	14	13	12	10	8–12
	Max.	40	33	29	25	22	20	18	17		
KT66	Min.	70	58	50	44	39	35	32	29	25	25–30
	Max.	100	83	71	62	56	50	45	42		
KT88 JJ	Min.	118	98	84	74	65	59	53	49	42	40–50
	Max.	168	140	120	105	93	84	76	70		
KT88	Min.	112	93	80	70	62	56	51	47	40	40–50
	Max.	160	133	114	100	89	80	73	67		
KT120	Min.	168	140	120	105	93	84	76	70	60	100–150
	Max.	240	200	171	150	133	120	109	100		

Notes:
1. Plate voltage is shown in volts (V), and bias current is shown in milliamperes (mA).
2. The bias range is a general reference for push-pull Class AB operation, approximately 70%–100% of maximum plate dissipation at idle.
3. Approximate PP Output Power is a practical reference for a properly designed push-pull Class AB amplifier using an appropriate output transformer.
4. Output-power values are typical reference ranges for a push-pull pair. Actual output depends on plate/screen voltage, load impedance, transformer design, bias, distortion, and tube characteristics.
5. Always verify final operating conditions against the tube manufacturer's datasheet and the amplifier design.

Why toroidal output transformer can make High-Frequency Oscillation

A well-designed toroidal output transformer can have excellent high-frequency response because of its core material, construction and winding arrangement. That is very good for audio, but it means the transformer does not naturally attenuate high-frequency signals as much as the EI transformer.

How to Reduce High-Frequency Oscillation

1. **Add a small compensation capacitor**
   Add a small capacitor to the feedback or gain stage to reduce high-frequency gain. A typical starting value is **47–220 pF**.
2. **Add a Zobel network**
   Add a **series resistor and capacitor** across the speaker output. A common starting point is **10Ω + 100 nF**. This can help stabilize the amplifier at high frequencies.
3. **Add grid-stopper resistors**
   Install a **1kΩ–10kΩ resistor directly at the power tube grid pin**. This helps prevent high-frequency oscillation in the power tube. The PCB has R3 & R4 resistors. Try to increase to 10KΩ.
4. **Improve grounding and feedback wiring**
   Keep the feedback connection and ground return as short as possible. Make sure the feedback wire is separated from the output signal and high-current wiring.

How to test

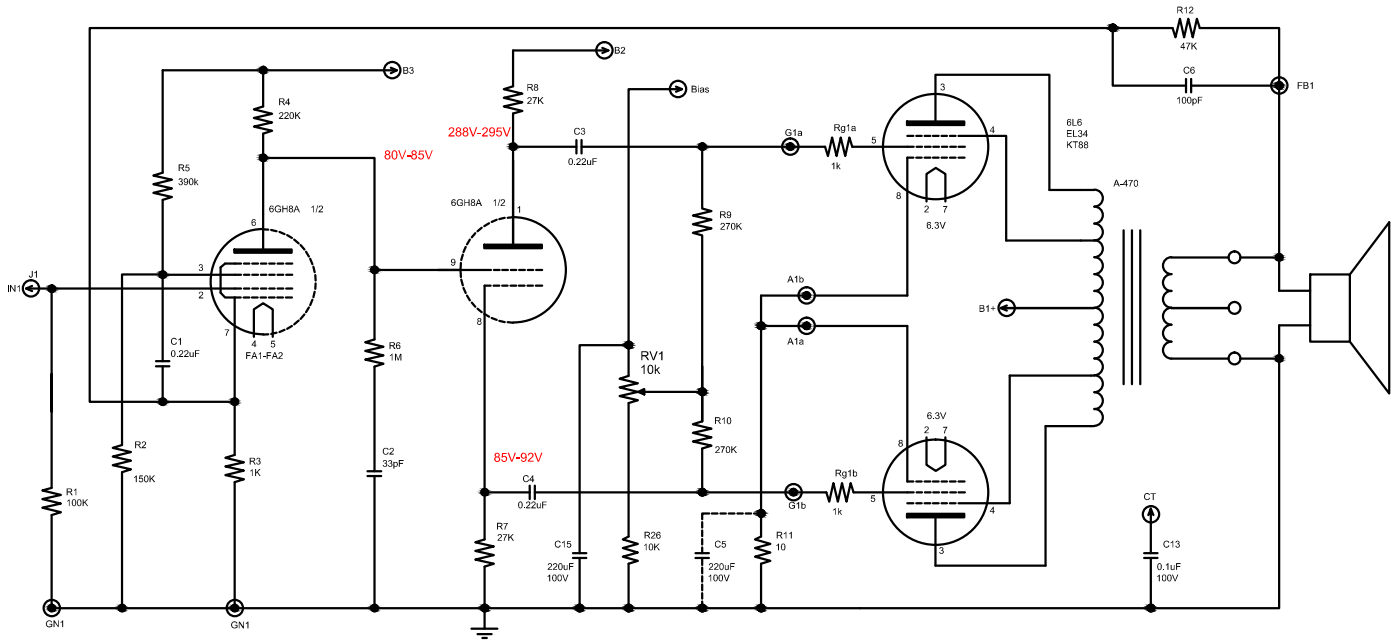
Before changing multiple components, use an oscilloscope to check the amplifier for high-frequency oscillation.
Connect a suitable dummy load to the amplifier and monitor the output with the oscilloscope.
Then gradually increase the signal-generator frequency:
10 kHz → 20 kHz → 30 kHz → 50 kHz → 100 kHz → 200 kHz → 500 kHz
Watch for:

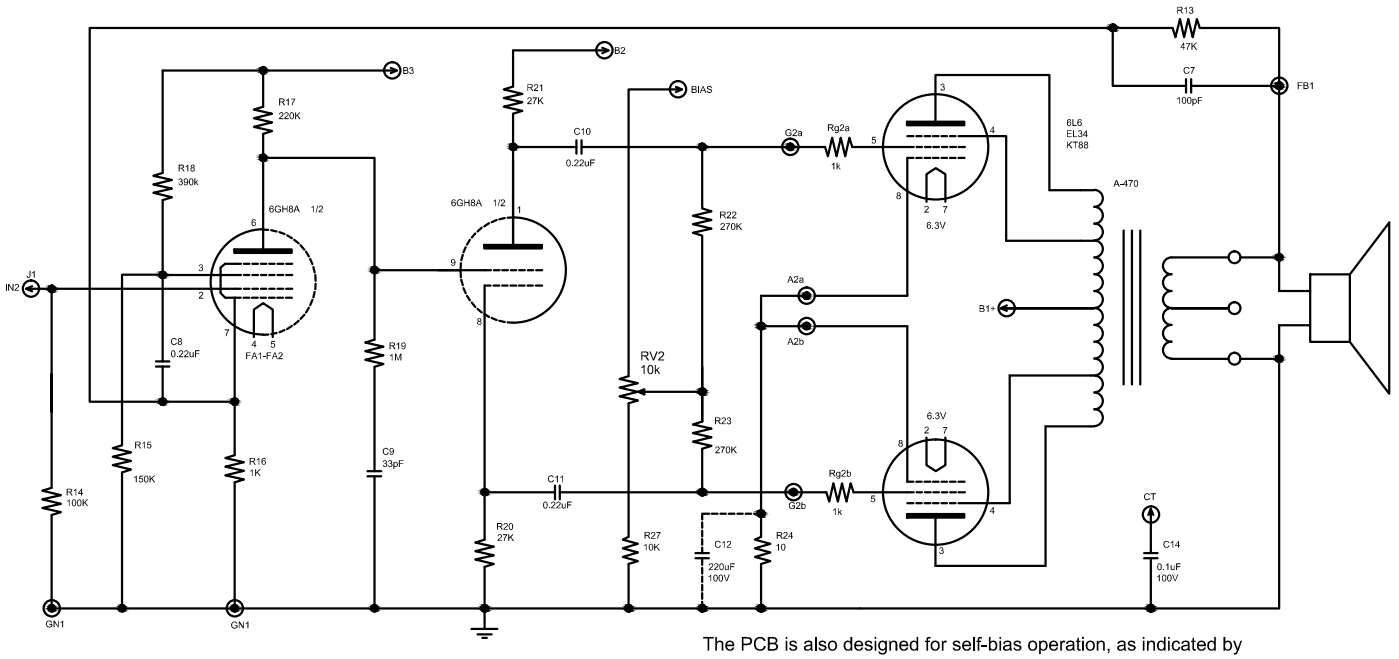
1. **Increasing ringing or overshoot**.
2. **A high-frequency waveform riding on the audio signal**
3. **Sudden oscillation**
4. **A significant increase in amplitude at a particular frequency**

You may see something like:
20 kHz — clean
50 kHz — slight ringing
70 kHz — significant ringing
100 kHz — oscillation
This will help identify the frequency where the amplifier becomes unstable.

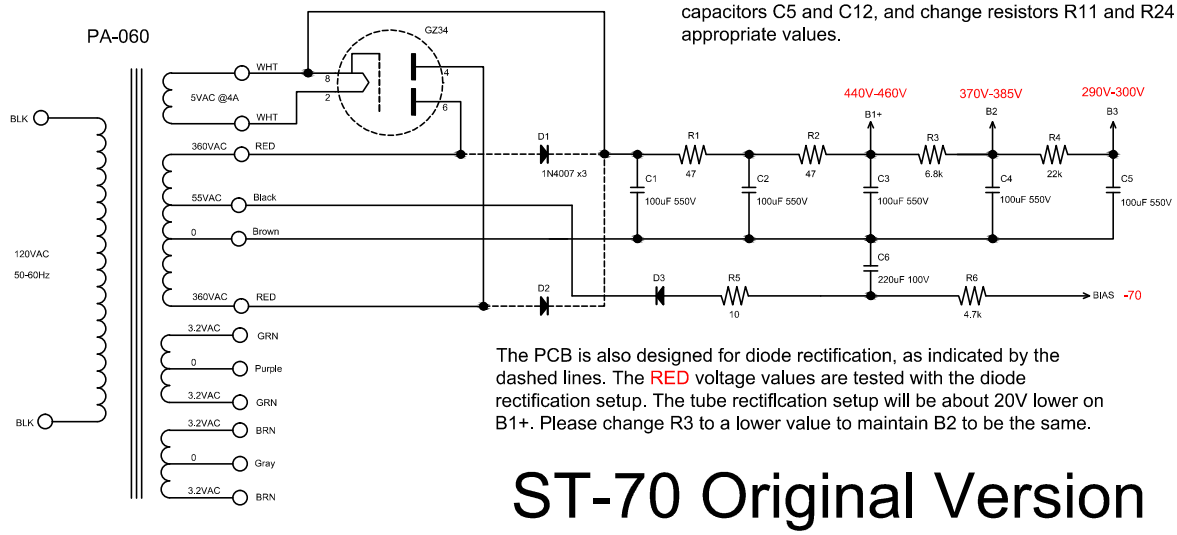
If you do not have an oscilloscope available, you can still listen to the amplifier with high-power music. You may not be able to hear the high-frequency oscillation directly, but the music may sound abnormal, harsh, or distorted, which can be an indication of instability. However, an oscilloscope is strongly recommended for confirming the problem.

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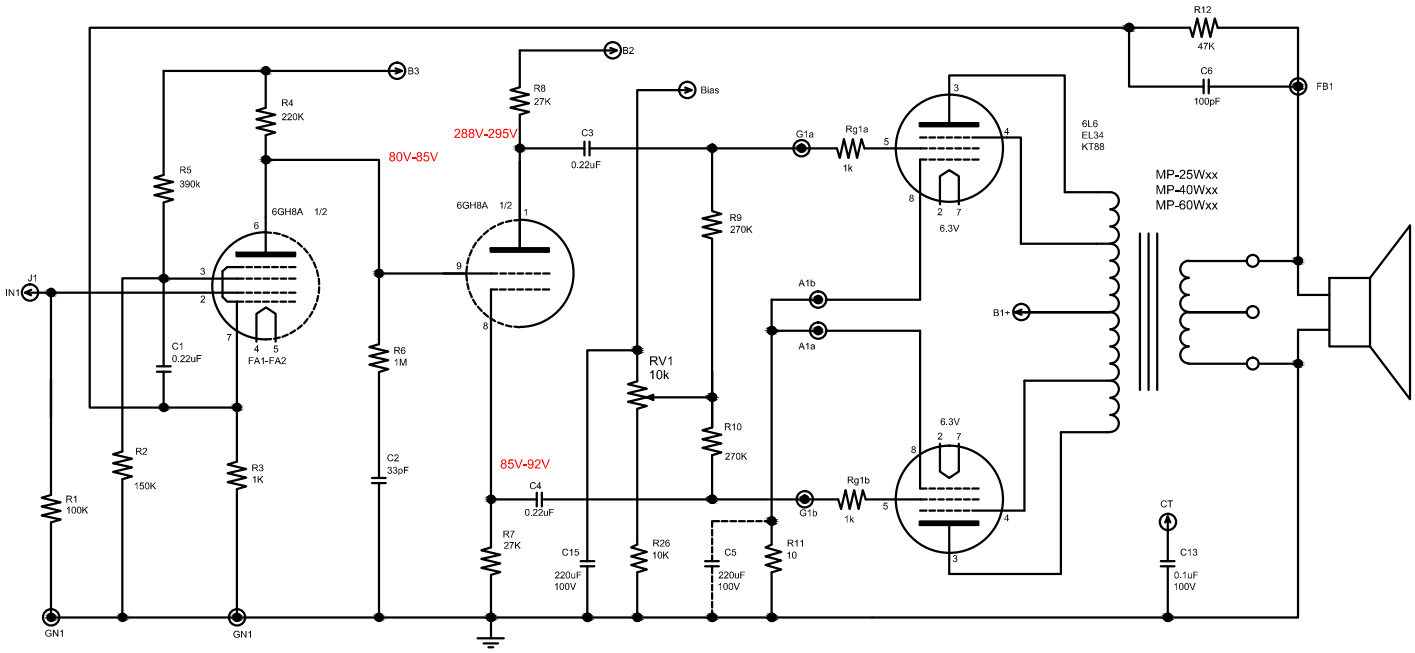


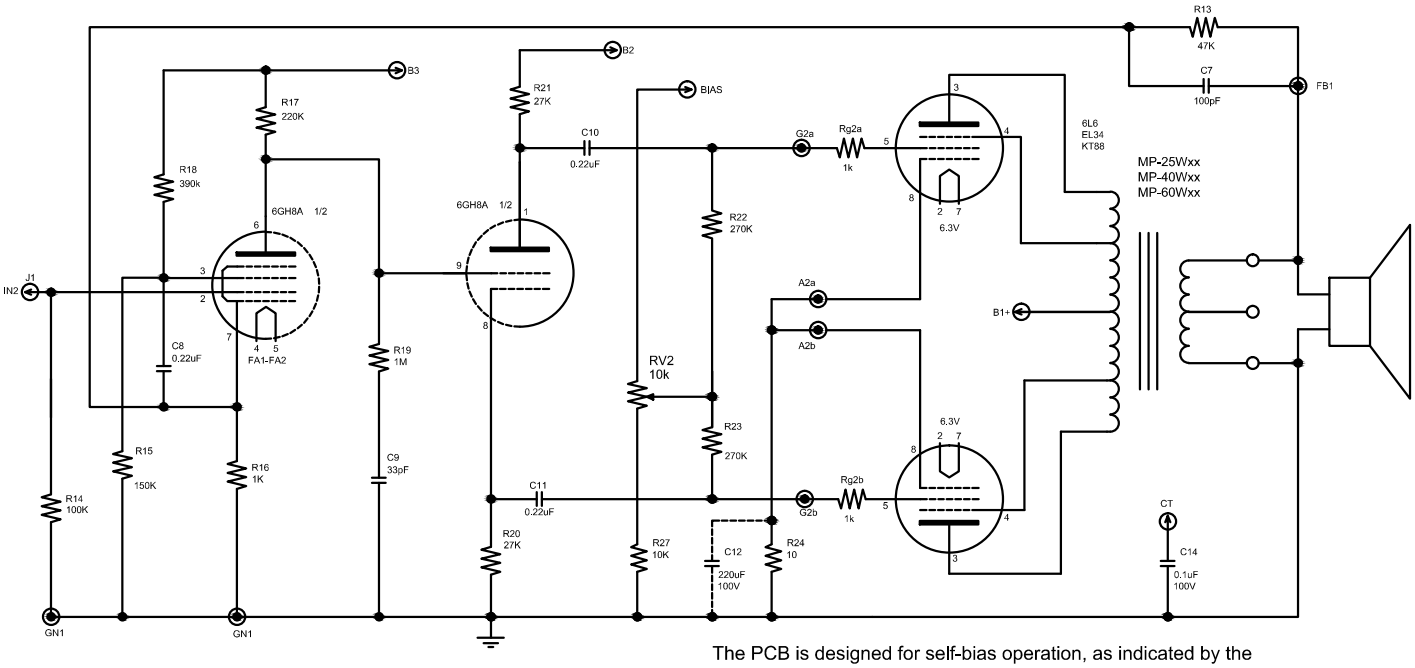
The PCB is also designed for self-bias operation, as indicated by the dashed lines. To configure it for self-bias, add bypass capacitors C5 and C12, and change resistors R11 and R24 to the appropriate values.



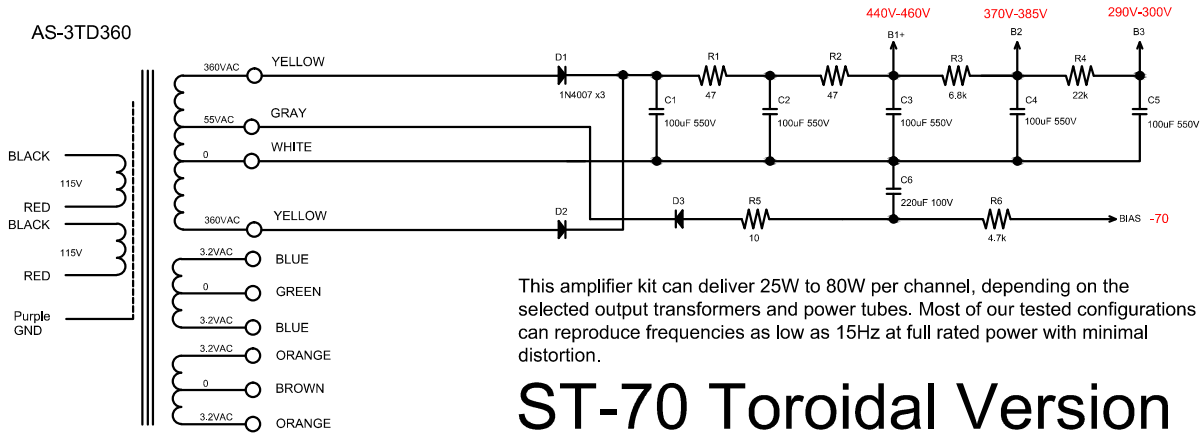
The PCB is also designed for diode rectification, as indicated by the dashed lines. The RED voltage values are tested with the diode rectification setup. The tube rectiflcation setup will be about 20V lower on B1+. Please change R3 to a lower value to maintain B2 to be the same.

ST-70 Original Version





The PCB is designed for self-bias operation, as indicated by the dashed lines. To configure it for self-bias, add bypass capacitors C5 and C12, and change resistors R11 and R24 to the appropriate values.



This amplifier kit can deliver 25W to 80W per channel, depending on the selected output transformers and power tubes. Most of our tested configurations can reproduce frequencies as low as 15Hz at full rated power with minimal distortion.

ST-70 Toroidal Version