Amber

AMBER ELECTRONICS, INC. P.O. BOX 2015 CHARLOTTESVILLE, VA 22902 TLX 901601 (804) 296-5696

Amber Technical REport # 00007

Series 70 : Setting The Bias

The quiescent state of the S-70 output transistors is determined by collector current measurement at thermal equilibrium. Changing the operation point is easily accomplished by turning the trim-pot located on the PCB.

This is the proceedure:

(1) Idle the amplifier without a speaker load and without an input signal, for 30 minutes or longer. This allows the transistors to reach thermal equilibrium.

(2) Measure the current (1.00 Ampere scale) in series with the positive (+) fuse of a given channel. If the value is 150 mA (± 10 mA) then the bias is set correctly, and no adjustments are necessary for this channel.

(3) If the current reading is not between 140 mA and 160 mA, then turn that channel's trim-pot so that it does. The thermal equilibrium has now been changed so it is necessary to return to step (1) and repeat the sequence.

Repeat this proceedure for the other channel and the biases will be set correctly. If turning the trim-pot does not change the bias current or the current measurement is extraodinarily high (800 mA or more) then problems may exist in the bias circuitry. If any such problems are suspected, return the amplifier to the Amber factory for thorough diagnosis.

Cary Lancaster
Director of Engineering

Amber

AMBER ELECTRONICS, INC. P.O. BOX 2015 CHARLOTTESVILLE, VA 22902 TLX 901601 (804) 296-5696

Amber Technical Report # 00008

S-70 : High Current Transistors

(2N5686, 2N5684)

Perfect musical reproduction necessitates components that can accurately respond to the most demanding musical passages. Very loud and dynamic music requires a power amplifier capable of providing quick and sustained energy surges. The Amber Series 70 uses very large (32,000 µF) capacitors and a high-current, custom-made transformer to ensure that any possible energy requirement is met. We avoid current limiting, soft-clipping and other forms of protection circuitry that in any way hinders current flow.

The driver and output transistors within the power amp must be capable themselves of meeting these current requirements. Early Amber Series 70 amplifiers used the BD348/BD349 series drivers and the 2N5884/2N5886 series output transistors. These semiconductors are capable of supplying most all current requirements. Some speakers, however are now being produced with impedances of 2 Ohms or less that draw even greater current. To provide a greater safety margin, Amber began using transistors of greater current capability. The D44C11/D45C11 series drivers and 2N56 series output transistors (rated at 60 amperes) have been standard production transistors in Series 70's with either silver or bronze faceplates. Early power amplifiers with black faceplates used the BD34 drivers and the 2N58 output transistors.

The Amber factory can retrofit the Black Series 70's with the higher-current transistors and ensure the maximum current flow with the maximum margin of safety.

Cary Lancaster
Director of Engineering

Amber

AMBER ELECTRONICS, INC. P.O. BOX 2015 CHARLOTTESVILLE, VA 22902 TLX 901601 (804) 296-5696

Amber Technical Report # 00009

S-70 : Turn-On Delay

(20 µF + 47.5 k Ohm)

Stereo components are very succeptible to damage between the times they are turned-on and when they have reached full operational equilibrium. During this changing period, currents can be very large, and should these be amplified by the power amp, speakers run the risk of damage.

The Bronze edition Amber Series 70 amplifier encorporates a 2 second delay that essentially turns-off the first amplification stage during this time. The delay is achieved by placing a series RC network (20 µF and 47.5 k Ohm) between pin 14 of the LM391N-100 and ground. When the capacitor is charged, the first stage turns on. The two second delay helps protect the Series 70 and speakers should components before the amplifier produce excessive turn-on transients. (Note: we do not encourage a longer delay-time using an RC network, as additional problems arise).

This modification is encorporated in all current Series 70 amplifiers with bronze face-plates, rear mounted heatsinks, and circuit boards mounted directly to the heatsinks. The turn-on delay can be retrofitted to previous production amplifiers through authorized service stations or the Amber factory.

Cary Lancaster
Director of Engineering

Amber

AMBER ELECTRONICS, INC. P.O. BOX 2015 CHARLOTTESVILLE, VA 22902 TLX 901601 (804) 296-5696

Amber Technical Report # 00010

S-70 : LM 391 Voltage Regulation

(221 Ohm + 1N4754)

The Series 70 Power Amplifier incorporates the LM391N-100 integrated circuit (IC) in its first-stage voltage amplification network. This IC provides very clean amplification and has extremely low levels of distortion. However, it is potentially susceptible to breakdown from large transients entering its power supply terminals. These transients are occasional random voltage spikes which originate in the AC power line.

To prevent such transients form entering the IC, Amber has designed a voltage regulation circuit which effectively filters the power supplies that feed the IC and which precisely regulates the voltage of those supplies.

The voltage regulation circuitry consists of standard pi-filters added to both the positive and negative power supply leads. These filters use the 1N4754 (39 volt) zener diode, a 1,000 µF filter capacitor, and a 221 Ohm resistor in the usual pi-configuration.

This LM391 voltage regulation circuitry provides significant protection against abnormal voltage spikes and transients which are prevalent in many power lines.

LM391 voltage regulation is incorporated in all bronze-faced Series 70 Power Amplifiers. It can be added to units with silver or black front panels at the Amber factory.

Cary Lancaster
Director of Engineering

Amber

AMBER ELECTRONICS, INC. P.O. BOX 2015 CHARLOTTESVILLE, VA 22902 TLX 901601 (804) 296-5696

Amber Technical Report # 00011

S-70 : Capacitative load Considerations

(5mH + 10 Ohm)

Almost all modern loudspeakers exhibit an impedance which has a reactive component that is capacitative over certain frequency ranges. This capacitative reactance is caused by the crossover network used to divide the frequency spectrum. Some loudspeakers also exhibit capacitative reactance due to the very physics of their design (e.g. electrostatic loudspeakers).

Capacitative loads can place a considerable strain on almost all power amplifier design configurations. In some cases, a particularly capacitative loudspeaker will cause an amplifier to become unstable and to oscillate dangerously at very high frequencies. For class AB amplifiers, capacitative loads also cause the output transistors to dissipate greater amounts of power.

While the Series 70 circuit design is relatively insensitive to capacitative loads, an extra measure of "desensitization" is provided by the inclusion of a 0.005 Henry choke coil between the speaker fuse and the positive speaker terminal of each channel (in parallel with a 10 Ohm, 2 Watt resistor). This insures that you will receive uncompromised performance from the Series 70 regardless of the speakers you choose to listen with.

The output coils have been included in all Series 70 Amplifiers since the late-production Silver series. They were not included in the original Black-faced units. Coils can easily be added to older units either at the Amber factory or at your local Amber dealer.

Cary Lancaster
Director of Engineering

Amber

AMBER ELECTRONICS, INC. P.O. BOX 2015 CHARLOTTESVILLE, VA 22902 TLX 901601 (804) 296-5696

Amber Technical Report # 00012

S-70 : Line Voltage Transient Protection

(M.O.V.)

The voltage supplied to standard household outlets is very poorly regulated. Not only does the nominal value vary from 110 volts to 130 volts, but very large surges of short duration occur frequently. Line voltages may reach as high as 5,000 volts for a few microseconds!

These "voltage spikes" can damage sensitive electronic components, such as those incorporated in the Series 70 Power Amplifier. To prevent such damage Amber installs a Metal Oxide Varistor (MOV) in parallel with the primary winding of the power transformer. This semiconductor device essentially shorts any voltages greater than 130 Vrms and prevents them from entering the amplifier. The MOV is an exceptionally fast-acting device and will protect the amplifier from potential damage and increase the longevity of all the semiconductor devices used in the amplifier by eliminating line surges.

Metal Oxide Varistor protection is included in all current Series 70 Power Amplifiers, and can be added to older silver and black series units either at the Amber factory or at your local Amber dealer.

Cary Lancaster
Director of Engineering

Amber

AMBER ELECTRONICS, INC. P.O. BOX 2015 CHARLOTTESVILLE, VA 22902 TLX 901601 (804) 296-5696

Amber Technical Report # 00013

S-70 : Turn-On Shock Reduction

(0.1μF)

Two large filter capacitors (32,000μF each) provide high current output capability for the Series 70 Power Amplifier. These capacitors require a great deal of energy to "charge up" when the amplifier is initially turned on. This surge places an unusually large demand upon the AC line (hence the flicker of household lights) and also places a small strain on the filter capacitors themselves.

To reduce the magnitude of this turn-on surge, Amber has placed a high-voltage 0.1μF capacitor in parallel with the Series 70's power switch. This capacitor allows a small trickle of current to keep the filter capacitors slightly charged when the power switch is off. As a result, turn-on shock is grealty reduced and all circuit components are continuously run at a low current level. This actually extends component life expectancy because it is the voltage surge of turn-on which is most responsible for component deterioration. (It is for this reason that computer facilities are left powered 24 hours per day.) One by-product to note is that the power LED on the front panel will remain slightly aglow even with the amplifier turned off.

This power switch capacitor is standard on all bronze-faced Series 70 Amplifiers and can easily be fitted to later Series 70's either at the Amber factory or at your local Amber dealer.

Cary Lancaster
Director of Engineering

Amber

AMBER ELECTRONICS, INC. P.O. BOX 2015 CHARLOTTESVILLE, VA 22902 TLX 901601 (804) 296-5696

Amber Technical Report # 00015

S-70 : Input Overload Protection

(1N914's)

As with most power amplifiers, the input stage of the Series 70 Power Amplifier can be accidently damaged by an excessively large input signal (> several volts) or by a sustained DC input voltage.

To prevent the potential damage such gross-fault input conditions can cause, Amber has designed an input overload protection network which will not activate under normal music-playing conditions but which will protect against failure due to input overload. This network does not use the large DC blocking capacitors or electronic limiting circuitry found in most power amplifiers because such circuitry can seriously degrade sonic performance. Instead, the Series 70 network consists of two 1N914 signal diodes placed in parallel (with reversed polarities) across the inputs to the IC. These diodes activate **only** under gross fault conditions, during which they short the overload and protect the amplifier.

If each component located before the Series 70 in the audio system is functioning properly (not producing DC offsets or high-frequency oscillations) and the signal input cables are not removed while the amplifier is powered, it is almost certain that this overload protection will never be activated.

This circuit is incorporated in all Series 70 Power Amplifiers with bronze front panels and wood side panels, It can be added to previous units (silver or black faced) at the Amber factory.

Cary Lancaster
Director of Engineering

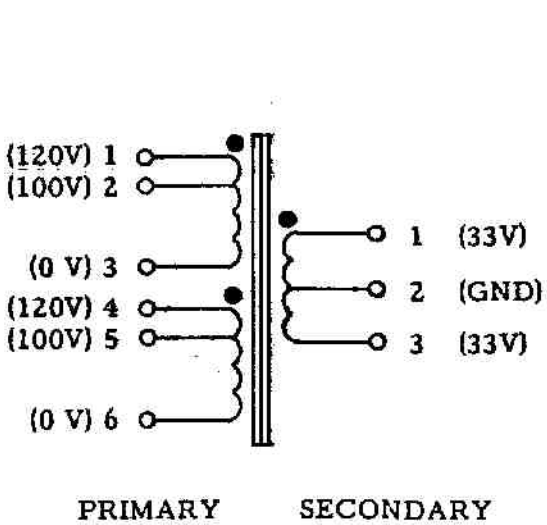
AMBER ELECTRONICS, INC. P.O. BOX 2015 CHARLOTTESVILLE, VA 22902 TLX 901601 (804) 296-5696

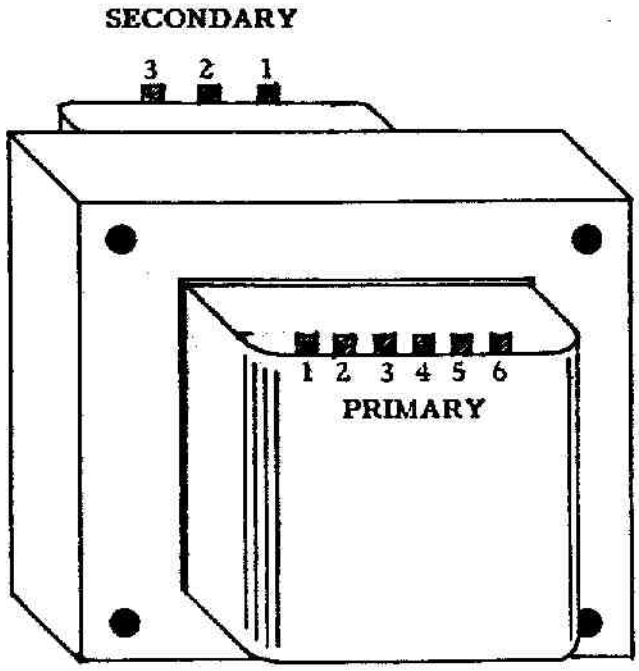
Amber Technical Report # 00016

Transformer Voltage Conversions (S-70, 50b)

(For Dual, Tapped Primary Transformers : 6 Primary Leads)

Change of the power supply to meet various a.c. line voltages around the world require changes in the transformer PRIMARY wiring. The following gives a table of these changes relative to the primary terminals. These terminals are not often numbered and so should be oriented as in the figure below. With rewiring, the power supply can accomodate voltages of 100V, 120V, 200V, 220V, 240V (AC rms).





100V OPERATION

Two A.C. Line in wires	-	TERMINALS 2 & 6 of PRIMARY
0.1µF Filter Cap	-	TERMINALS 2 & 6 of PRIMARY
130V M.O.V.	-	TERMINALS 2 & 6 of PRIMARY
16 Guage Jumper	-	TERMINALS 3 & 6 of PRIMARY
16 Guage Jumper	-	TERMINALS 2 & 5 of PRIMARY

120V OPERATION

Two A.C. Line in wires	-	TERMINALS 1 & 6 of PRIMARY
0.1µF Filter Cap	-	TERMINALS 1 & 6 of PRIMARY
130V M.O.V.	-	TERMINALS 1 & 6 of PRIMARY
16 Guage Jumper	-	TERMINALS 1 & 4 of PRIMARY
16 Guage Jumper	-	TERMINALS 3 & 6 of PRIMARY

200V OPERATION

Two A.C. Line in wires	-	TERMINALS 2 & 6 of PRIMARY
0.1μF Filter Cap	-	TERMINALS 2 & 6 of PRIMARY
250V M.O.V.	-	TERMINALS 2 & 6 of PRIMARY
16 Guage Jumper	-	TERMINALS 3 & 5 of PRIMARY

220V OPERATION

Two A.C. Line wires	-	TERMINALS 2 & 6 of PRIMARY
0.1μF Filter Cap	-	TERMINALS 2 & 6 of PRIMARY
250V M.O.V.	-	TERMINALS 2 & 6 of PRIMARY
16 Guage Jumper	-	TERMINALS 3 & 4 of PRIMARY

240V OPERATION

Two A.C. Line wires	-	TERMINALS 1 & 6 of PRIMARY
0.1μF Filter Cap	-	TERMINALS 1 & 6 of PRIMARY
250V M.O.V.	-	TERMINALS 1 & 6 of PRIMARY
16 Guage Jumper	-	TERMINALS 3 & 4 of PRIMARY

ALL SECONDARY CONNECTIONS :

Two wires to Bridge Rectifier	-	TERMINALS 1 & 3 of SECONDARY
Wire to Ground Star	-	TERMINAL 2 of SECONDARY

NOTE

These solder joints require care.
Use of a soldering iron of 100 Watt rating or more is recommended.