

# **Bel Canto Design**

## **SET 40**

**Single Ended 845 Triode Stereo Power Amplifier**

### **User's Guide and Operating Information**

# SET 40

## Single Ended 845 Triode Stereo Power Amplifier

The Bel Canto Design **SET 40** uses the most simple and elegant of circuit architectures with the highest quality of parts and construction to produce an audio amplifier which is unparalleled in recreating the musical event.

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*Bel Canto grew from the quest to achieve the ultimate musical satisfaction from an audio system. This goal began with the discovery of the inherent sonic qualities and musical performance potential of a nearly forgotten technology, the single-ended triode amplifier. The ability of this type of amplifier to recreate the musical experience and evoke a powerful emotional response in the listener, much like the live event, inspired the development of the SET line of amplifiers through the ultimate expression of this technology. The SET 40 circuit was developed to be used as both a cornerstone for a modern audio system and as a reference tool to explore the reasons behind the single-ended triode amplifier's uniquely musical attributes.*

*For the better part of a decade this quest continued and has resulted in a line of fine audio amplifiers that are designed to incorporate the unparalleled musical reproduction of the single-ended triode architecture. Bel Canto Design's goal for the SET Line is simply to provide the most expressive and powerful musical experience outside of the live event. Bring some of the greatest musicians and their performances into the intimacy of your home, for many years to come.*

*The **SET 40** represents the attainment of a goal and is designed to provide very high value and to retain this value for many years, both because of the quality of design and manufacturing and also the timelessness of each component's musical performance.*

*Bel Canto Design*

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# Unpacking

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## Unpacking

The box containing your **SET 40** contains the following parts:

- 1 - **SET 40** User's Guide
- 1 - Power Cable for connection to utility power [6' 7" - 2 meters long]
- 1 - **SET 40** audio power amplifier
- 2 - 845 power triodes in a protective box, these tubes may be shipped in a separate shipping container.
- 1 - Bel Canto Owner's Warranty & Registration Card

Carefully unpack each piece and check for shipping damage. If there is any damage, please contact your dealer or Bel Canto Design, Ltd. **Save** all packing materials as the packing is specially designed to protect the amplifier during shipping or transporting. If you lose or damage the packing materials or carton, please contact your dealer or distributor before attempting to transport the amplifiers.

***The SET 40 power supply is preset for the proper national voltages before you receive it. The power cable will have the correct plug for your local power system. If you believe this is not true, please contact your dealer immediately. Do not attempt to alter or change power settings yourself!***



### Warning

#### **Do not connect power to this amplifier yet!**

***This power amplifier, like any electrical component, can be dangerous and cause injury unless correct handling procedures are observed and used. Before powering this power amplifier it is necessary to read and follow proper procedures concerning its setup and use.***

***Do not open up your SET 40 (do not remove the chassis covers). There are no user serviceable parts inside. Any tampering of internal parts will immediately void your warranty.***

***Complete and mail the Owner's Registration Card immediately in order to activate your warranty.***

# Initial Setup and Assembly



## Warning

1. Never remove the bottom panel of the amplifier. There are no fuses or user serviceable components in the amplifier, and dangerous voltages could be present if the bottom cover is removed. Removal of this cover or any tampering with the amplifier will immediately void the warranty.
2. Never plug the amplifier into the power source without all tubes in place and the protective tube covers attached to the top plate of the chassis.
3. Always use a correctly grounded power outlet to ground the chassis of the amplifier. If there is any question about this refer to your dealer/importer or a qualified electrician.
4. Never connect the amplifier to any other audio components until directed to proceed later in this manual.

Assembling the **SET 40** requires that the 845 power triodes be placed in the tube sockets **prior** to plugging the amplifier into the power outlet.

**NOTE:** This procedure is not difficult or dangerous if done according to the following instructions, but it does require some care in handling the 845 tube. If you are unsure of yourself or would like more help than can be given in this manual, please contact your dealer, who will be pleased to help you set the **SET 40** up. All of our dealers are chosen with this service in mind, and we urge you to request dealer assistance in setting up your system.

Follow these steps in inserting or changing the 845 tube. (Total time for this procedure: approximately 15 minutes.)

1. **Be certain the SET 40 is not connected to a power source.** This is the most important step! The amplifier could be damaged if power is applied without the tubes in place and extremely dangerous voltages are present and assessable at the tube sockets if power is on!

2. Remove the 845 tube from its wrapping. It is important for tube life that oils from your hands do not get on the upper part of the glass tube envelope. Insert the 845 into the large socket, taking care to line up the bayonet pin protruding from the metal base of the tube with the slot in the tube socket.

3. Push down on the tube until you feel that the pin has reached the bottom of the slot in the socket. Some force and slight movement of the tube may be required to get the tube to clear the contacts and go down far enough so that the tube can rotate. Do not apply too much rotational force until you are

# Initial Setup and Assembly

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certain that the tube is down far enough. The metal tube base should protrude less than 1/4" from the top of the tube socket when the pin is at the bottom of the slot in the socket. When you are certain that the tube is in place, then rotate the tube approximately 1/8 turn in the clockwise direction.

The tube should be nearly vertical or leaning slightly. **NOTE:** Be certain that the bayonet pin is at the bottom of the slot before applying rotational force on the tube. The pin could be damaged if too much force is applied if it is not at the bottom of the slot. Place the tube cover ring assembly over the 845 and push it home into the three sockets for the banana type plugs on the ring assembly.

4. When the 845 tube is in place, check that the 4-12AX7 input/driver tubes are correctly seated in their sockets. These should be in place when the amplifier is received. If there are any questions at this point contact your dealer.

**Figure 1.**

## Input Tube Types and Positioning One Channel Shown



# Connecting and Use

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## Connecting the SET40 into Your System

### *Input Connections*

There is one pair of RCA input jacks for the analog inputs. The right channel is marked with a Red band and the left with a Black band.

### **Loudspeaker Connection**

The loudspeaker connections use one of the two pairs of output jacks behind the output transformer on the top plate of the chassis. The output jacks accept many types of wire termination, although we recommend either a high quality spade lug or the use of simple tinned wire terminations for this hookup.

Determine the nominal impedance of your loudspeaker. The 8 ohm switch position should be used with loudspeakers which have greater than 6 ohm minimum impedance. The 4 ohm position should be used with loudspeakers with 3 to 6 ohm minimum impedance. The impedance selector is between the loudspeaker outputs.

### **Power Switch**

The rear panel power switch marked 0 1 will take the amp out of standby when switched to the 1 position. The input tube filaments are always powered to insure a gentle turn on and instant sound output.

The 845 output tubes are designed for commercial use in and will provide at least 8000 hours of life as used in the SET circuit. This translates to over 5 years of typical use. The input tubes generally have 2000 hour life and will need replacement every 1 1/2 to 2 years. These tubes are available off the shelf from current production at reasonable prices. Contact your dealer or Bel Canto Design for replacement.

## Tube Life and Replacement

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## Amplifier Power and Loudspeaker Selection

The **SET 40** has a nominal power rating of 37 watts for each channel. While this may seem like a low power output compared to many amplifiers on the market, because of the class A operation, the low distortion, wide power bandwidth, and the grace that these amplifiers have when overdriven, they will produce as much or more level sound than many 100 watt amplifiers. We suggest that you consider any loudspeakers with average rated sensitivity of 86-87 dB/Watt/Meter or greater. Greater sensitivity will allow higher listening levels before either the amplifier or the loudspeaker runs out of steam. Remember that with many speakers in even a relatively large room the amplifiers will be operating at average levels of only 1-5 watts each with typical music at quite a high average sound level of 90 dB. This leaves 15 to 17 dB of amplifier headroom for musical peaks.

We have successfully used the **SET 40** with many types of loudspeakers, including dynamic cone, planar magnetic and electrostatic types. When choosing a loudspeaker many variables come into play, therefore we will not attempt to recommend a type or set of 'brands' which you should consider. Our suggestion is that you work with the dealer representing the **SET 40** and choose a loudspeaker which works well for your tastes, in your room with your system. A dealer which sells the **SET 40** will be more than competent to guide you in your selection.

## Amplifier Placement and Power-on

When installing the amplifiers it is important that they receive adequate ventilation. Allow at least 6 inches above the amplifiers, and be certain that the holes on the bottom cover are open to air circulation (do not place them directly on a thick carpet, as this will block the bottom ventilation holes). Do not use the **SET 40** in a closed cabinet unless fan cooling is allowed or the amplifiers will overheat and could be damaged. They generate considerable heat in operation because of their single-ended class A operation. With adequate ventilation on an open shelf or stand they will cool themselves through convection and will not require any additional cooling.

When the setup is complete and all connections are made, the power cord can be installed and the power switch turned to the 'on' position. The amplifiers will be operational nearly immediately, and they require only 15 to 20 minutes to reach optimum performance. There will be a short break-in period of 20 to 30 hours when the amplifiers are first used. The sound quality potential will improve during this period as all of the components and tubes 'settle in' during this time. Further improvement in sonic performance will occur during the first 100 to 200 hours of use as the copper wire anneals and all of the components settle in.

# Technical Description

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## Circuit Description and Technical Information

The philosophy behind the design of the **SET 40** is based on the observation that simplicity of the circuit and the reduction of the number of active devices in an audio amplifier will permit the greatest quantity of information to get through the amplifier. This allows the illusion of music to be most powerful and results in the amplifier 'disappearing' effectively from the playback chain. This chameleon-like performance is achieved through an elegantly simple circuit.

The primary design goal of the **SET 40** was to take the idea of the single ended (SE) triode amplifier to its ultimate level, using only two triode stages to keep distortion low and reduce the number of active devices to a strict minimum, while delivering enough power so that a wide range of loudspeaker choices could be made for use in a home audio system. Unlike other high power SE triode amplifiers which use several stages of gain and buffering, the **SET 40** takes advantage of the distortion cancellation and reduction which occurs when using just two triode stages. The low distortion figures at typical playback levels of 1-5 watts are achieved with no local or loop feedback. This total absence of feedback also maximizes the amplifier's ability to transmit the information content in the music signal.

Care in the choice of active and passive parts results in an audio amplifier which will remain valid in the future as fashion and taste changes. In other words, it is likely to become a 'classic,' retaining its musically satisfying performance for many years to come. This thinking begins at the power supply which uses two high value PI filters with 2-10 Henry inductors and over 150 Joules of energy storage. This provides a very quiet and well regulated supply for the output stage. The capacitors used for all high tension supplies and decoupling are the highest quality audio grade polypropylene film caps. The single coupling capacitors are custom Bel Canto film and foil units.

The output stage uses the 845 triode (a tube which has seen many, many years of use as an audio amplifier in high power radio station

modulators) to drive a custom output transformer which provides superb power handling and bandwidth. The 845 tube is run at maximum power in radio stations for over 8000 hours, you should get similar performance life in the **SET 40**.

The **SET 40** bandwidth is similar to many amplifiers which use feedback and push-pull operation to achieve good performance. The **SET 40** achieves this without resorting to these information robbing circuit techniques.

The use of self bias for the 845 tube allows a higher grid resistance to be used, permitting a single high gain, relatively low power, input/driver stage. This type of bias scheme is more difficult to implement than grid bias schemes, requiring high quality, high value decoupling capacitors, large power resistors and a higher voltage on the main supply. (This voltage is near 1200 V DC on the **SET 40**!)

The input/driver stage uses two 12AX7s in a modified SRPP stage which provide total gain of 30 dB and 1 K ohm of output impedance. This input stage can supply over 100 Vrms at low distortion into the 400 K ohm grid resistor used on the 845. The SRPP type load provides power supply rejection and reduces the sensitivity of the input stage to power supply variations. It also reduces power supply modulation and avoids the problems inherent in the use of high power/high voltage resistor load devices.

# Specifications

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Continuous power output into 4 or 8 ohms • 37 watts  
Peak power output • >70 watts  
Bandwidth • -3 dB 6 Hz - 35 kHz  
Class of operation • Class A single-ended 845 triode  
Input level for 37 watts output • 1.5 V rms  
Signal to Noise Ratio re 1 watt out • 96 dB A weighted  
Distortion at 1 watt / 1 kHz • <0.1% predominantly 2nd harmonic  
Damping Factor • 3 across full bandwidth  
Input configuration and impedance • 100K ohm single ended RCA  
Gain at 8 ohm tap • 21 dB

Power Requirement • 110-120 / 220-240 VAC; 50-60 Hz  
• 400 VA

***Voltage settings are made at our facility to correspond to requirements of the country in which the product is shipped.***

Size • 19.5" W x 15" D x 11" H (496 mm x 381 mm x 280 mm)  
Weight • 85 lbs (39 kg)

## Service

Under normal operation the fuse should not need replacing. There is one standard 1/4" x 1" fuse. Remove the power cord before changing the fuse. Contact your dealer if assistance is needed.

## Warranty Information

Please take a moment to fill out your warranty registration card. Returning this registration validates your warranty and allows us to send you information on product updates and new product development. Completion of this card is requested within 15 days of purchase to ensure immediate warranty coverage.

Bel Canto Design offers a 3 year limited warranty on internal parts and workmanship (this does not include tubes) that will replace any defective parts directly. This warranty is void if damage is due to abuse, neglect or unauthorized modification.

Bel Canto Design products are uniquely identified with a serial number on the back of each unit. This number is required to validate your warranty, please reference if service is required. If you have any questions, comments or if we can be of service, please contact us Monday through Friday 9:00 a.m. - 5:00 p.m. central time.

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