

# bel canto

## **SETi 40**

**Integrated Amplifier  
Single Ended 845 Triode**

**User's Guide and  
Operating Information**

# SETi 40

## Single Ended 845 Triode Integrated Amplifier

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

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# *Dedicated to Technical Virtuosity and Beauty of Music*

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*Bel Canto grew from the quest to achieve the ultimate musical satisfaction from an audio system. This quest 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 SETi 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 and bring some of the greatest musicians and their performances into the intimacy of your home.*

*The **SETi 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*

# Unpacking

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## Unpacking

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

- 1 - **SETi 40** User's Guide
- 1 - Power Cable for connection to utility power [6' 7" - 2 meters long]
- 1 - **SETi 40** audio power amplifier
- 2 - 845 power triodes in a protective box, these tubes may be shipped in a separate shipping container.
- 4 - 12 AX 7 driver tubes
- 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 SETi 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 SETi 40 (do not remove the chassis covers). There are no user serviceable parts inside. Any tampering of internal parts will immediately void your warranty.***

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

# Initial Setup and Assembly

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## 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 cover (Necessary in Europe for CE, optional in US) 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 **SETi 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 **SETi 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 SETi 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. Extremely dangerous voltages are present and accessible at the tube sockets if power is on!**

2. Remove the 845 tube from its box. 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 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.

# Initial Setup and Assembly

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*(Continued)*

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. **(Gold Ring Assembly is Optional)**

4. Remove small driver tubes from their protective boxing and install by aligning the pins at the bottom of the tube with the tube socket in the amplifier chassis. Once the pins are properly aligned, push down on tube until the tube contacts the tube socket.

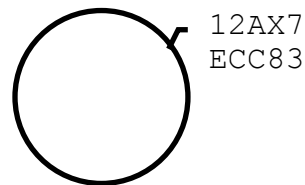
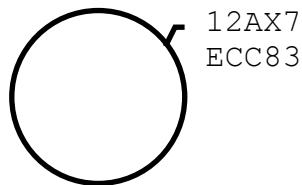
**Figure 1.**

## Input Tube Types and Positioning

One

Channel

Shown



# Connection and Use

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## ***Input Connections / Selection***

On the back of the **SETi 40** there are three pairs of RCA jacks for the analog inputs. The right channel is marked with a Red band and the left with a Black band. These inputs correspond with the input selector display (marked 1 2 3) located at the bottom left of the main display on the front of the SETi40. These inputs can be used for any source (CD, VCR, etc.) that has an RCA output.

**\*All function may be activated through the use of the front panel selector buttons or the corresponding button the remote control.**

### **-Input Selection**

The **SETi 40** provides switching for 3 sources with RCA outputs. Source selection is accomplished by pressing the INPUTS button until the input light activates above the input number (located at the lower left of the front panel display and marked 1 2 3 ) that corresponds the desired RCA input on the back panel of the **SETi40** (again marked 1 2 3).

### **-Volume and Balance Control**

All controls are located in the control cluster near the center of the front panel display. Simply:  
Volume up is the top button in the cluster.  
Volume down is the bottom button in the cluster.  
Balance left is the left button in the cluster.  
Balance right is the right button in the cluster.

### **-Muting Control**

Pressing the mute button will completely mute the output of the SETi 40 and activate the LED located above the Mute button on the front panel display. Pressing the mute button again will turn off the LED and resume volume at the previous volume level.

### **-Standby Button**

Pressing the standby button will take the unit in and out of the standby mode. When in this mode all tubes and lights, except the standby LED, will be turned off and no music output.

## **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 impedance selector is between the loudspeaker outputs and can be switched with music being played. The 8 ohm switch position should be used with loudspeakers that have greater than 6 ohm minimum impedance. The 4 ohm position should be used with loudspeakers with 3 to 6 ohm minimum impedance.

### **-Power Switch / Standby Button**

**WARNING – Be certain all tubes are in position and fully installed before turning this amp on!**

To turn on, place the rear panel switch marked 0 1 into the 1 position. This will activate the front panel standby light above the button marked standby. By pressing the remote control or front panel standby button you may now activate your **SETi 40**. All tubes will “light up” when the **SETi 40** is powered.

### **-Tube Life and Replacement**

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.

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## Amplifier Power and Loudspeaker Selection

The **SETi 40** has a nominal power rating of nearly 40 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 **SETi 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' that you should consider. Our suggestion is that you work with the dealer representing the **SETi 40** and choose a loudspeaker that works well for your tastes, in your room, with your system. A dealer who sells the **SETi 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 **SETi40** 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 **SETi 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 **SETi 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 **SETi 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 that 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 that 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 **SETi 40**.

The **SETi 40** bandwidth is similar to many amplifiers which use feedback and push-pull operation to achieve good performance. The **SETi 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 **SETi 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.

# SETi40 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

Output Impedance = 1.5 @ 4ohms – 2.5 @ 8ohms

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 • 64 lbs. (29 kg)

## **Warranty Information**

Completion and return, by fax or mail, of your warranty papers along with a copy of the original sales receipt is the only way to receive **ANY** extended warranty coverage. **Please return the requested documentation to Bel Canto within 15 days of original purchase.**

***Bel Canto Design offers a 90-day warranty that can be extended to a 3-year limited warranty by simply returning, by fax or mail, your fully-completed warranty paper along with a copy of your original sales receipt.***

Warranty coverage includes all parts and workmanship. Warranty is void if damage is due to abuse, neglect or unauthorized modification. All warranty work must be done by Bel Canto or authorized Bel Canto international distributor.

Bel Canto Design products are uniquely identified with a serial number on the back panel or the bottom plate 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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