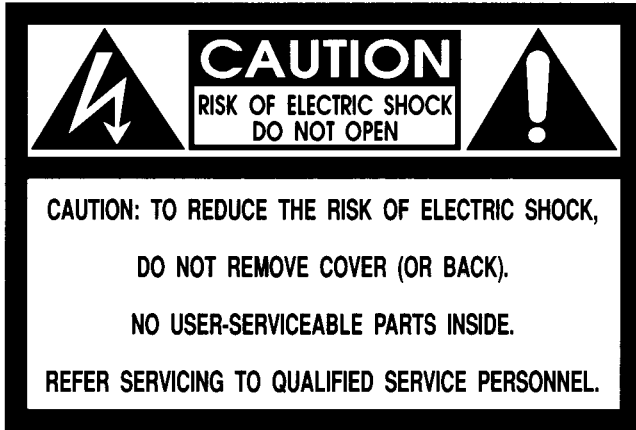


**BBE<sup>TM</sup>**  
**Sound Inc.**

**MODEL 802**  
**USER MANUAL**

5500 Bolsa Ave., Suite 245  
Huntington Beach, CA 92649. (714) 897-6766  
in USA (800) 233-8346. in CA (800) 558-3963

# Important Safeguards



## WARNING

To prevent fire or shock hazard, do not expose the unit to rain or moisture.

**ATTENTION: RISQUE DE CHOC ELECTRIC- NE PAS OUVRIIR.**



The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.



The exclamation point, within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

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For your protection, please read these safety instructions completely before operating the appliance, and keep this manual for future reference.

Carefully observe all warnings, precautions and instructions on the appliance and described in the operating instructions supplied with the appliance.

## INSTALLATION

**Water and Moisture** - Do not install the appliance near water: for example, near a bathtub, washbowl, kitchen sink, laundry tub, in a wet basement, or near a swimming pool.

**Heat** - Do not install the appliance near sources of heat such as radiators, heat registers, stoves, or other appliances that produce heat.

**Ventilation** - Situate the product so its location or position does not interfere with its proper ventilation. For example, you should not place the product on a bed, sofa, rug, or similar surface that might block the vent openings, or placed in a built-in installation, such as a bookcase or cabinet that might impede the flow of air through the ventilation openings.

**Wall or Ceiling Mounting** - If your appliance can be mounted to a wall or ceiling, mount it only as recommended.

## USE

**Power Source** - Connect the appliance to a power supply only of the type described in the operating instructions or as marked on the appliance.

**Power-Cord Protection** - Route the power cord so that it is not likely to be walked on or pinched by having objects placed on it, paying particular attention to the plugs, receptacles, and the point where the cord exits from the appliance.

**Grounding or Polarization** - Do not defeat the grounding or polarization feature of the AC power cord. If your AC receptacle will not accept the power cord plug, contact your electrician to install a proper AC receptacle.

**When not in use** - Unplug the power cord of the appliance from the outlet when left unused for a long period of time. To disconnect the cord, pull it out by grasping the plug. Never pull the plug out by the cord.

**AC Receptacle** - Check to make sure that the AC receptacle holds the power cord plug firmly and securely. If the power cord plug is loose, contact your electrician to replace the defective and unsafe AC

**Foreign Objects** - Be careful that foreign objects and liquids do not enter the enclosure through openings.

## SERVICE

Unplug the appliance from the wall outlet and consult qualified service personnel when:

- the power cord or the plug has been damaged.
- a solid object or liquid has fallen into the cabinet.

- the appliance has been exposed to rain or moisture.
- the appliance does not appear to operate normally or exhibits a marked change in performance.
- the appliance has been dropped, or the enclosure damaged.

Do not attempt to service the appliance beyond that described in the operating instructions. For all other servicing, refer to qualified service personnel **only**.

## **Congratulations!**

Thank you for buying the BBE Model 802 Audio Processor. You now own a very unique signal processing device with no other equal in the audio world today. Whether you purchased the BBE 802 for recording studio, live concert, playback or industrial use, you will find the unit's rugged construction and careful electronic design a welcome addition to your audio system.

This manual will help you use the BBE 802 more effectively and in ways of which you may not be aware. Review of the information contained in this owner's manual will answer most of the common questions that our service department receives. But if you still have questions, please feel free to call toll-free (in USA) 1-800-233-8346 or (in CA) 1-800-558-3963.

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### **The BBE™ Process — “What Is It?”**

Loudspeakers have difficulty dealing with the electronic signals supplied by an amplifier. These difficulties cause such major phase and amplitude distortion that the sound reproduced by a speaker differs significantly from the sound produced by the original source.

In the past, these problems have proved unsolvable and were thus relegated to a position of secondary importance in audio system design. However, phase and amplitude integrity is essential to accurate sound reproduction. Research shows that the information which the listener translates into the recognizable characteristics of a live performance are intimately tied into the complex time and amplitude relationships between the fundamental and harmonic components of a given musical note or sound. These relationships define a sound's “sound”.

When these complex relationships pass through a speaker, the proper order is lost. The higher frequencies are delayed. A lower order frequency may reach the listener's ear first or perhaps simultaneously with that of a higher frequency. In some cases, the fundamental components may be so time-shifted that they can reach the listener's ear ahead of some or all the harmonic components.

This change in the phase and amplitude relationship of the harmonic and fundamental frequencies is technically called “envelope distortion”. The listener perceives this loss of sound integrity in the reproduced sound as “muddy” and “smeared”. In the extreme, it can become difficult to tell the difference among musical instruments, for example, an oboe and a clarinet.

BBE Sound, Inc. conducted extensive studies of numerous speaker systems over a ten year period. With this knowledge it became possible to develop an ideal speaker and to distill the corrections necessary to return the fundamental and harmonic frequency structures to their correct order. While there are differences among various speaker designs in the magnitude of their needs for correction, the overall pattern of correction needed is remarkably consistent.

The BBE™ process is so unique that 42 patents have been awarded by the U.S. Patent Office.

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### **“How It Works”**

The BBE™ process imparts a pre-determined phase correction to the high frequencies where most harmonic information exists. This is done by breaking the signal into three sub-bands or groups: the low frequency group which is crossed over at 150Hz, the mid-range group which is crossed over at 1200Hz and the high frequency group that handles everything else up to 20kHz.

The low group is delayed about 2.5 ms (milliseconds) via group delay within a passive low pass filter. The front panel control allows for either a flat response or a boost of the lows at 50Hz.

The mid-range group is delayed only about 0.5 ms and passes through an active band-pass filter. The mid group is used as a point of reference to make dynamic amplitude corrections in both positive and negative directions to the high frequency group which has been passed through a high quality VCA (Voltage Controlled Amplifier).

Two RMS average loudness detectors continuously monitor both the mid-range and high frequencies to compare the relative harmonic content levels of the two bands and apply the appropriate amount of control voltage to the VCA, thereby determining the amount of high frequency harmonic content present at the final output of the BBE™ processor.

## **Product Description**

The BBE 802 is an intelligent audio processor designed to solve a series of complex problems as described in the previous section. It is, however, very simple to set up and operate and once installed will function flawlessly without further attention.

It is a dual channel, rack-mountable device for use in +4dBu balanced line level applications, such as those found in recording studios, large concert systems and industrial audio applications. The BBE 802 takes up one EIA standard rack space of 19 inches width and 1.75 inches height (1U). There are two completely separate channels to allow for either full stereo program or two independent mono channels, such as separate processing for a snare drum tape track in channel A and a synthesized bass track in channel B.

BBE™ applies different phase correction algorithms to three separate frequency bands. A variable front panel control for each channel allows the user to adjust the amount of process desired.

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## **Using Your New BBE 802**

BBE™ is a process to be added before all other mixing of reverb, special effects or equalization. The BBE 802 should be used to increase the clarity and intelligibility of the total finished mix or an individual track, i.e.: vocal or instrument.

Unlike many aural exciters and equalizers, the BBE 802 will not add any extra noise or harmonics to the sound. Thus, there will be no future problems in duplication or mastering caused by aberrant high frequency distortion. Since the BBE™ technology is a single-stage process there is no need for encoding and decoding.

Always "A-B" the processed to unprocessed sound with the process in/out switch to adjust the amount of processing required.

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## **Things To Remember**

The BBE 802 is designed to work in a line-level environment. The program average levels feeding the input of the processor should be around "0" VU or anywhere from -20dBu to +8dBu. The BBE 802 drives load impedances down to 600 Ohms and supplies up to +24dBu levels at which point it will clip. The BBE 802 accepts both unbalanced and balanced inputs and supplies floating outputs on the XLR connections. The "tip" is hot on the 1/4 inch jacks and the inputs and outputs are transformer isolated.

If the program material has excessive background noise, the noise may be modulated with the program. In this case, an equalizer or other type of noise reduction system may be inserted in front of the BBE 802 to roll off the noise first. Post-amplification of the BBE 802 is not necessary and not recommended, as the BBE 802 will drive any other device in the studio audio chain to full level directly. This assumes that the BBE 802 is operating in the aforementioned fashion with line-levels.

## Applications

### Various applications of the BBE™ process include:

#### Recording Studios

The BBE 802 is designed for use in professional studios to restore liveness, clarity, and improve the transient response of individual tracks or entire two channel mixes. The patented BBE™ process works especially well on digital drum machines, on synthesized brass patches and on vocals where extreme equalization would cause stridency and distortion at peak levels. The BBE 802 works as a playback processor when inserted between the tape track output and the console line input. Conversely, when recording with the BBE 802, the output of the console feeds directly to the input of the BBE 802. The BBE 802's output then feeds the tape recorder's input. The BBE 802 saves poorly recorded or overcompressed tape tracks and brightens low-level instruments without bringing up a lot of noise in the process. Figure 1 shows the BBE 802 in a typical recording studio application where the recording buss output to the tape track is interrupted and the BBE 802 inserted.

#### Live Concert Systems

The BBE 802 adds a much needed clarity to the monitor mix without shrillness. The two independent channels are ideal for two monitor mixes when one mix requires more processing level than the other.

Figure 2 shows the BBE 802 in a typical concert sound system where channel A of the BBE 802 is used for the main house mix feed and channel B is used for the monitor mix feed when two different amounts of processing are required along with the two different mixes. The BBE 802 unit should be placed **before** any house graphic equalizers. All pink noise checks should be made with the BBE™ unit switched "out" to obtain the desired house curve. The BBE™ process can then be dialed in to suit the music production. Extreme console equalization normally used during live performance may be reduced due to the dynamic enhancement effect of the BBE 802.

The BBE 802 may be inserted in many places within the console's signal path to achieve specialized results. In the case of non-VCA sub-groups, the BBE 802 is inserted between "buss out" and "sub-group fader in" for the application of the BBE™ process to a whole group of drum microphones, for example.

If the BBE™ process is to be used on only one microphone source, then the BBE 802 is inserted in the normal "insert send and receive" points exactly like a limiter or equalizer is patched.

If the P.A. mixer does **not** have "insert points" or if the mixer is a powered-type unit without any way of interrupting the signal path before the power amplifier then the BBE 401 should be used. The BBE 401 accepts low-levels from microphones, etc. and interfaces directly to the P.A. mixer.

#### Audio Cartridge/Cassette Copies

Since the BBE™ technology is a single-stage process without the need for encoding and decoding, the stereo BBE 802 is inserted between the master two-track and the audio cartridge or cassette recorder for crisper punchier copies. Figure 3 shows the BBE 802 in real time cartridge or cassette copy mode.

In the case of high-speed cassette duplication, the BBE™ process must be applied when the equalized cassette master dub is made at the mastering studio. See Mastering.

#### Mastering

The BBE 802 is used in the mastering of vinyl records, audio cassettes and digital compact discs to dramatically increase the clarity of the program material. Mastering engineers generally use much less equalization when the BBE 802 is used. Once again, the BBE 802 is inserted between the master tape reproducer and the mastering console.

#### Industrial

The BBE 802 greatly improves intelligibility in speech or music programs by improving transient playback response. This makes the BBE 802 a natural for public address, intercom or wide area dispersion of pre-recorded music or voice announcements over an existing old and dull loudspeaker system. Figure 4 shows the BBE 802 inserted between the telephone matching adapter and the auxiliary input to the public address intercom amplifier. Since the BBE 802 is a line-level operated device, plugging a microphone directly into the unit will not work. If the existing P.A. amplifier has no provision for auxiliary input, then the BBE 401 unit should be used. The BBE 401 unit accepts a microphone directly and then interfaces with an existing P.A. amplifier without costly on-site modifications.

#### Broadcast

The BBE 802 is perfect for "on the air" audio enhancement when inserted after the studio mixing console before the final peak limiters.

Figure 5 shows a typical BBE 802 installation at the broadcast station. Usually a separate BBE 802 would be integrated into each engineer's booth adjacent to the mixing console. The BBE 802 reduces the high and mid frequency smear for clearer, less strident high end and more distinct mid range. The BBE 802 is also used in the production of music and commercial tape cartridges to make cleaner and crisper copies.

## Movie Theater

The BBE™ process brings film and sound tracks which feature a wide range of special effects to dramatic life. It also adds sparkle and intelligibility to dull and muddy optical film sound. Both music and dialogue take on a fresh, bright character when processed through the BBE 802.

Figure 6 shows the BBE 802 in a typical movie theater application inserted after the Dolby Surround Processor™ directly in front of the theater's speaker power amplifiers. A four channel theater requires two BBE 802s while six channel houses requires three BBE 802s. The "set and forget" adjustments on the BBE 802 mean the theater operator does not need to rely on the projectionist for proper BBE™ operation.

## Disco/Club

Figure 7 shows the BBE 802 in a disco club application. Usually, the same rules mentioned in live concert systems apply but on a smaller scale. The ideal place to insert the BBE 802 is between the "main program buss out" and the master volume control. Not all disco club mixers have this facility, so the next best place is at the power amplifier. The output of the mixer feeds the BBE 802's input and the output of the BBE™ feeds the power amplifier. The BBE 802 unit is set to accommodate the loudest levels used.

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## The Controls

Operation of the BBE 802 is quite simple due to the sophisticated "smart" circuitry within the unit. Below are the names and purposes of each control on the BBE 802.

<b>Process Control</b>	The process control regulates the amount of amplitude compensation as indicated by the LED stack. Advancing the knob clockwise increases the amount of the BBE™ process. Once set, the BBE™ process is fully automatic and responds to the program material instantly and quietly.
<b>LED Stack</b>	Each channel is equipped with a set of LED indicators that instantly show the relative amount of processing. In normal operation, the amber LED flashes alternately with the green LED. The red LED lights up only on program peaks and indicates maximum processing. The "Clip" LED indicates that the output of the BBE 802 has reached the maximum level.
<b>Line Gain</b>	The Line Gain is a front panel screwdriver adjustment which sets the gain of the unit in process mode. Fully clockwise is unity. Turning counterclockwise attenuates the output in process mode.
<b>Low Frequency Level</b>	The low frequency level control is a front panel screwdriver adjustment which sets the low frequency gain in the process mode from 10Hz to 200Hz. Fully counterclockwise setting of the control is "flat" at 50Hz while increasing the adjustment clockwise provides up to 6dBu of boost at 50Hz. In many applications the boost in the low end balances out the processed audio.
<b>Process In/Out</b>	The process in/out switch allows a quick comparison of processed with unprocessed sound. When the switch is in, the green LED lights and indicates "process on". When the switch is out, the amber LED lights and indicates "process off". In the "process off" mode the audio signal goes through a single piece of wire and a set of sealed relay contacts — no noisy switches or pots.

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## Set-Up

The BBE 802 is connected into the audio chain in series with the signal path — the same way a graphic equalizer or limiter is connected. The output of the mixer, pre-amp or tape recorder feeds the input of the BBE 802. The input level should fall within the nominal range as outlined in the specifications.

Setting-up and using the BBE 802 as an echo send device like a digital reverb is **not** recommended. The processing effect is not fully realized when the output of the BBE 802 is summed with the original source audio.

## Specifications BBE 802

Frequency Response	
Bypass	DC to 20kHz
Process Mode	program controlled
Noise in Process Mode	- 90dBu below 0dBu output level
Total Harmonic Distortion in Process Mode	less than 0.15% @ 1kHz. @ +4dBu
Input Characteristics	
Input Impedance	15K Ohms (balanced or unbalanced)
Nominal Input Range	- 10dBu to +8dBu for best operation
Maximum Input Level	+24dBu (input clip point)
Output Characteristics	
Minimum Load Impedance for full output	600 Ohms (balanced or unbalanced)
Nominal Output Level	- 10dBu to +8dBu
Maximum Output Level	+24dBu into 600 Ohm Load (clip point)
Power Requirements	
120 VAC (nominal) 50/60Hz	8 Watts (switchable to 220 VAC)
*See instructions below	
A/C Line fused protected	
Terminations/Connectors	
Rear Panel	XLR and 1/4" Tip-Ring-Sleeve (Tip is hot)
Dimensions	
1 3/4" H x 17" W x 7 1/2" D	Standard 1U single rack
Weight	
6 1/2 lbs. (2.5Kgs)	

NOTE: 0dBu = 0.775 Vrms

Instructions for changing to 220 VAC Operation: Power is applied to the BBE 802 by means of the standard IEC line cord provided. This cord may be used for 115 or 230 Volt Operation. There is a small plug-in circuit card underneath the fuse on the rear panel. This card must be turned so that the line voltage being used is visible through the plastic window.

**ALL SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE**

## Calibration Procedure for the BBE Model 802

### For serial numbers up to 2XXXX

#### Equipment Required:

Audio Signal Generator  
AC/DC Voltmeter

This procedure details calibration of channel A. Comments (in brackets) pertain to channel B. All tests are done with a signal level of 0dBu (.775Vrms) except for clip indicator calibration.

#### Procedure:

1. Apply AC power. Engage the process control.
  2. Connect a jumper between TP2 (TP6 for channel B) on the PC board and signal ground.
  3. Set channel A process control to mid-scale.
  4. Set channel A line gain control fully clockwise.
  5. Set channel A low frequency level control fully counterclockwise.
  6. Set VR6 (VR14 for channel B) fully clockwise.
  7. Set signal generator to 500Hz. Apply signal to channel A input.
  8. Set voltmeter for AC volts and connect to TP4 on the PC board (TP8 for channel B).
  9. Adjust VR8 (VR16 for channel B) until the voltmeter indicates 1Vrms.
  10. Connect the voltmeter to channel A output.
  11. Adjust VR6 (VR14 for channel B) until the voltmeter indicates 0dBu (.775Vrms).
  12. Set the signal generator output to 5kHz.
  13. Adjust VR5 (VR13 for channel B) until the voltmeter indicates 0dBu (.775Vrms).
  14. Set the signal generator output to 500Hz.
  15. Set the voltmeter to DC volts.
  16. Connect the voltmeter to TP3 (TP7 for channel B). Note the DC voltage at this point. (Approximately 0.5 VDC).
  17. Set the signal generator output to 5kHz.
  18. Connect the voltmeter to TP1 (TP5 for channel B).
  19. Adjust VR4 (VR12 for channel B) until the voltmeter reads the same amplitude found in Step 16, but in a negative direction.
  20. Set the signal generator output to +24dBu (12.28Vrms) at 500Hz.
  21. Adjust VR7 (VR15 for channel B) until the front panel clip indicator just lights.
- THIS COMPLETES THE CALIBRATION OF THE BBE MODEL 802



## **Service**

We recommend that if at all possible a BBE 802 which requires repair be sent to our facility in Huntington Beach, CA. We request that a "Return Authorization" be issued by the dealer from whom you purchased the unit. If this is not possible, call BBE Sound, Inc. directly to obtain a "Return Authorization" and include with the unit a copy of the bill of sale so that this process can be expedited.

As the repair turnaround time is minimal, we request that the unit be sent to BBE Sound, Inc. We also need to add reliability data to our files so that future revisions may be undertaken if necessary to improve the product.

## **Warranty**

The BBE 802 Processor is warranted against defects in material and workmanship for a period of one (1) year from date of purchase from BBE Sound, Inc. or from an authorized dealer.

During this period, we will repair units free of charge providing that they are shipped pre-paid to BBE Sound, Inc., 5500 Bolsa Ave., Suite 245, Huntington Beach, CA 92649. We will pay return UPS shipping charges within the U.S.A. All charges related to non-U.S. shipping, including customs clearance, will be billed.

This warranty will be considered null and void by BBE Sound, Inc. if any of the following is found:

1. Equipment has been physically damaged.
2. Equipment shows sign of abuse.
3. The equipment has been electrically damaged by improper connection or attempted repair by the customer or a third party.
4. The equipment has been modified without authorization.
5. The bill of sale indicates that the purchase date of the equipment is not within the warranty period.

BBE Sound, Inc. is NOT LIABLE FOR CONSEQUENTIAL DAMAGES. Should the processor fail to operate for any reason, our sole obligation is to repair the unit as described above.

## **Maintenance**

Maintenance of the BBE 802 is limited to proper cleaning of the unit with mild household cleaner such as Formula 409<sup>™</sup> or Windex<sup>™</sup>. The chassis and cover are steel finished with a durable polyurethane paint, while the front panel is an anodized aluminum extrusion.

There are no user replaceable parts and the unit should not be opened for any reason unless you are a qualified technician.

Calibration should be performed if parts are replaced or if a performance check-out indicates a problem with calibration. Long term use has shown that over the life of this unit there is little or no drift of the components in the BBE 802 which would cause a change in calibration. A very conservative design philosophy has resulted in a piece of equipment which runs very cool and should give years of trouble-free service.

**FIGURE 1**  
**RECORDING STUDIOS**

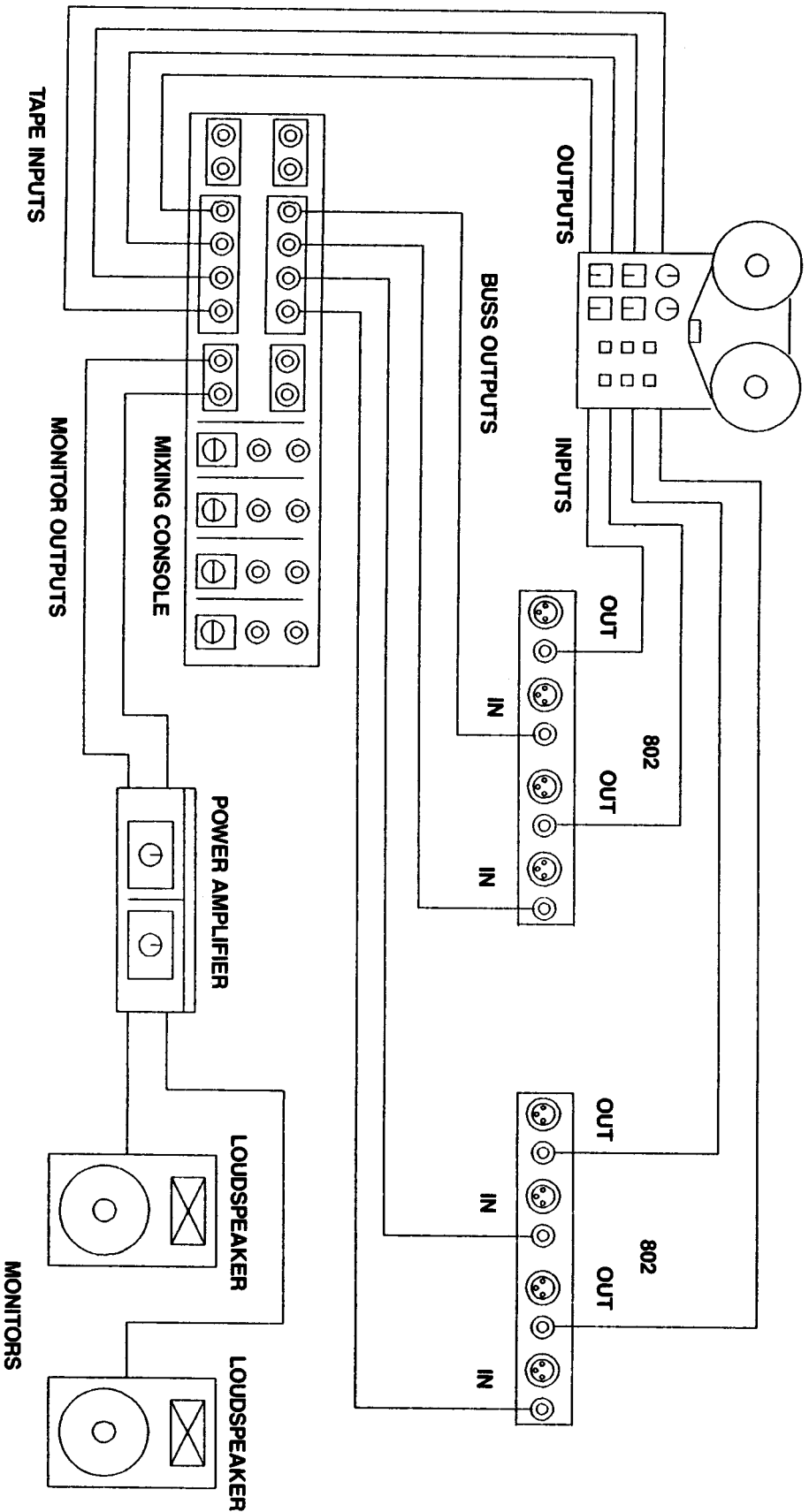
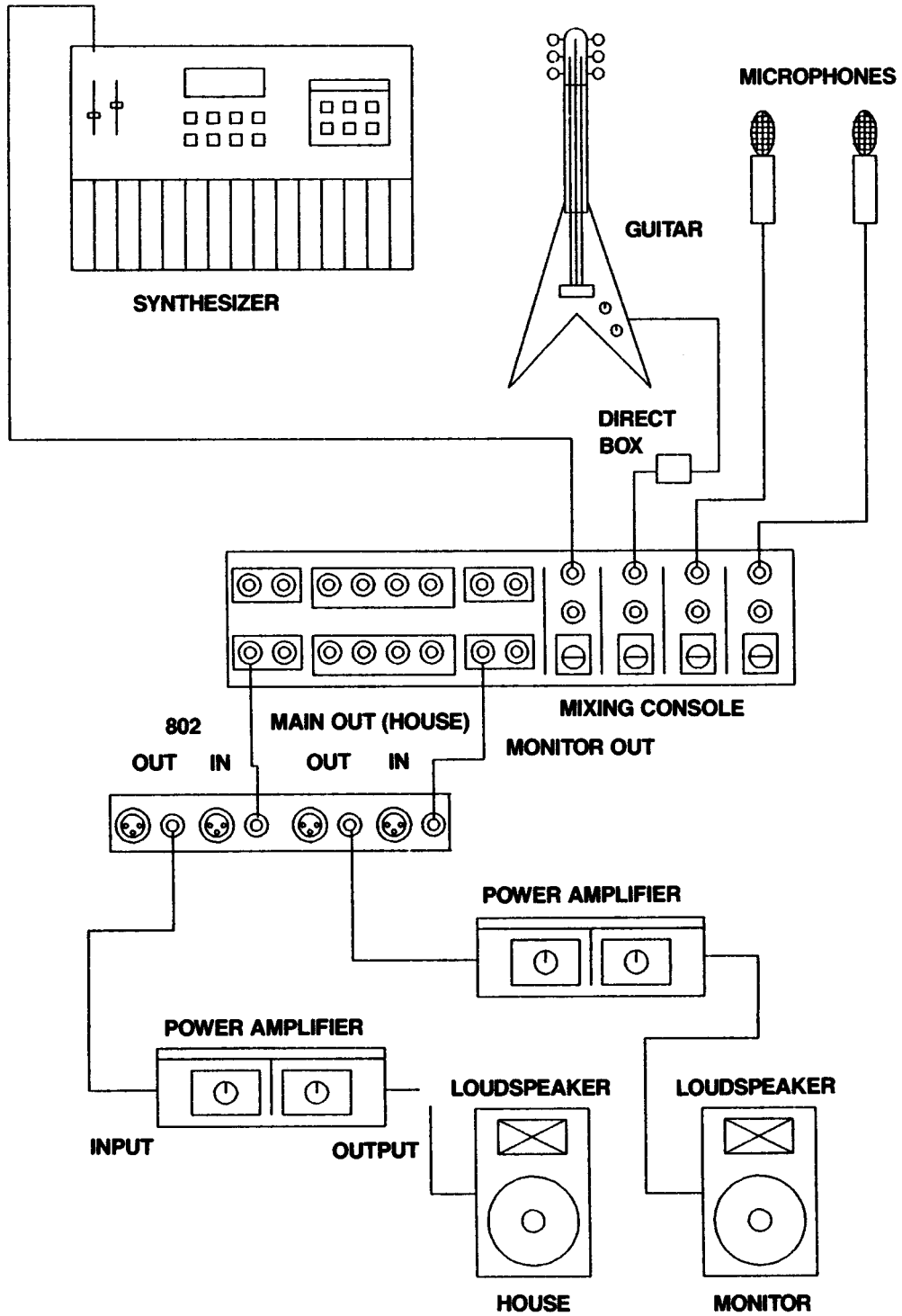
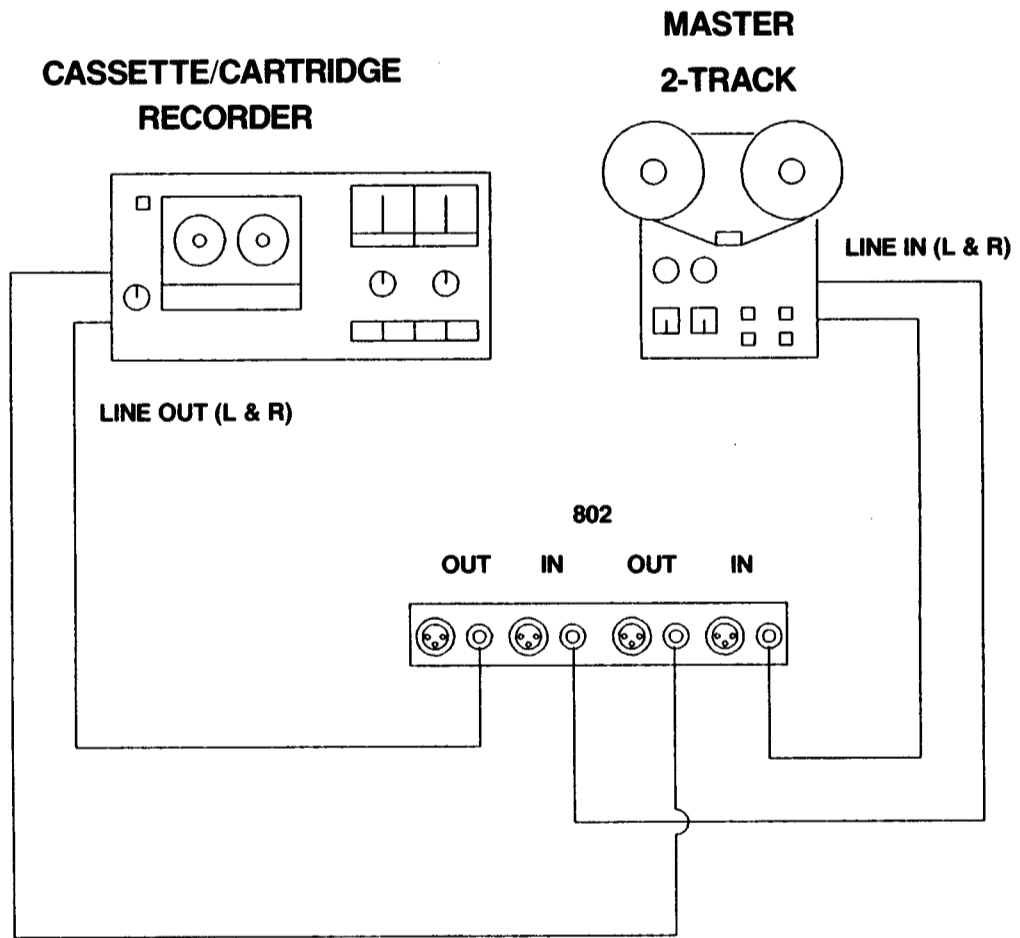


FIGURE 2

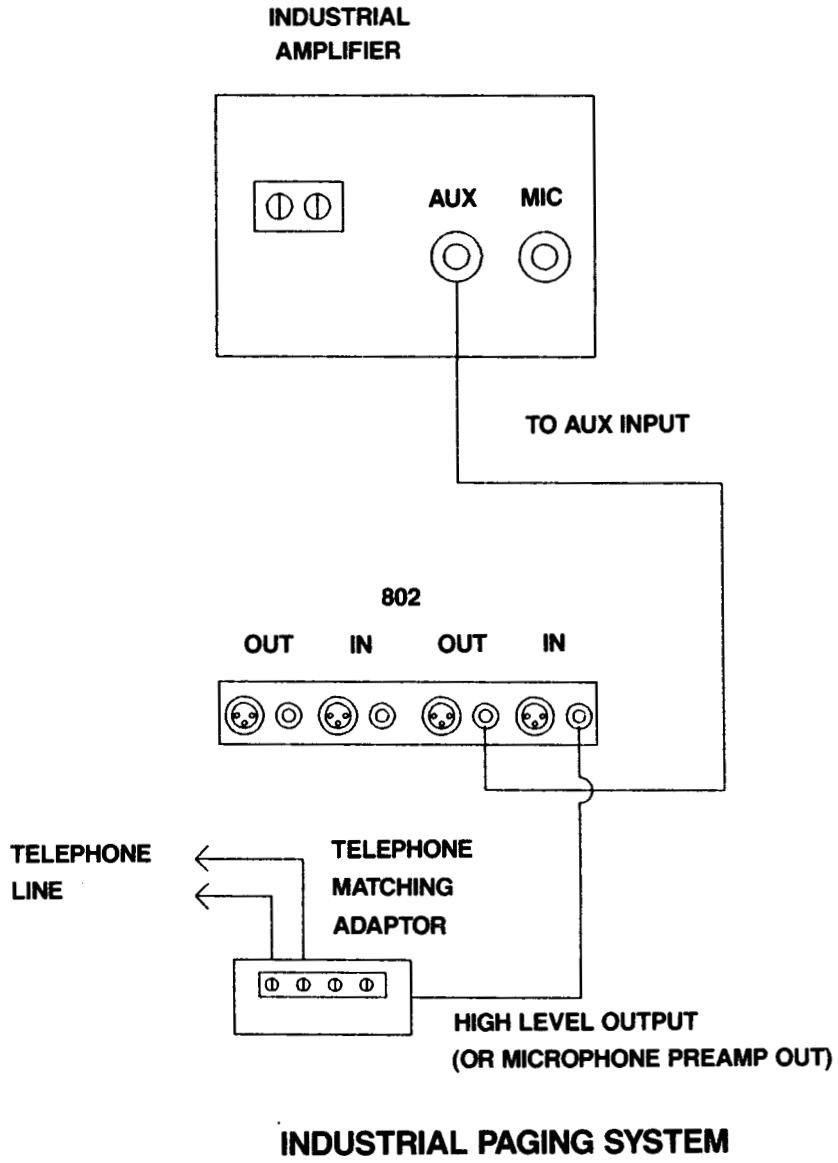
CONCERT SOUND SYSTEM



**FIGURE 3**



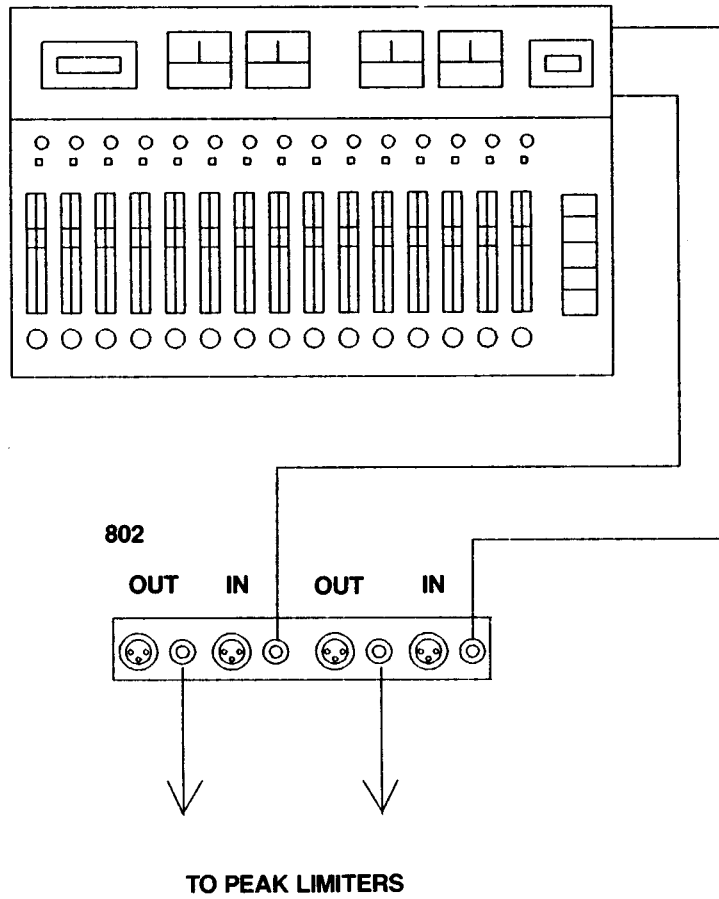
**FIGURE 4**



**FIGURE 5**

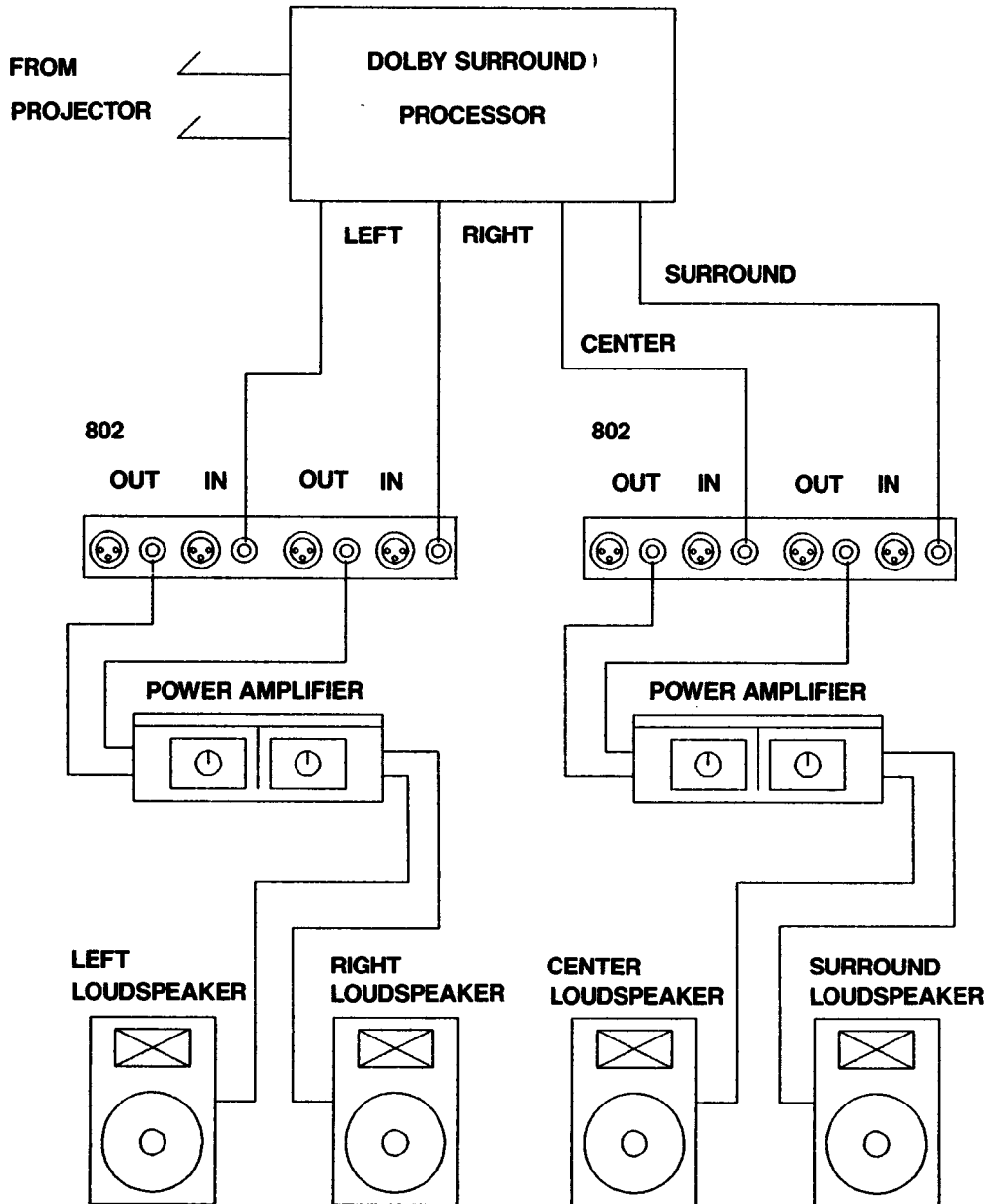
**BROADCAST APPLICATION**

**RADIO CONSOLE**



**FIGURE 6**

**MOVIE THEATER APPLICATIONS**



**FIGURE 7**

**DISCO CLUB APPLICATION**

