

# ESP-3™

## IMAGE AMPLIFIER OWNER'S INSTALLATION MANUAL

**Congratulations** on buying a truly unique enhancement to any quality car stereo system. Properly installed and adjusted the ESP-3 will make an incredible improvement in stereo imaging, ambience and sound stage width. However, right up front we strongly recommend that it be installed by a professional. Still, it doesn't hurt to read this whole manual. It will give you an idea of what has been added to your system, how the ESP-3 works and a lot of other nifty stuff that will make you the envy of your friends (Imagine dropping little tidbits about opto-isolated power supplies and psychoacoustic ear-brain processing).

Because this manual should most appropriately be used by a pro, we have included a COMPRESSED POWER-USERS' HOOK-UP section. After all, you want your system back as soon as possible — and installers often DO charge by the hour....

But read on anyway. There's nothing but re-runs on the tube.

### WHAT YOU CAN EXPECT FROM YOUR AUDIO CONTROL ESP-3

- **Serious, cast-in-stone, dead nuts imaging.** Vocals come out of the center where they're supposed to. Instruments are absolutely welded into the stereo sound field, spread in a semi-circle in front of you in a precise array just the way they were when the song was recorded.
- **The sensation of a larger space and wider sound field** — far wider than the physical dimensions of your vehicle.
- **Ease of control** with a single unobtrusive dashboard adjustment (while the rest of the ESP-3 is mounted out of sight).
- **Highest quality** because the ESP-3 is designed and built in the U.S.A. by an award-winning manufacturer.
- **Jealous friends**, after they hear your car system.

**AudioControl**®

*making good stereo sound better*

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## COMPRESSED POWER-USERS' HOOK-UP INFO

These are “express” instructions for installers. HA! Caught you secretly thinking you might save a few bucks and install it yourself, didn't we? Again, we honestly recommend that you have the ESP-3 professionally installed.

1. Hook the ESP-3 between your head unit's pre-amp outputs and the front power amplifier.

2. Connect the ESP-3's OUTPUT CENTER to an additional amplifier and center-channel speaker (there's a lot to this, frankly).

3. Read the Serious Considerations listed below.

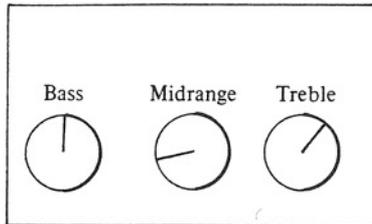
4. If you have an AudioControl Epicenter, it goes BEFORE the ESP- 3

5. If you have an equalizer or crossover, it should go AFTER the ESP-3. See? This IS more complicated than you thought it was. Better relent and just read all of the instructions before proceeding.

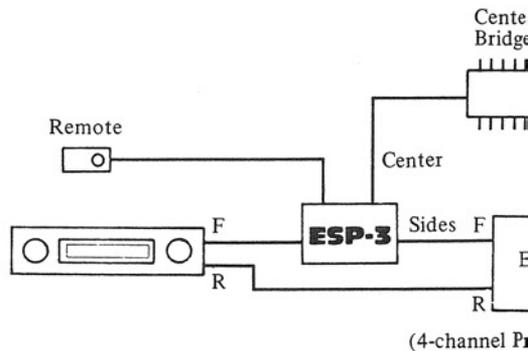
6. Make sure that the Programmable Frequency Match filter frequency is set correctly.

7. Adjust CENTER LEVEL MATCH. (This is a little tricky.)

8. Adjust SPATIAL RESTORATION TONE SETTINGS. These adjust only the spatial restoration effects, not the overall sound. The best way to find what you like is to experiment (and read the section later on in the manual).



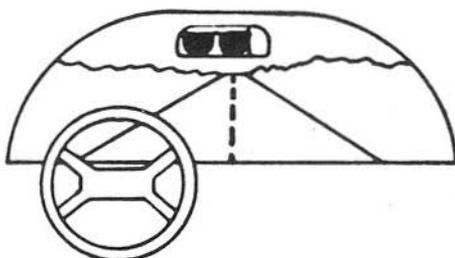
These settings are a good starting point.



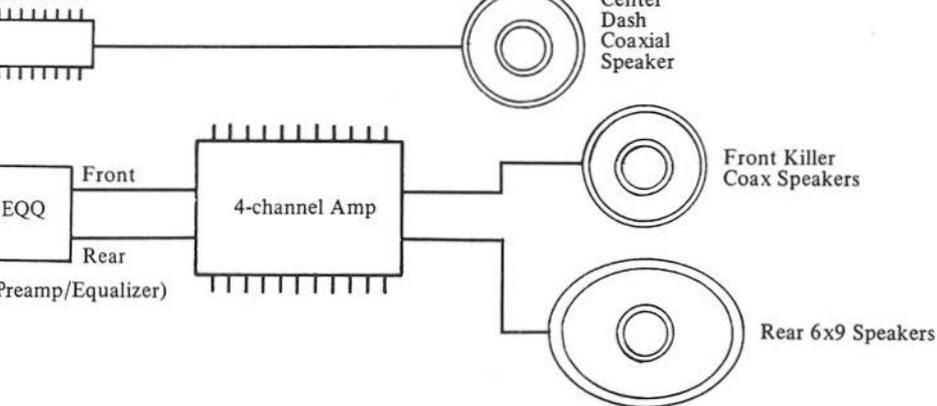
[Click here for full diagram >](#) **Simple System**

## SERIOUS CONSIDERATIONS - EVEN FOR POWER INSTALLERS

- You **MUST** have a special center channel speaker with its own amplification (otherwise you shoulda bought our ESP-2).
- The center channel speaker should be:
  - as large as possible (not just a tweeter)
  - placed as up front as possible (don't stick it down by the gas pedal)
  - sonically similar to the front left/right main speakers (more on all three of these subject later).
- Your system should have good treble output. The most optimal set-up is separate tweeters mounted relatively high in the front passenger area: for example, at the top of the door panels or on the dashboard. If you just have two 6" coaxials playing at your pant legs out of the kick plates at the bottom of your doors, the ESP-3 won't do its job as dramatically.
- You need a good STEREO sound source. Lots of tape hiss or multipath-ridden FM will frankly be exaggerated by the ESP-3's circuitry. And it can't take a tape with very little stereo separation and work wonders on it. The ESP-3 is pretty amazing but it's not a miracle worker.

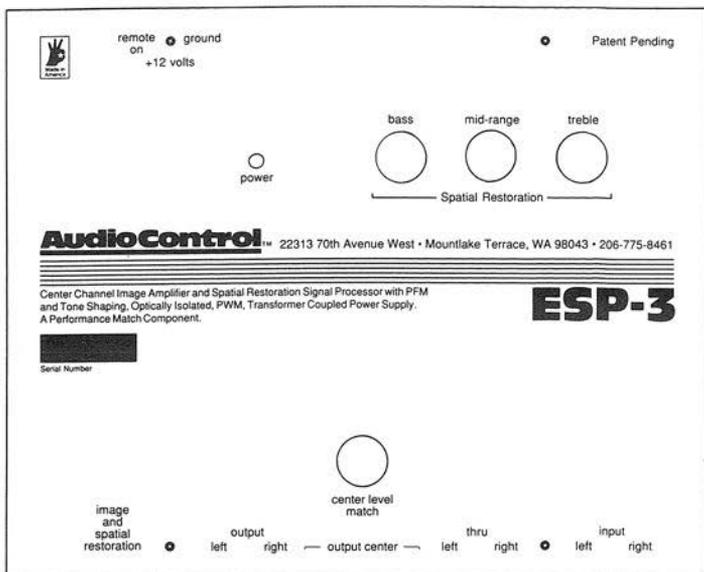


er Channel Amp -  
ged Mono



## GETTING TO KNOW YOUR ESP-3

Well, maybe not personally. But on a first-name basis, anyway.



**The ESP-3 Main Chassis.** The first thing you notice is that there aren't many controls on the ESP-3 Main Chassis; just some set-and-leave-it Spatial Restoration tone controls and a center channel gain control. That's because the main knobs are on the Dashboard Image Control Unit.

Along one side of the Main Chassis, you'll see the Ground and +12 Volt terminals for power, and a terminal for remote activation of the ESP-3 when your head unit is turned on.

On the other side of the Main Chassis are:

1. Left & right INPUTS
2. Two OUTPUT CENTER connections (identical mono outputs)
3. Left & right "THRU" outputs - we'll explain this one later.
4. Left & right RESTORED OUTPUTS
5. A socket for the Dashboard Image Control's remote connection.

On the top surface of the ESP-3 are:

1. A power LED. It's handy for determining whether your power connections have been made correctly or as a very dim reading lamp if you like to hang out in your trunk.
2. BASS, MIDRANGE and TREBLE spatial restoration tone shaping adjustments.
3. CENTER LEVEL MATCH rotary gain control.

**The Dashboard Image Control Unit.** The control portion of the ESP-3 consists of two rotary controls: a SPATIAL Enhancement Control and an Image Amplification control. An LED tells you when the ESP-3 is operating. You must pull the Image Amplification knob "OUT" to turn on the ESP-3 restoration circuitry.

The Image Amplification knob adjusts the focus on your stereo. The further to the right, the sharper your center image becomes.

The SPATIAL Enhancement knob controls the restorative action of the ESP-3's circuitry. The farther to the right it is turned, the greater the effect of the ESP-3.

The best way to find the optimum settings for you and your system is to experiment.

## HOW TO INSTALL THE AUDIO CONTROL ESP-3

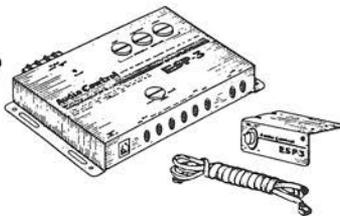
Before we dig into this, we want to give Professional Installers another plug. They can do a great job of installing the ESP-3 and your new center channel speaker. We're just pointing out that installers have a lot of experience and exactly the right tools.

In addition, the ESP-3 includes a third channel. Determining the right kind of speaker, power amplifier and level match with left and right main front channels is best done with the benefit of some experience — not to mention a professional spectrum analyzer such as the AudioControl Industrial SA-3050A.

That said, we'll proceed to...

### A. THE MOST IMPORTANT INSTRUCTION OF ALL

Fill out the WARRANTY CARD and mail it in! It's also critical that you keep your invoice or sales slip to establish the date when you purchased your ESP-3, and hence your warranty. It's also good insurance proof should a car thief take a fancy to your system. Insurance companies are notably reluctant to believe something as esoteric as the ESP-3 was part of a system.



### B. PLACEMENT AND MOUNTING OF THE ESP-3 MAIN UNIT

**Placement.** Theoretically, you can place the ESP-3 anywhere that it can receive power. The most convenient places are under the dash, under the seats or in the trunk.

While the ESP-3 has been designed with very rugged parts, and engineered in a manner which reduces physical circuit board stress, be sure to consider the following guidelines:

Avoid mounting the ESP-3 near a heater, in front of the firewall or anywhere else where it can get really hot.

The mounting location must be safe from water seepage. Lots of trunks have seal problems (poor gaskets, not sleek, furry mammals who balance beachballs and eat mackerel at the zoo). Check for old water stains.

Make sure the ESP-3 can be firmly mounted without vibration. This protects connections from breakage and stress as well as the possibility of it coming UN-attached when you blast over a speed bump.

Avoid any location where mounting screws may potentially pierce a gas tank (lots of which are in the vicinity of the trunk) or gas, brake or electrical lines.

**Mounting.** The ESP-3 installs just like a power amplifier, secured by four screws and lock washers through the four slots in the unit's base.

1. First place the ESP-3 in its mounting position and mark the four screw holes. Try to keep them to the outsides of the slots if possible.
2. Now remove the ESP-3 and drill four small pilot holes. This will insure accuracy and guard against stripping out the larger holes to come.
3. Drill the larger holes.
4. Replace the ESP-3 and secure tightly with four sheet metal screws and lock washers.

### C. PLACEMENT AND MOUNTING OF THE ESP-3 IMAGE CONTROL

The Image Control may be mounted under the dash using its own bracket or through the dash without the bracket. It should be within reach of the driver and where the indicator LED is plainly visible.

**Under-dash Installation.** The Image Control mounts with four screws which attach to the underside of the dashboard. Since you're going to need to slide in upside down to get a clear view of the nether parts of the dash, it's handy to have a Faithful Assistant to hand you things.

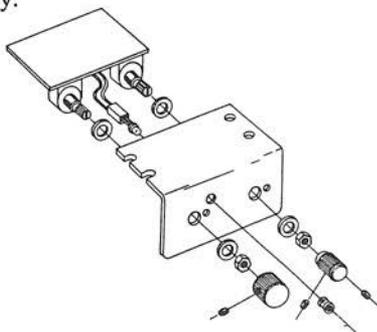
1. First slide into the car and place the Image Control in its potential mounting position (this is starting to sound kinky). Now ask for "Forceps" and then tell your assistant you're just kidding and want the pencil instead.

2. Mark the four holes and remove the Image Control.

3. Drill four holes into the dashboard underside.

4. Replace the Control and secure it with four screws.

**In-Dash Installation.** For that custom, finished look (or if under-dash mounting just isn't practical), the Image Control can be mounted directly into the dashboard. We have provided an extra label and LED holder to make this easier. A small hex driver, medium screwdriver, pliers, and power drill with 9/32", 13/64" and 1/8" bits are required...along with some patience and delicacy.



1. You will need to disassemble the ESP-3 Image Control. First gently pull the LED assembly from its black plastic holder on the Image Control bracket. Do not remove the actual LED wires from its connector, if possible.

2. Next, remove the circuit board and rotary controls from the bracket. Take off the knobs by loosening their set screws, then unscrew the lock nuts and washers.

3. Now take a deep breath and using the label as a template, drill two 9/32" holes in the dashboard (if this is a burlwood Rolls Royce dash, you're a very gutsy person).

4. Drill 1/8" holes for the lock tabs. Or remove the lock tabs if you're sure you can keep the circuit board from rotating.

5. Drill a 13/64" hole for the LED.

6. Apply the pressure-sensitive label.

7. Remove the black plastic LED holder from the Image Control bracket and push it into the 13/64" hole.

8. Insert the rotary control/circuit board into the 9/32" hole, and the LED assembly into its black plastic holder. Make certain the red wire on the connector goes to the long lead of the LED.

9. Check for any parts of the LED wires or circuit board touching metal and then replace the lock nuts and washers and tighten securely.

10. Finally, put the knobs back on and tighten the set screws.

11. Enjoy the applause and go buy your Fearless Assistant a beer, Pepsi, Yoohoo or diet Ginseng soda.

#### D. ESP-3 AUDIO WIRING

**Center Channel Speaker Considerations.** Key to the ESP-3's Image Amplification process is an additional center channel speaker. Your choice of speaker should be a function of the following considerations (does that sound official or what?). It should be:

- In the center. This may sound like we're stating the obvious, but the center channel **MUST** be placed in between the left and right front speakers. It "anchors" the stereo image and if you skew center channel to either side, the whole gigantic Spatially Restored, Image Amplified sound will be out of whack.

- As large as possible. Center channel information is definitely FULL range. So, within reason, you should use a full-range center speaker. The absolute smallest would be a 4 inch (some claim to go down to 90 Hz but we don't believe it). 5-inch or 6x9 coaxial is far better. We've made things easier by including a PFM filter which acts as a low-cut filter, but the speaker should be capable of strong output right down to the cut-off frequency. We said "largest within reason" because another factor enters in...

- Placed as up front as possible. Because the center channel is full range it contains treble which doesn't fare too well if its playing at the listeners' knees. Obviously larger speakers are harder to mount high up in the center.

- Finally, the speaker should have the same sonic signature as the left and right speakers. In other words, its frequency response should resemble that of the main speakers. If you have carbon fiber tri-axials with titanium tweeters on the sides, don't use a cheap, mushy cardboard cone "full range" in the center — it won't have the same mid and high response. If you have separate mid/woofers and tweeters on the sides, consider the same for the center if there's room.

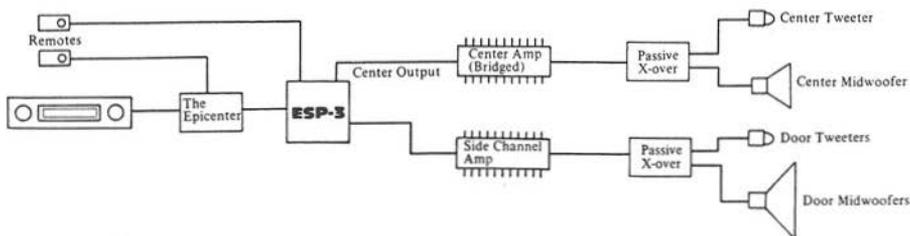
**Amplifier Considerations.** The ESP-3 creates the need for an extra amplifier channel. If you had two before you'll need three. If you're running the ESP-3 with a really complicated multi-amp system, we'll leave you to your own mad-scientist plans. But if the ESP-3 is part of a smaller system (one with just front left, front right and subwoofer, for example) you might consider taking advantage of a 4-channel amp. If the woofer isn't too big, you can run left, right, center and subwoofer off one channel each. The other option is of course to devote a whole amp to the center channel. If this is the case, just size it so it is driven by about the same power as the left and right front channels. For example, if the left and right speakers are being driven by 50 watts, select a 50 watt amp. Or use a 25-watt amp and bridge it.

**The ESP-3's THRU Connections.** Along with the regular INPUT's and OUTPUT's, there are left and right THRU sockets. These are really two more OUTPUT's except that the ESP-3's circuitry doesn't affect their sound. This is so you can drive other sets of speakers where you don't want the spatial restoration effect without resorting to "Y" cords.

**Center Channel Outputs.** They're both the same output and are mono, so don't entertain ideas about trying to get a stereo center channel or anything like that. We provided two to give you additional flexibility in sophisticated, multi-channel installations like the example below.

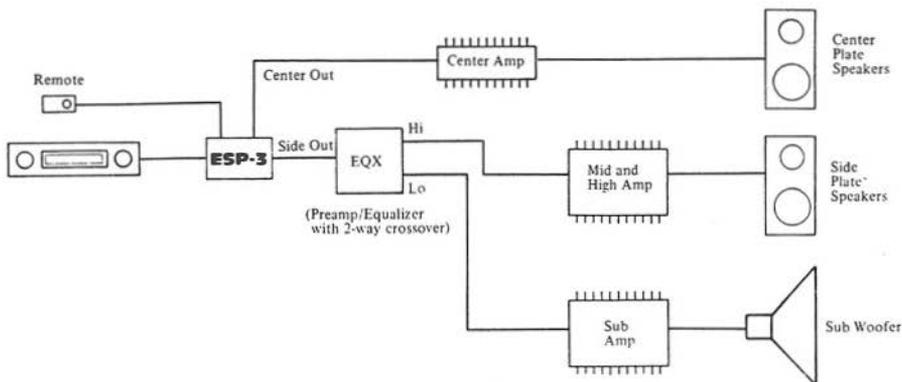
**Planning Your Hook-up Strategy.** Okay, time to trot out the flow charts and diagrams. Naturally, there are lotsa ways to hook up the ESP-3, depending on what the rest of your system is like and whether you choose to use the THRU connections.

The simplest type of system is one where you're adding the ESP-3 to a system with a tape deck and a single stereo power amplifier. In this case, the ESP-3 goes between the tape deck and the amplifier. One connection is made between an OUTPUT CENTER socket and another amplifier or amp channel. Its output is hooked to the center channel speaker. If you're also installing The Epicenter, it should come BEFORE the ESP-3 in the signal path. Any equalizer or crossover should be AFTER the ESP-3.



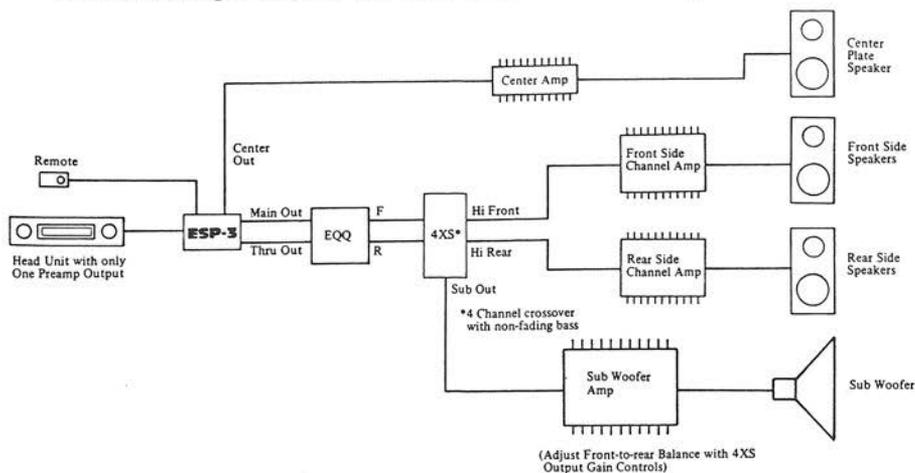
### Simple Stereo System with The ESP-3 and The Epicenter

A simple bi-amp system splits the full-range output of your deck into high and low frequency bands and then routes them to separate amps. Because the ESP-3 works across the whole sound spectrum, it should be connected BEFORE the inputs of the electronic crossover.



### The ESP-3 with an Equalizer and an Electronic Crossover

Here's an example using the 4XS where the ESP-3's THRU outputs are also used:



### Using the ESP-3's Thru Outputs

We know you've probably dreamed up others which makes this look primitive so we'll give up. Like Carl Sagan used to say, "There are billions and billions of possibilities."

**Type of Wire.** It is extremely important to use high quality coaxial stereo hook-up cables for the audio signal wiring. Intense electromagnetic fields are generated in an automobile which can be picked up by car stereo wiring. Theoretically, all RCA-type coax cables (like the ones you use to hook up your home stereo) are shielded to prevent interference. Unfortunately, cheapoid cables skimp on external shielding, because interference is not a problem in most home hi-fi hook-ups. Avoid the temptation to simply use "that old set of patch cords that came with my receiver".

Consult with your Audio Control dealer to obtain high quality, well-shielded cables with securely fitting connectors on each end. Remember, it's better to invest in good cables before installation, rather than try to trace noise once inferior cables are buried in your car's interior.

**Audio Wiring Placement.** We recommend that you route line level (coaxial) wiring between the head unit and the ESP-3 away from car wiring, amplifier power cables or speaker wires. This will help avoid noise induction problems, especially when you're running cables from the head unit all the way back to the trunk.

The one exception to these precautions is the remote wire between the ESP-3 main unit and the remote Image Control. It only carries control voltages, not an audio signal and is not prone to interference. Just make sure it doesn't rub against anything or is otherwise violated along the way.

**Audio Connections.** After all this preface, there really isn't much to say. The signal from the head unit goes into the INPUT sockets on the ESP-3. Outputs to the equalizer take off of the OUTPUTS. One or more feeds for the center channel exit the OUTPUT CENTER sockets. Make sure these connections are really snug.

If you need another set of full-range outputs for speakers like subwoofers or rear satellites where you don't want ambient effects, use the THRU output sockets.

## E. ESP-3 POWER WIRING

**IMPORTANT:** Disconnect the negative terminal of your car's battery before working on any electrical connections. Unless you want a little extra tingle in your life.

**Type of Wire.** Both +12 and ground (-) connections to the ESP-3 should be made with multi-stranded wire no smaller than 16 gauge.

The remote turn-on connection between power amp and the ESP-3 can be made with thinner wire.

**Positive (+12V) Connection.** If the ESP-3 is being mounted near the power amp(s), you may simply make a parallel connection from the amp's +12V terminal to the ESP-3's +12V terminal. A fuse or circuit breaker never is a bad idea. Use at least a amp rating.

**Ground Connection.** The hook-up most open to interpretation and possible problems is the ground connection. For best protection from noise, there should be ONE AND ONLY ONE ground path to the negative side of your vehicle's electrical system. That means connecting the ground terminals of the head unit, ESP-3, and power amplifiers together to someplace you're SURE is actually part of the negative side of the car's electrical system; preferably the battery itself. The nearest piece of bare metal probably isn't a true ground. If you're in doubt, connect the car stereo system's common ground directly to the battery's negative terminal or where the battery's negative grounding strap contacts the vehicle frame.

**Remote Turn-on Connection.** Sounds titillating doesn't it? Actually, what it means is that the ESP-3 is turned on by a control signal from the head unit. Locate the remote turn-on terminals on both the ESP-3 and one of your power amplifiers or the head unit and connect them.

**Center Channel Connections.** The really REALLY unique thing about the ESP-3 (as compared to our merely really unique ESP-2) is its center channel. It's what makes the ESP-3 a true "Image Amplifier". The center output is not just full range mono, but has been processed via all sorts of electronic wizardry in order to provide complimentary effects to the Left/Right SPATIAL RESTORATION. Make sure to read our previous recommendations as to type of center channel speaker, placement and other advice for living.

**IMPORTANT: The Programmable Frequency Match (PFM) Circuit.** The ESP-3 has a special programmable circuit to prevent the center channel speaker from trying to reproduce low frequencies. If you're using, say a 5" center channel speaker, it can't very well be expected to crank out 40 Hz bass. Or at least it may cough out its voice coil trying.

That's where the PFM circuit comes in. You could think of it variously as a crossover or a low cut filter (or just nifty if you're not technically minded). When shipped from the factory, the ESP-3's PFM is programmed to cut off frequencies below 150 Hz (for the center channel only). That should protect even the lamest 5-inch speaker. If you're used to installing other Audio Control Performance Match Components such as our 4XS, and desire a higher or lower frequency, you'll know what to do. If you don't, you should take the whole thing to a professional installer. The wrong PFM frequency could damage the center channel speaker or at least cause intermodulation distortion.

## F. A SHORT TEST RUN

1. First, re-connect the negative terminal of the car's battery.
2. Next, make sure that any other dashboard equalizer loudness or tone controls are either switched out of the signal chain, or turned to their center (neutral position).
3. Confirm that the three rotary controls on the top of the ESP-3 (BASS, MIDRANGE, TREBLE) are set in their center detent position.
4. Make sure that the CENTER LEVEL MATCH gain control is at its center detent position.

5. Turn the ESP-3's Spatial Restoration and Image Amplification Controls all the way to the LEFT (7 o'clock position) and pull the Image Amplification knob out. The LED on the remote should be on now.

6. Now pop in a tape or CD and turn the system up to a pleasant listening level.

7. Do you hear silence instead of sound? If so, check the wires from the head end unit to the ESP-3, or the ESP-3 to the power amplifier. Make sure the Power LED on the main unit is on.

8. Make certain the Image Amplification knob is pulled out and turned to the left. Now rotate the ESP-3 Spatial Restoration Control to the right (toward MAX). Do you hear wonderfully wide stereo with the sound actually wider than the confines of the vehicle? If so, the basic connections have been made correctly. If you hear sound, but nothing different even though you've turned the Image Control all the way up, check all connections including the one between the ESP-3 main chassis and the dashboard Control. Also check that you pulled out the knob on the dash control. If the LED is glowing brightly on the dash control and you do not hear a difference, check to see if you have used the THRU jacks by mistake

9. Now check the center channel speaker. Turn the Image Amplification knob towards the right. Is sound coming out of center speaker? If you're not getting any sound, check the signal and speaker hook-ups, make sure the center channel power amplifier is on, etc. Most likely, sound WILL be coming from the center channel. Adjust the CENTER LEVEL MATCH control if it is too loud or too soft. Remember, we're just going for an approximation.

SAGE ADVICE from the old Performance Matcher in the Sky: The first inclination is to turn up the center channel too loud. Like the first time you get a subwoofer (either at home or in a car), you crank it at a high, obvious level for a few days and then realize that you're overdoing it. Try to go for a level that BLENDS the center with left and right. Like a subwoofer, it should be "there" but unobtrusive.

10. Now with the controls cranked back to the left (off) position, rotate the head unit's balance control to the far left. Does the sound in the car move to the left? If the sound heads to the starboard (right for you landlubbers), the RIGHT and LEFT inputs or outputs need to be checked at the ESP-3 and power amp(s). General practice is to use RED plugs for RIGHT and BLACK (or White) plugs for left. Make sure LEFT is LEFT all the way on through from the head unit to the power amplifier inputs. If the problem persists, tear your seats out, turn them the other way and only drive your car in reverse.

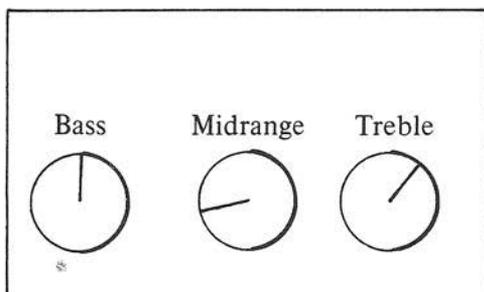
## G. ADJUSTING THE SPATIAL RESTORATION TONE SHAPING CONTROLS

On the top of the ESP-3 are three "tone" controls. NOTE: They only affect the spatial restoration (ambience) effects added by the ESP-3, NOT the overall sound OR the center channel.

MID, TREBLE and BASS ESP-3 controls really have two different purposes: First, they can be used to compensate for various speaker installations. If you have OK treble but not as good as we've recommended, you can adjust the TREBLE EQ on the ESP-3 control to boost the high-frequency ambient products. If the ESP-3's effect is not pronounced enough, kick up the MIDRANGE. If your system is really bass-heavy and the ESP-3's effect sounds weird through the subwoofers, reduce the BASS, etc. Second, the EQ controls can be used purely to change the effect of the ESP-3. In other words, use your own taste. Go nuts!

To set these controls:

1. Play the same tape or CD you did before.
2. One by one rotate each control all the way to the left and then all the way to the right to familiarize yourself with them. Make sure to return each control to the center detent position before experimenting with the next one.
3. Adjust them the way you think they sound best. This is purely subjective. If you're still confused, here's a good starting point to try.



4. Now, try some different tapes or CD's or tune in a clear, strong FM station and experiment with the ESP-3 Image control to discover how much wider and more dramatic stereo can be.

5. Get out of your car and call at least three friends with car stereo systems that could benefit from an ESP-3 and extensively brag to them about how much better your system sounds.

#### H. ADJUSTING THE CENTER SPEAKER LEVEL .

The center speaker gain setting on the master unit should be set so that the image moves to the center, but the overall total sound does not change.

To do this, set the Image Amplification knob all the way to the right and compare it in and out. Adjust the center level gain so as you click in and out, the overall sound doesn't increase or decrease but the image moves solidly center. Again, your taste is what is right. The Autosound Police won't come to your house.

## **GENERAL EXPLANATIONS, CONFIDENTIAL-TO-INSTALLERS AND OTHER UNSOLICITED ADVICE**

### **WHAT HAVE I BOUGHT? A DISCUSSION OF THE ESP-3'S TECHNOLOGY**

**The ESP-3 In Action: SPATIAL Restoration.** What is SPATIAL restoration? Let's start with the basics.

Obviously there IS a difference between stereo and mono. It's the difference between left and right channels. We call that LEFT MINUS RIGHT (L-R). Sometimes the differences are obvious: If a guitar sound seems to be placed to the left in the sound field, you can bet there is more guitar in the left channel than the right. Not all of it but MORE.

However, L-R has another purpose, too. It contains the SPATIAL cues which have been captured during recording or synthesized at the studio. This includes the echoes and reverberation which give you a sense of space and position in relation to the performers. It creates the spaciousness which sets stereo apart from mono.

The ESP-3 creates a copy of the L-R component of the input signal, amplifies it, shapes its tonal contours and then injects it back into the main signal. It's sort of like adding "seasoning" to the "bland", normal sound. The amount of additional L-R signal is controlled by the remote Spatial Restoration knob on the dashboard. The actual "flavor" of the additional SPATIAL information is controlled by the three tone control knobs on the top of the ESP-3.

**The ESP-3 In Action: Image Amplification.** The AudioControl center channel image amplifier can dramatically improve the sound of a car system. Our psychoacoustic ear-brain processing system has to be fooled into combining left and right channels into a solid "between the speakers" image. This same ear-brain processing system works best when the speakers are (you guessed it) IN FRONT of you. Like a home stereo system. Even if you slather the dashboard with mini-tweeters, it is still not possible to achieve the best imaging configuration for fullrange sound (and hence full range imaging). An additional seasoning of Left plus Right information projected from the center of the stereo sound stage psychoacoustically establishes a reference point.

We didn't invent the concept. People have been doing summed mono center channels before this. But the problem here is that all they get is TWICE as much mono information (they're essentially getting L & R PLUS L+R). Even if the speaker's volume is reduced, that still detracts from the sound field's width and spaciousness. The ESP-3 does it right by electronically processing the L+R portions of the signal and sending the right amount to your center channel speaker. Yes, this circuitry is patent pending.

**Nailing Hum.** Yes, we're proud of how the ESP-3 can enhance the stereo effect in your car and center the stereo image dead-on right there on top of the Styrofoam rear view mirror dice. But changing sound is one thing, making sure that adding extra "boxes" into your signal chain doesn't also add noise is equally important. That's why we've added a special optically-isolated switching power supply for superior noise rejection.

From an audio standpoint, car electrical systems are about as quiet as a rock concert in a motorcycle factory during an earthquake. (For a thorough discussion of this, send for our Technical Paper 103).

While the ESP-3 will not contribute to this electronic cacophony, it must be capable of REJECTING everything thrown at it. It does this with a special switching power supply like those used in computers and electronic test instrumentation. This power supply is optically isolated to keep this trash away from your audio signal.

## **GETTING THE MOST FROM THE ESP-3**

As we said in the quick introduction, certain factors affect the performance of the ESP-3. These include:

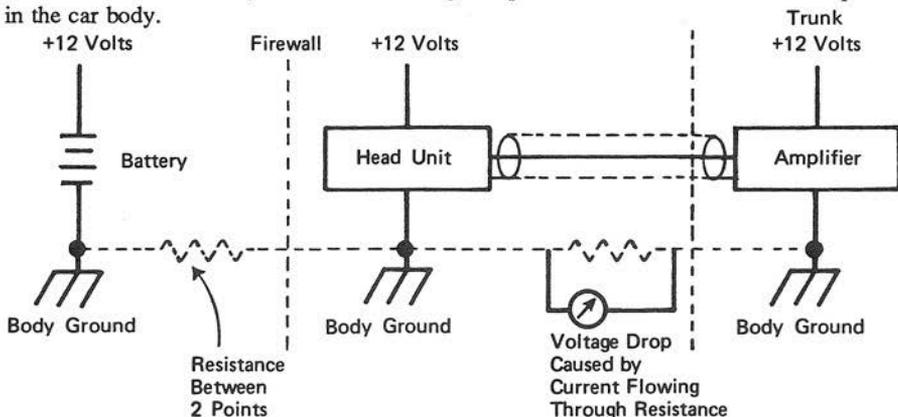
- Correct center channel speaker type and placement. This is covered a while back but is VERY important to the Image Amplification process.
- Correct adjustment of the center level match.
- Sufficient power. If a system is bogged down and on the verge of clipping, it cannot successfully reproduce much L-R, much less an extra healthy dose from the ESP-3.
- Good treble and midrange speakers. The majority of L-R SPATIAL information lies from about 500Hz on up. A muffled system with indistinct sound will get a little better with the ESP-3 cranked up.
- A good STEREO sound source. Some tapes (due to crummy cassette decks with poor separation) just don't have as much L-R information as they should have. Multipath-ridden FM, on the other hand, has TOO MUCH. The ESP-3 will grab the interference and REALLY make it sound unpleasant. It will also do weird things to tape hiss.

## I. FOR INSTALLERS ONLY

Yes, we know that means everyone will immediately read it. But there's nothing secret here.

**Ground Loops.** Ground loops are insidious. They are caused by the non-zero resistance of the wire used to interconnect the equipment. Typically, ground loops are created by a piece of equipment having multiple connections into the grounding system.

The drawing below shows what happens. Generally, the audio wiring has higher resistance than the power wiring. Since the electrical system of the car uses the body/frame structure as its negative return, the non-zero (yes, it's small, but not small enough!) resistance of the car body allows small voltage drops to be created between various points in the car body.



**Ground Option Switch.** All of the above would suggest that we want total isolation between signal ground and power ground. In most cases you do. But occasionally (and with certain brands of head units and amps who will remain mentionless here), it is necessary to actually reduce the amount of isolation which we worked and slaved and strived to achieve with our optically isolated power supply.

Inside the ESP-3 (see why this is in the installers-only section?) is a 3-position slide switch. In position 1 (all the way to the LEFT), it provides total isolation — infinite ohms with an optical isolator. In the center position, you get 200 ohms of isolation. In the almost-never-used (except with —oops we almost said that brand name) far RIGHT position 3, the signal and power supply grounds are combined. Use the switch as a last resort. Alternator whine can almost always be cured with proper grounding practices.

**Setting the Programmable Frequency Match.** This is covered in Tech Note 1004. Ladies and Gentleman, do not try this at home. Also, we have a special Tech Note on building modules. That is number 1006.

**Setting Center Channel Gain.** We've given you some guidelines on achieving proper center channel balance via the ESP-3's CENTER LEVEL MATCH CONTROL. But for those of you who really enjoy our glib prose, we've concocted a special Tech Note just on this subject. Look for it on the best-seller list as Tech Note 1005 — Adjusting Center Channel Gain.

## MISCELLANEOUS TROUBLESHOOTING NOTES

- The LED on the dashboard Image Control will not light if the cable or LED wires are shorted anywhere.
- The Control Knob won't do zip if the cable is shorted, violated or partially disconnected.

- Make sure that the THRU connections haven't gotten mixed with the OUTPUT's — you won't get any effect out of them.
- The ESP-3 won't amaze you and your friends unless you pull the knob out to turn it on.
- The ESP-3 does not work with The Epicenter or ESP-2 dashboard remotes.

## A BRAZEN PLUG FOR OTHER AudioControl PRODUCTS

The AudioControl ESP-3 is part of our Performance Match Series which includes:

- The EQX, a compact, 2-channel, audiophile-grade, digital-ready 12-band equalizer, line level preamplifier, bridging adaptor and programmable electronic crossover. Winner of the Autosound Grand Prix Awards in 1987, 1989 and 1990).

- The EQL, 12-band equalizer with input line preamplifier.

Same ultra-handly 5-band half-octave bass equalizer and 7-band octave stereo equalizer as the EQX. 1988 Equalizer of the Year

- The EQQ, a 4-channel version of the EQL.

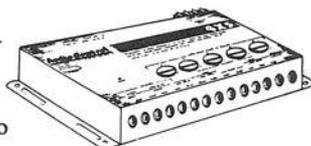
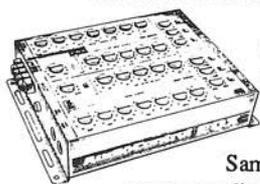
- The EQT, an amazing THIRD-OCTAVE mono equalizer that gives you the greatest possible tonal control over the entire frequency range. Thirty (count'em) 30 separate bands with Constant Q circuitry which minimizes adjacent band interaction. Yep, this one also won a Grand Prix award!

- The 2XS, 2-way 18dB/octave programmable electronic crossover with 18dB/octave subsonic filter, output gain adjustment and bridging adaptor.

- The 4XS. This is more than just a double 2XS. It is a 4-channel 2-way or 2-channel 3-way crossover with non-fading bass. It allows up to five different frequency parameters to be customized for multi-speaker, multi-amp systems. If you're into serious sound, check this one out.

- The ESP-2, the ESP-3's little brother. Left/Right SPATIAL Restoration, but not center channel for Image Amplification.

Each of these components will deliver significant improvements in the sound of any car system and are part of the AudioControl Performance Match system. Check with your AudioControl dealer for the juicy details.



## AUDIO CONTROL ESP-3 SPECIFICATIONS

All specifications are at 14.4 volts DC

Total Harmonic Distortion	0.03%
Signal to Noise Ratio (full output)	-110dB
Input Impedance	20 KOhms
Output Impedance	150 Ohms
Maximum Output Level	7.5 volts
Frequency Response	±0.5dB:10Hz - 50KHz
Power Supply	Transformer coupled, switching DC/DC converter with optical isolation
Current Draw (maximum)	500 mA
Size	1.20"H x 7"W x 5.6"D
Country of Origin	U.S.A.

## AUDIO CONTROL ESP-3 LIMITED WARRANTY

People are scared of warranties. Lots of fine print. Lots of noncooperation. Well, don't be scared of this warranty. It's designed to make you rave about us to your friends. It's a warranty that looks out for you and helps you resist the temptation to have your friend "Who's good with electronics", try to repair your Audio Control ESP-3. So go ahead and read through this warranty, then enjoy your new component for a few days before sending in the warranty card and comments.

If you honor these conditions, we will warrant all materials and workmanship on your ESP-3 for ONE YEAR from the date you bought it, and will fix or replace it, at our option, during that time.

Here are the conditions that make this warranty conditional:

1. You have to fill out the warranty card and send it to us within 15 days after you purchased your ESP-3.
2. You must keep your sales slip or receipt so you have proof when and from whom you bought your ESP-3.
3. Your ESP-3 has to have been originally purchased from an authorized Audio Control dealer.
4. You cannot let anybody who isn't; (a) The AudioControl Factory or (b) Someone authorized in writing by Audio Control to service your ESP-3. If anyone other than (a) or (b) messes with your ESP-3, that voids the warranty.

5. The warranty is also void if the serial number has been altered or removed, or if the Audio Control ESP-3 is used improperly. Now that sounds like a big loophole, but here is all we mean by it:

Unwarranted abuse is; (a) Physical damage (our mobile products are not meant to be used as jack stands for your car); (b) Improper connection. We have done the best we can to protect the inputs, however, 120 volts into the jacks can fry the innards of the poor beastly. (c) Sadistic things. This is the best mobile product we know how to manufacture, but if you use it on the front bumper of your Baja bug and get it full of water, things will go wrong.

Assuming you conform to numbers 1-5, and it isn't all that hard to do, we get the option of deciding whether to fix your old unit or replace it with a new one.

### Legalese Section

This is the only warranty given by Audio Control. This warranty gives you specific legal rights that vary from state to state. Promises of how well your ESP-3 will work are not implied by this warranty. Other than what we've covered in the warranty, we have no obligation, express or implied. Also, we will not be obligated for direct or indirect damages to your system caused by hooking up the Audio Control ESP-3. Failure to send in a properly completed warranty card negates any service claims.

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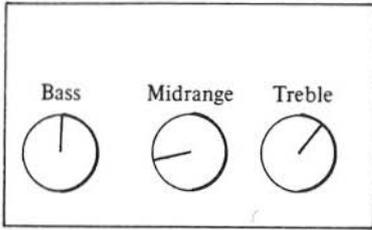
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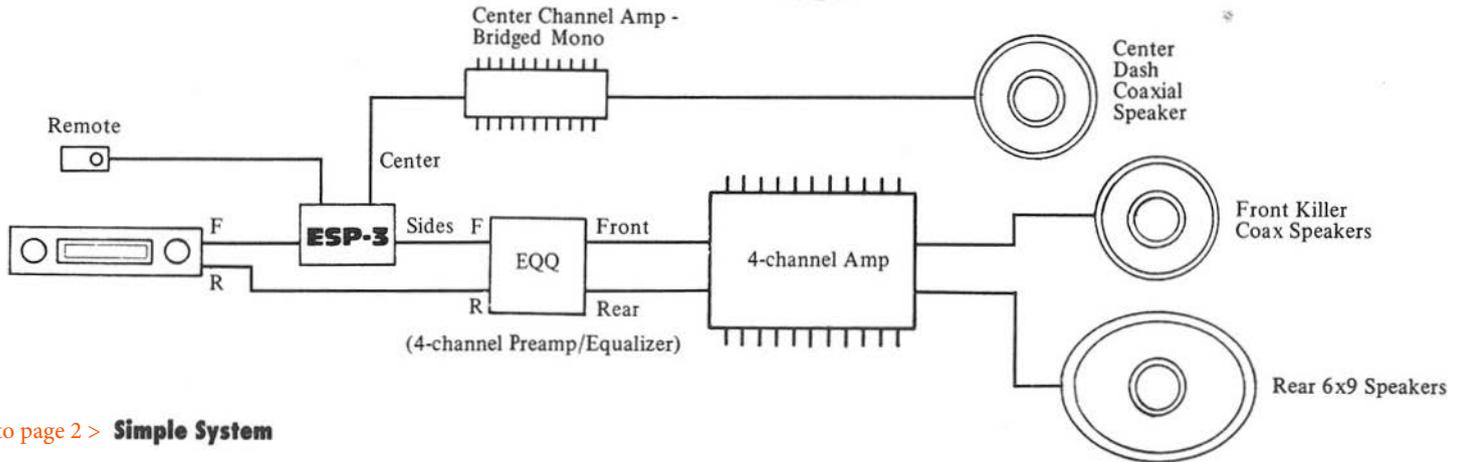
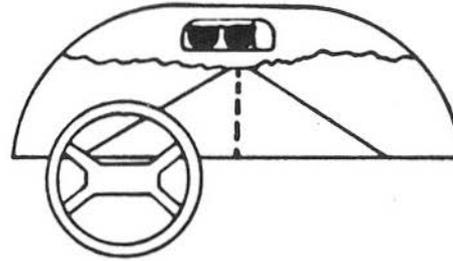
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These settings are a good starting point.



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