



**MODEL 5002<sup>©</sup>**  
**(1986-MSRP \$899.00)**

## **OWNERS MANUAL AND INSTALLATION GUIDE**

### **INTRODUCTION**

Several new features appearing for the first time in these two **LINEAR POWER™** amplifiers include: true compatibility to **2 ohm** and **4 ohm** speaker impedances, switchable Bridged Mono capability, a turn on delay to avoid speaker damage, control circuitry for an optional cooling fan, and the new "**Dynamics Improving Processor<sup>©</sup>**" circuit. The "**Dynamics Improving Processor<sup>©</sup>**" provides a well controlled and precise redistribution of power in the bass region to help overcome the factors in the mobile environment that work against the auto-sound installer: poor speaker placement, the masking effect of a car in motion, and the natural tendency of most speakers to roll off too soon in the low bass region. The net result is accurate musical reproduction that you can take with you. Isn't that what it's all about?

### **TECHNICAL DESCRIPTION**

**POWER SUPPLY:** Self oscillating for reliability and efficiency. The transformer is epoxy dipped for extreme vibration resistance. Banks of high-speed **TO-3** switching transistors provide massive current reserves. **LINEAR POWER™** amplifier design incorporates an unregulated power supply for increased dynamic headroom and efficiency.

**OUTPUT STAGES:** Transformerless, direct coupled and fully complimentary. Output transistors are high current and low distortion **TO-3** devices, operating at a fraction of their limitations. The **TO-3** output stages of these amplifiers will deliver a significant increase in power into 2-ohm stereo loads. Amplifier reliability is accomplished by operating the output transistors at **50%** of their maximum rating even into a 2-ohm stereo load. In 4-ohm stereo, the output devices, in the **5002™**, work at less than **30%** of their design capabilities as engineered by Motorola. **Linear Power™** products are seriously over built!

**PROTECTION:** Our stable amplifier design is made virtually indestructible by two protection circuits. One is a precision thermal protection circuit, which prevents damage from high frequency oscillation, or an excessive ambient temperature. The second protection circuit is a current sensing device guarding against instantaneous abnormalities, such as short circuits. Both circuits are

automatically resetting. A turn-on delay has been added to prevent speaker damage from turn-on transients.

**CONSTRUCTION FEATURES:** Our unique, variable input sensitivity control permits optimal signal matching for lowest noise and lowest distortion with virtually any source. All components used are rated for at least 150% of their intended use. Only glass epoxy circuit boards are used.

**QUALITY CONTROL:** In-house construction of critical components like transformers and chassis, as well as total assembly, allows Linear Power to maintain uniform quality. 100% of the finished units are tested, then burned in for four hours, and tested again. Amplifiers which pass these rigorous controls have truly earned **LINEAR POWER™** logo.

## INSTRUCTIONS

Read the following instructions through completely. If they appear too complicated we recommend you have an authorized **LINEAR POWER™ Dealer** do the install.

## WIRING

1. Disconnect the negative ground cable from your vehicle's battery before making any power connections to your amplifier.
2. Connect the negative power wire from the amp to a solid frame member via a bolt or self-tapping screw. This connection must be a clean, unpainted surface. Always attach the ground wire first when installing this amplifier, and disconnect the ground last when removing this amp from the system.
3. A fuse of the proper size must be installed in line with the main power in order to prevent damage to your wiring. It should be connected to the battery's positive terminal, or as close to the battery as possible. Use the fuse holder and fuse provided, and replace only with the same size fuse. **Model 5002© uses a SC-60 fuse.** This may appear to be a small fuse size, but the **Bussman SC series** fuse is a fiberglass cased, silica (sand) filled ¼ diameter fuse able to take many times its rating for peak current demands over several seconds without blowing, but is still able to protect the amp from sustained current draws in excess of its rating.

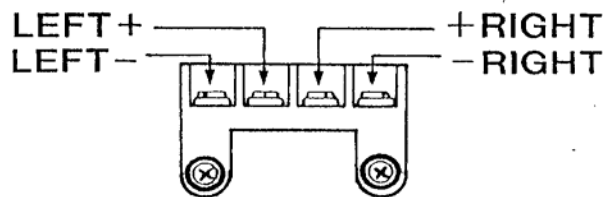
## WARNING USE OF OVERSIZE FUSE WILL DAMAGE YOUR AMPLIFIER

4. The other end of the fuse holder should be connected to the positive power wire from the amplifier. To extend the length of the power lead, use 6 gauge wire or larger to reduce power loss.

5. The red and white wire acts as an electrical switch to turn the amplifier on and off. It should be connected to the power antenna lead from the radio. Where no power antenna lead exists, a source of 12 volts, connected through a toggle switch, will do. Do not connect directly to a source that will leave the amplifier permanently on as this will drain the battery.

6. The RCA (phono) jacks will accommodate either high or low level signals, ranging from 200mv to 5 volts. For low-level signals, always use shielded cable and avoid routing signal cables in the vicinity of any power wires. The center pin of the RCA plug is ALWAYS the positive input connection.

7. As shipped from the factory, the **Model 5002**® will be set up as a normal stereo amplifier, with the **Dynamics Improving Processor**® off, and ready for a **4 ohm stereo** load on each channel. If you wish to engage one of the optional functions of this amplifier, remove the main power fuse to avoid the risk of electrical shock from the high voltage present inside the case of the amp, then remove the bottom cover. The speaker connections are (from left to right, with the amp fins up, connector plate facing you): **LEFT (-), LEFT (+), RIGHT (+), RIGHT (-)**.



### BRIDGED MONO OPERATION

Locate the switch marked, "**Stereo/Bridged.**" Move to "**Bridged**" position. The **left positive** speaker wire is now the **+** speaker output, with the **right positive** speaker wire becoming the **-** speaker output. The two negative speaker outputs **will not** be used. The amplifier will now operate as a **bridged mono** amplifier. **Please observe the correct impedance loads, stereo and bridged for this amplifier!**

### TWO-OHM CAPABILITY

Unplug the two jumper wires near the center of the main PC board from the lugs marked "4" and press them firmly back onto lugs marked "2". This will allow the amplifier to operate into **2-ohm stereo** load on each channel, or a **4-ohm bridged** load when used in bridged mono mode.

### **DYNAMICS IMPROVING PROCESSOR®**

Locate the switch marked, "D.I.P. Off/D.I.P. On." Move to "D.I.P. On" position. The amplifier will now operate with the **Dynamics Improving Processor®** in circuit. This is the only switch accessible through the plug on the bottom cover of the amplifier, and may be switched without removal of the bottom cover.

### **SPEAKER OUTPUT - MODEL 5002®**

The output current capability of the **5002®** exceeds the rating of our standard speaker plug. To ensure a good connection with this much power, a terminal strip is used. The speaker cable can be brought directly to the amplifier and connected to this terminal strip as described above.

### **MOUNTING**

1. The amplifier will work best if it is kept cool as possible. Mount in a position that allows air to flow freely through the black fins. Be sure there is ample space above the amplifier to avoid trapping heated air rising from the amplifier. The amplifier should not be mounted upside down. Avoid mounting the amplifier in the dash or on the firewall to avoid noises being radiated directly into the case.
2. Mount your amplifier in a position that allows ample room for gain adjustments, and the installation, removal and attachment of leads.
3. The case of your amplifier is designed to act as a noise shield. To maintain this protection, be sure the metal case of the amp does not touch the metal of the car. Do not remove or damage the rubber grommets, which provide electrical insulation and vibration isolation.

### **OPERATION / ADJUSTMENT**

The output of most any car audio equipment will follow a common distortion curve. This curve will show that the distortion is at its lowest level right before it reaches full rated output. After that point, the distortion increases rapidly to unusable levels.

For any system to operate at minimum distortion with minimum noise and still reach full power output, the equipment should all be aligned to operate at the same point on the curve at the same time.

In a basic system, using a single amplifier, set the amp gain to minimum, turn the deck up until it just starts to distort, then back the deck down slightly. This is the point where the output of the deck is cleanest. Now, bring the gain of the amp up until it just starts to distort, and back it down slightly. This will allow the deck and amp to reach maximum useable output at the same time.

## WARNING

Your new **LINEAR POWER™** amplifier, when used in conjunction with many of the efficient speaker systems on the market today, can produce sound pressure levels that are considered harmful to your hearing.

Exposure to loud music may lead to loss in hearing. This effect may not be readily appreciated because the damage to hearing is progressive. Those who are exposed to excessive sound pressure should utilize direct individual protection in the form of earplugs or earmuffs, which are specifically designed for noise reduction.

In accordance with the **OSHA** (Occupational Safety and Health Act) regulations for noise levels as they relate to the work area, excessive sound pressure is defined as **115db(a)** continuous for any length of time.

We recommend that you exercise restraint while enjoying the performance of this and other high-powered mobile audio equipment.

## GENERAL TROUBLESHOOTING

**NO SOUND** Check all connections. Check main power fuse. Check accessory fuse. With a trouble light or meter, be sure +12 volts is present at the amplifier on the large positive cable and on the small red/white turn-on wire. Check for a good ground connection. Check by substitution or other method for proper operation of music source.

**BLOWS FUSES** Check all connections to be sure all power wires and speaker wires do not touch ground or each other. Re-check polarity of main power wires.

**SHUTS OFF** As this amplifier is equipped with a thermal and a short circuit shut-down system, in the unlikely event of excessive temperatures due to high ambient temperature or improper speaker impedance, the amp will turn itself off. To avoid damage to the speakers, turn the volume to a minimum while waiting for the amp to turn itself back on.

## NOISE TROUBLESHOOTING PROCEDURES

In most any car, the possibility of picking up unwanted noises can be reduced if the installation is done properly. Keep the system's wiring away from the vehicle's wiring harness. Attach the ground for the amplifier to a clean, solid portion of the body or frame. Use a good grade of shielded cable for all low level signals.

Because of the astronomical number of possible noise problems, a detailed solution to each and every specific problem is impossible. Here we will discuss the major noise types, and try to proceed from cause to solution of each.

## TYPES OF NOISE

**1. Alternator noise:** This is the most common source of noise, and expresses itself as a high-pitched whine, which increases and decreases in pitch with the speed of the engine. Unfortunately for sound systems, the cable between the alternator and the battery forms a beautiful antenna to transmit the alternator's noise to anything surrounding it.

**2. Ignition noise:** Ignition noise is formed by the primary and secondary ignition systems in gas engines. It is characterized by a rapid ticking or popping noise that increases or decreases with engine speed. The first form of ignition noise, from the primary circuit, is caused by the points or solid-state circuitry that fires the coil. These primary pulses can feed back through the ignition coil and into the vehicle's electrical system. The secondary ignition circuit is composed of the ignition coil, the spark plug wires, and the spark plugs. Since the secondary circuit operates at quite a high voltage, and since this voltage is pulsed, it forms a nice radio (noise) station under the hood. This noise is often transmitted to the vehicle's wiring harness.

**3. Accessory noise:** Accessory noise is caused by the electrical noises formed by the many electrical accessories in the vehicle. The most common noises are the pops caused by high current switches (like the brake light switch) and whirring noises caused by the various electrical motors in the vehicle (such as the fuel pump or fan motor).

## ENTRY METHODS

**1. Radiation:** Radiated noise is the most common problem found. As mentioned earlier, the worst problem area is the wiring between the alternator and the battery. The entire wiring harness can become contaminated if a portion of it runs along side the alternator to battery cable.

**2. Ground loops:** Ground loops are the most common way radiated noise gets into a mobile stereo system. This is especially true of multiple amp systems. They have more ground points, and that means more possible locations for ground loops to form. A ground loop is formed when any ground point in the system is at a different potential than any other ground point in the system.

**3. Power Lead (+12V) Noise:** Since true power lead noise is the only noise that isn't radiated, and since the vehicle's battery (if in good condition) provides adequate filtering for alternator noise, then only ignition and accessory noise could enter the system through the power leads.

## **BUILT IN NOISE SUPPRESSION**

The vehicle's battery forms a huge capacitor bank that does a fantastic job of filtering noise. Unfortunately, batteries grow old and lose their ability to hold a charge. At the same time, they lose their ability to filter noise; even corrosion on the battery terminals will cause increased noise as it isolates the battery.

If the vehicle is in need of ignition repair or tune up, increased noise will result. Specifically, check the condition of points and condenser, as well as the spark plug leads. Don't forget to check for resistor plugs, too.

## **TROUBLESHOOTING NOISE**

Once the type of noise has been determined, the entry method must be isolated. The easiest place to start is the amplifier. Unplug the RCA jacks and listen for a change in the noise level. If little or no change occurs, the amplifier's power is contaminated. If the noise is gone, the possibilities are a ground loop or a noise problem earlier in the system. If the problem is a ground loop, the best solution is a better ground for the amp(s). Another solution is to carefully connect a wire from the shield of the RCA connector, at the amplifier end, to a good ground on the vehicle. This will effectively short circuit the ground loop.

The next check is for radiated noise. With the deck still electrically connected to the vehicle, slowly remove it from its installation, and listen for a change in noise level. Any reduction would indicate that noise was being radiated directly into the deck while it was in the dash. If you are dealing with radiated noise, the only solution is isolation. The easiest method is usually to move the contaminated wiring away from the stereo's wiring.

The best way to eliminate power line noise is to install a filter capacitor across the noise source. The best capacitors to use are .5mfd 25v bypass capacitors for the coil, as well as any accessory motors, and .1mfd 100v ceramic disc

capacitors for switches. Another way to suppress power line noise is with noise filters.

### **SERVICE OR REPAIR**

To obtain modification, service or repair, please contact our **ONLY Authorized LINEAR POWER™ Product Service Center:**

**T.I.P.S. INC.**  
3455 Lanell lane, Pearl, MS 39208  
(601) 932-8477  
E-mail: ray@tipsinc.net



# LINEAR POWER™

3455 LANELL LANE, PEARL, MS 39208 (601)932-8477

## SPECIFICATIONS

### 5002©

RMS Average Continuous Power Output (4 Ohm stereo)	250x2
THD (20Hz - 20KHz)	<0.12%
Frequency Response (+/- 1dB)	35HZ-30KHz
Signal to noise ratio (A-weighted)	>95dB
Damping Factor @ 4-ohms/2-ohms	>219/102
Slew rate in volts per microsecond	16 V per $\mu$ S
Input Sensitivity (at rated output - min/max gain)	200mV - 5Volts
Max Power Consumption Idle/4-ohm/2-ohm	2A/77A/90A

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