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# CARVER

MODEL M-500t

OWNER'S MANUAL

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## SPECIFICATIONS

<b>Power Output:</b>	251 watts RMS per channel into 8 ohms from 20Hz to 20kHz with no more than .05% total harmonic distortion.
<b>Power at Clipping:</b>	270 watts RMS per channel into 8 ohms at 1kHz. 350 watts RMS per channel into 4 ohms at 1kHz. 700 watts RMS into 8 ohms single channel.
<b>Noise:</b>	Greater than 100dB down, IHF A weighted. Harmonically related commutation noise is equal to or less than non linear distortion components, IHF A weighted.
<b>Intermodulation Distortion:</b>	.05% SMPTE
<b>Transient Intermodulation Distortion:</b>	Unmeasurable
<b>Frequency Bandwidth:</b>	+0 - 3dB 1Hz - 100kHz at 1 watt.
<b>Slew factor:</b>	Greater than 200
<b>Display Tracking:</b>	$\pm 1$ dB
<b>Display Ballistics:</b>	Peak responding, 1 millisecond attack, 1 second decay.
<b>Input Impedance:</b>	15 k ohms

## INTRODUCTION

Thank you for choosing the Carver Magnetic Field Amplifier. We are particularly proud of this instrument and would like you to know why.

Your Magnetic Field Amplifier is a superb performer. Judged against conventional amplifier standards, the M-500t is second to none; its sound quality is smooth, sweet, and absolutely accurate. It can deliver more than 250 watts RMS per channel into an 8 ohm loudspeaker or 500 watts into a single mono loudspeaker! It can deliver this power from 20kHz all the way down to 1Hz with distortion that is so low that it can be accurately measured only by the most advanced laboratory test equipment. Closed-loop frequency response extends from below 1Hz to beyond 100,000Hz.

Judged by the standards of its new technology the M-500t stands in a class by itself. Most obvious is its compact size and weight. The magnetic field technology that makes this possible yields performance advantages that go far beyond that of conventional amplifiers.

The M-500t is remarkably efficient; considerably more efficient than conventional amplifiers. Its power supply can momentarily "assign" power as required: Unused power from one chan-

nel is available to the other by as much as 300 watts.

The M-500t can operate safely into any speaker impedance down to 4 ohms without requiring fan-cooling.

### **PRIOR TO INSTALLATION**

Carefully remove the M-500t from its packing. It is important to save the carton and all packing materials as this is the safest protection if you need to move or return the unit for servicing.

Make a note of the serial number which is located on the back of the M-500t. Record it in the space provided here for convenient reference. You will need to refer to this number in the event you require service or if it is stolen.

### **INSTALLATION**

The M-500t should be located on a smooth surface where it is protected from excessive heat, direct sunlight or moisture. All connections should be made before plugging in its AC power cord.

For normal two channel stereo operation refer to the diagram on the back panel of the amplifier. Speaker connections are made by stripping only 1/4" of insulation off each conductor and twisting the strands tightly before inserting in the correct terminals. Make all connections firmly.

It is imperative to use good quality speaker wire. While twenty-two gauge zip cord can be used, eighteen gauge lamp cord is recommended. For runs exceeding 15-20 feet even heavier wire will prevent power losses.

## **PHASING**

Correct phasing is essential to assure that left and right speakers are working in unison rather than opposing each other. Each speaker has + and - connections normally indicated by a red terminal or "8" for + and a black terminal, "0" or "Common" for -. Each should be connected the same way to the M-500t. This is facilitated by the markings on speaker cable; lamp cord generally has a small ridge on one conductor's insulation. Other wire may use silver and copper colored wires for the conductors.

To audibly check phasing, wait until after you've completed all the hookup and operating instructions. At that time, you may play music rich in bass frequencies and switch between mono and stereo on your preamp. When you are standing midway between the speakers you can identify an out of phase hookup by a weakening of bass when mono is selected. If phasing is correct the bass is unchanged. To correct, simply reverse the leads for one speaker.

## Notice

Do not connect any of the speaker terminals from the M-500t to each other – either at the amplifier or at the loudspeaker. Make certain no stray strands of exposed wire are touching between terminals.

## COMMON GROUND SPEAKER SWITCHING SYSTEMS

**NOTE: READ THE FOLLOWING CAREFULLY.**

Certain kinds of common ground systems may be used. Certain other kinds may not be used.

The multiple switching systems used in high-fidelity salons may not be used because one of two unacceptable conditions would result:

- (1) One channel shorted to ground . . . OR
- (2) One channel out of phase with respect to the other. The preceding occurs because other, conventional amplifiers are always included in the system.

A common ground switching system properly installed in a home may be used. You will have to connect the common ground wire to the black terminal marked “chassis”, and the two outside terminals (one black, one red) become the “hot” signal leads and may then be routed through any switching system of your choice. (The

red terminal marked "chassis" remains unused.) At this point, there is no electrical conflict in terms of ground or signal leads, however, in order to preserve phase integrity, the wires that connect to each left speaker in the system must be reversed 180.

### **MONO HOOKUP**

The M-500t can be used as an immensely powerful single channel amplifier without use of any special bridging adaptor. Again refer to the back panel illustration. You will need to feed both input jacks with identical signals from a "Y" connector. The speaker leads must be connected to the two outer terminals **only**. The two inner terminals are left unconnected. The + wire goes to the red (non-inverting), the - wire to the black (inverting).

The resulting output power is 500 watts RMS into 8 ohms.

### **POWER**

The M-500t is designed to be connected to the convenience outlet on your preamp. If required, use only a heavy duty extension cord to minimize power loss.

Do not switch power on and off with loud music playing. Accessory outlets should be rated at no less than 500W.

## OPERATION

Before plugging in the AC line and turning on power, double check input and speaker connections. Never change any connections with the AC cord of the M-500t plugged in. The resulting transient may blow a fuse or may permanently damage loudspeakers.

## POWER LEVEL METERS

The two large-sized power meters allow the power output of the left and right channels to be monitored. The RMS power output level is indicated on each meter for each channel. The gradations of the scale are based on an 8-ohm load. With a 16-ohm load, the meters indicate double the actual power, and with a 4-ohm load, the meters indicate half the actual power. When the unit is being used as a single channel amplifier, the correct total power output will be four times that indicated by each meter. Brightness of the meter-lights may be changed by sliding the meter lighting switch located at the back panel up (bright) or down (dim).

## FUSES

The main fuse is selected to protect the M-500t from damage



without sacrificing its ability to recreate dynamic range. If the fuse blows, investigate, then replace only with the original value.

Very few loudspeakers can handle the full power of the M-500t for more than a brief time period, such as a musical crescendo. Yet, its unclipped, undistorted output is less hazardous than the waveform of a smaller amplifier's clipped output. We strongly recommend separate fusing as per the speaker manufacturer's recommendations; your dealer should be consulted. Naturally, Carver Corporation cannot be responsible for damage to loudspeakers connected to the M-500t.

### **OPERATING TEMPERATURE**

Under normal conditions your M-500t operates with cool efficiency, with huge reserves for voltage and power dynamic headroom. However, even though it is extremely efficient, the M-500t will still generate some heat when called upon to produce extremely high power.

Under sustained high power operation, it is normal for this small chassis to dissipate internally generated heat and may be quite warm to the touch. This will not harm the internal components, however, as they are all rated for safe operation under far more extreme ranges than they encounter in the M-500t.

Nevertheless, you must provide good ventilation around and beneath the M-500t so air can enter underneath and exit out its top, back, and sides. Avoid placing on a pile carpet that can impede air flow.

### **CARE OF THE M-500t**

Never short circuit the output terminals of the M-500t. Take care when connecting the speakers that the speaker wires do not touch each other at the terminals on the amp or on the speaker.

Protect your amplifier from moisture and excessive dust.

Avoid dropping your amplifier.

Never replace fuse with one other than the specified rating.

The anodized front panel may be cleaned with a soft cloth and diluted ammonia to remove fingerprints and film buildup. Never use detergents or abrasives.

If you suspect a problem, try some simple troubleshooting first. Frequently, a problem lies elsewhere in the system or even the hookup cables. If one channel of the M-500t does not respond, turn off the power and reverse the input cords. If the other channel is inoperative, then you know the problem is not in the M-500t. Check speaker hookups.

## **REPAIR**

If the problem still exists contact your Carver Corporation dealer or the factory. We may suggest some further troubleshooting hints. If the amplifier does require service, bring it to your dealer in its original carton. If you must return it directly to us, call or write to advise us before shipping. Refer to your Carver Corporation Warranty for details.

In no case should anyone other than the factory or its designated service station disassemble or attempt repairs to the M-500t. We want to inspect for cause and to assure proper future operation.

## **T-MOD**

Your M-500t uses the T-mod technology originally developed for the Carver M-1.5t power amplifier.

## **PROTECTION MECHANISMS**

This unit incorporates a main fuse and relay muting system in order to protect the loudspeakers which have been connected to the unit and the unit itself. For further protection, the following additional systems have been included.

## **HEAT SINK ABNORMALLY HIGH TEMPERATURE DETECTION CIRCUIT**

This unit employs skyve fin heat sinks in order to efficiently dissipate the heat generated by the power transistors. Under normal conditions of use, no problems are posed but when the unit is used in a poorly ventilated location or in a position exposed to direct sunlight and high power output, the heat may not be sufficiently dissipated and the temperature may rise to an abnormally high degree. In cases like this, the protection circuit will be activated once the temperature of the heat sinks rises to more than 100°C.

## **OVERCURRENT PROTECTION CIRCUIT**

Damaging overcurrent may flow through the power transistors when the terminals of the speaker system or this unit's speaker terminals are shorted. If such a short circuit occurs, the relay is tripped, and the unit and the speakers are separated, protecting both amplifier and speakers.

## **DC DETECTION CIRCUIT**

This circuit is activated when DC components are applied to the input, amplified and made to appear at the output or when one of the elements inside the amplifier malfunctions and DC components appear in the output. What happens is that the unit and speaker are separated and both are protected. This circuit is activated when a DC voltage of more than  $\pm 2.5V$  is detected.

## **SPECIAL NOTE**

As with any powerful amplifier, care should be exercised not to place the unit too close to other high sensitivity electronic instruments in order to avoid unwanted hum pickup. At least three feet is adequate for most installations.

## **TECHNICAL INFORMATION – BENCH TESTING**

The Carver M-500t Magnetic Field Amplifier utilizes technology that requires test procedures markedly different than for conventional amplifiers. Failure to observe these differences may

abuse the amplifier and result in measurement error. The following are the differences:

1. The left channel output "hot" is connected to the black (-) terminal because there is an internal  $180^\circ$  phase relationship between the two channels. This is done for the following reasons:
  - A. It allows the amplifier to utilize its power supply in push-pull fashion facilitating the availability of power reserves as needed for either channel.
  - B. It allows single channel high power operation without need for a phase inverting "bridging adaptor."

Since the ground for the left channel is connected to the red speaker terminal, exercise care not to attach the grounding system of the test equipment to the black hot output of the left channel amplifier.

2. The input AC line current is in quadrature phase with the input AC line voltage. The input power is thus the product of the in phase voltage component and in phase current component.

When input current begins to flow, the line voltage will drop, causing the "input" AC waveform to distort. Accurate measurement of the M-500t depends on a sufficiently

“stiff” AC supply. The 60Hz AC line distortion must be below I.H.F. specification.

Most of us have used only peak responding AC line monitors or “slow” thermal RMS responding line monitors and they are simply inadequate for the task. Inspect the diagrams below:

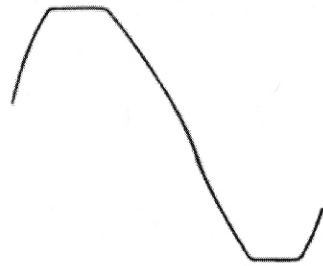
### Conventional Amplifier

no load  
120V.  
60Hz



Undisturbed waveform.  
Average responding voltmeter and peak responding voltmeter read identically and correctly.

full load  
120V  
60Hz



Waveform peaks clipped at 90° by pulsating current flow. Average responding voltmeter reads too high. Peak responding voltmeter reads correctly.

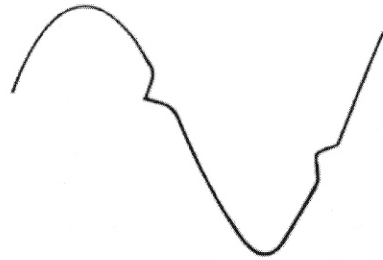
### Magnetic Field Amplifier

no load  
120V  
60Hz



Same as conventional amplifier.

full load  
120V  
60Hz



Waveform sides clipped at 180° by pulsating current flow. Average responding meters read too high. Only a meter that reads peaks at 180° can read correctly.

If you lack a “stiff” AC line supply or line distortion measuring method, you may use this rough approximation for determining a correction factor:  $K = 1.15$ .

$V_{\text{peak responding}} = K \times V_{\text{r.m.s. responding}}$ . The correction factor  $K$  will vary between roughly 1 and 1.15 depending on stiffness of the AC line.

3. THD measurements must separate the non-linear distortion products from the thermal noise and commutation noise products of the M-500t power supply. At low levels a spectrum analyzer must be used because a standard THD instrument cannot distinguish between distortion products and noise.

At high levels, a phase meter must be used at the output of the conventional THD instrument. This is to account for commutation noise products that are harmonically re-



lated to the non-linear distortion components, but are in quadrature phase with them. Without the phase meter, small but observable measurement errors will result.

An approximate alternative is to use an IHF "A" weighting network at the input to the standard THD instrument.

We wish you many hours of musical enjoyment. If you should have questions or comments, please write to:

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