CARVER

MODEL M-1.5t

OWNER'S MANUAL

CARVER Model M-1.5t
Magnetic Field Amplifier
Owner's Manual

Contents

I. INTRODUCTION AND SPECIFICATIONS

The Carver M-1.5t is something new in the way of stereo power amplifiers, designed around a philosophy that has been many years in the emergence, and intended to be the ultimate amplifier for the reproduction of music and music-like signals, today and for some years to come.

It is recommended without reservation for home listening of all forms and for any application in which the statistical duty cycles of speech and music, handled at extremely high levels with extremely low distortion, are the principal content of the information to be presented.

Although its power-output capabilities are unapproached by any other commercially available audio amplifier, the Carver M-1.5t is virtually indestructible under conditions of normal use and abuse. We at Carver Corporation hope you will take the time to study this manual in detail, in order to understand both the benefits and the liabilities of extremely high amplifier power, and to appreciate how the Carver M-1.5t has been designed to take both into account.

Thank you.

SPECIFICATIONS

Power output:	**350 watts per channel RMS into 8 ohms, both channels driven, with no more than 0.5 percent total harmonic distortion, 20 to 20,000 Hz.** 600 watts per channel RMS into 8 ohms for musically significant time periods. 750 watts per channel of Dynamic Headroom
Noise:	100 dB, IHF "A" weighting
IM distortion:	Less than 0.5%
Input impedance:	100 K ohms
Load impedance:	Recommended for driving impedances from 2 to 32 ohms
Power consumption:	35 watts idle, 1500 watts full power
Display ballistics:	1 millisecond attack, 1 second release
Dimensions:	3½" High, 19" wide, 10½" deep
Weight:	16 lbs.

(NOTE: For a more comprehensive description of performance characteristics, see TECHNICAL PROFILE, Section VII.)

Specifications subject to change without notice.

II. INSTALLATION

NOTE: Do not connect the M-1.5t to AC power until all signal connections have been made and the installation is complete.

1) Unpacking

Carefully remove the M-1.5t from its shipping carton, taking care not to damage the packing inserts. It is important to save the carton and all packing materials; they will provide the best protection if you need to transport the amplifier or return it for service in the future.

Record the serial number, located on the rear panel of the M-1.5t, in some safe place. You will need to refer to it in the event you require service or the amplifier is stolen.

2) Placement

The M-1.5t generates little heat and is quite tolerant of less-than-ideal ventilation conditions, **within reason.** The amplifier can be stacked with other components or installed in an equipment rack, so long as the chassis of the other components provide shielding adequate to prevent them from picking up hum or buzz from the M-1.5t's power supply. However, avoid placing the amplifier on deep-pile carpeting or any similarly resilient surface that might tend to block its underside ventilation slots from air circulation.

The M-1.5t cannot be damaged by self-generated heat in any way, although it may shut itself off temporarily if its chassis becomes excessively warm (see Section IV, PROTECTION). Should this happen, seek a location that provides better ventilation.

3) Cables

Standard audio patch cords connect the M-1.5t to the preamplifier. Cord length is not critical.

Ordinary lamp cord (zip cord), available in hardware stores in bulk, is suitable for speaker cables. The usual guage is No. 18, but for cable runs of 30 feet or more we strongly recommend the heavier No. 16 gauge. It is O.K. to use extra large speaker cables offered in the zip-cord ("twin-lead"), i.e., monster cable and similar configurations may also be used, but we advise against the coaxial or braided type of cable, which is expensive, may lead to instability, and, in our view, non-beneficial.

4) Connections

Phono jacks on the M-1.5t's rear panel connect it to the preamplifier via the patch cords. Be sure the leaf-type connectors on the phono plugs grip the outer rings of the jacks snugly.

Cables running to the two loudspeakers are connected via the four five-way binding posts, according to the diagram on the rear panel. Unscrew the plastic-clad caps on the posts and either wrap the bared cable ends around the metal shafts or insert them through the holes at the shafts' bases, securing the connection by re-tightening the caps. Do not strip excessive insulation off the cable ends (½ inch should be more than sufficient), and twist the exposed wire strands together to prevent their separating and making contact with adjacent connectors or the chassis.

The five-way binding posts will also accept dual banana plugs, available in any electronics store. The cables are connected to the plugs, which then insert into the socket holes of the binding posts.

Loudspeakers must be connected with consistent polarity for correct phasing between them. Incorrect phasing will do no physical harm, but bass response will be diminished and seem strangely disembodied. The instructions that came with your loudspeakers are your best guide to phasing. However, the general rule is to be sure that both speakers are connected in the same way: plus speaker terminal to plus amplifier terminal, and minus to minus, or vice versa, so long as **both** speakers are connected according to the same scheme.

5) Load impedances

The M-1.5t is recommended for driving loudspeaker impedances of between 2 and 32 ohms, although it can be in no way damaged by any impedance load presented to its outputs, including a short circuit (0 ohms). Impedances significantly in excess of 16 ohms will cause some reduction in available power output, and loads much below 2 ohms may cause premature tripping of the protective circuit intended to prevent loudspeaker voice-coil overheating (see Section IV, PROTECTION). In general, however, multiple pairs of loudspeakers can be driven consistently and satisfactorily.

Additional pairs of loudspeakers should be connected to the amplifier in the same way as the initial pair if all speakers are to play simultaneously. Switching between pairs will require an outboard speaker-switching accessory.

6) AC power

The M-1.5t is designed to be plugged into, and switched on and off by one of the convenience outlets on the associated preamplifier. For musical applications, the outlet should be rated at no less than 500 watts. For industrial applications, no less than 1500 watts. If the rating is insufficient, the M-1.5t can be plugged into a wall outlet or a "line strip" of the sort that includes an on-off power switch.

If an extension cord is required for the M-1.5t, use only a heavy-duty type to minimize power loss. Do not switch the amplifier on or off with loud music playing.

The AC-line fuse holder on the M-1.5t's rear panel comes with a 15-amp fuse installed. Additional fuses rated at 10 and 20 amps are also recommended.

We have found that fusing the amplifier with a 10 amp fuse will allow the wonderful explosive transients that are in the nature of music to be reproduced, and at the same time will help guard against longer term overload. We recommend that the extra 10 amp fuse that is included with your M-1.5t be installed in place of the 15 amp fuse. If you find that it blows very easily, then advance to the 15 amp fuse. However, if you find that it blows only under unusual and extreme conditions, it is a good idea to continue using the 10 amp fuse for the extra margin of protection that it provides. If your power requirements are for long term sustained high outputs, then you may install the optional 20 amp fuse. However, **under no circumstances,** ever install a fuse with a rating greater than 20 amps. (AGC 20 only).

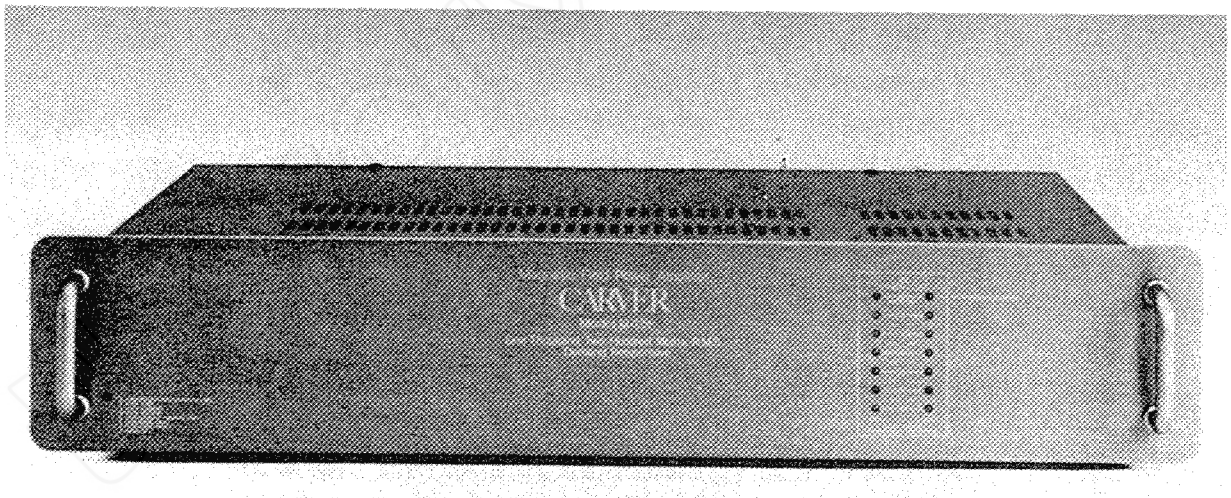
III. OPERATION

1) General

The Carver M-1.5t has no operating controls whatever. Connected into your system properly and plugged in, it is ready for indefinite service without further attention.

We would suggest only one additional precaution when using the M-1.5t. It involves your speakers. Fuse all loudspeakers according to their manufacturer's recommendation, and proceed gingerly in experimenting with the joyous undistorted sound levels the M-1.5t can drive them to. Amounts of power on the order available here can easily — repeat, **easily** — unseat woofer voice coils, damage cone suspensions, char or fuse tweeter voice coils, and even demagnetize driver motors.

Sound with a wide dynamic range that is free of clipping and other distortions seems much less loud than you might suppose, or that you are probably accustomed to, and we have found that, during the controlled high power of the M-1.5t is less likely to damage midrange and tweeter drivers than the uncontrolled clipping of lesser amplifiers.



2) Front-panel display

There are fifteen light-emitting diodes (LEDs) on the M-1.5t's front panel. Fourteen are arranged in two vertical rows that indicate peak output levels for the two channels. The fifteenth is at the lower left corner of the front panel and is a Fault Indicator, showing (when lit) that power has been removed from the output stages and the amplifier shut down by the protective circuits for some reason. When this happens, it usually also causes the two lowest LEDs of the level display to blink rhythmically and in synchronism with a "pup . . . pup . . . pup" sound (the audio alert) coming through the speakers. With these signals the amplifier is trying to tell you something. What it might be can often be deduced by consulting the chart that appears below, together with the PROTECTION section (Section IV) of this manual.

If, under normal operating circumstances, the top two "Headroom Exhausted" LEDs of the level display ever blink, it means the amplifier is running out of power and the anti-clip protective circuit (see Secton IV) is clamping down on the input signal to prevent audible clipping. This should rarely happen. But if it ever does, be assured that the amplifier can continue on in this way indefinitely in perfect health. You may be surprised at how easily this LED may be made to blink, especially with wide dynamic range music. It is O.K. for them to blink from time to time.

3) Routine care

Make every effort to keep your amplifier out of the vicinity of high external temperatures, moisture, airborne substances that can leave greasy deposits, and dust. When panels and covers become dirty, they can be cleaned with a soft cloth and a diluted ammonia solution. Never use detergents or abrasives.

IV. PROTECTION

Although no amplifier of the M-1.5t's capabilities can be considered "safe" in every sense, we have comprehensively provided safeguards to protect against accidently unleashed destructive potentials. A number of protective circuits have been built in, with their status indicated by front-panel LEDs, as described in the preceding section (Section III, OPERATION).

1) Anti-clipping

It is unlikely you will ever clip the M-1.5t. However, if you are inclined to take such a statement as a challenge and do your worst, you will find that the amplifier does not clip in the ordinary sense. A unique clipping eliminator circuit pulls the M-1.5t out of clipping. This accomplishes two things: (1) it saves tweeters by preventing the peaks of the drive signal from ever "squaring off" and showering the tweeters with high-order, high-energy distortion products; (2) it prevents the amplifier from ever **sounding** like it is clipping. (Incidentally, the action of the anti-clip circuit does not, of itself, sound like anything. For the levels at which it might come into operation, non-linearities of loudspeakers are great enough to completely obscure the mild and momentary attenuation in introduces.)

The threshold of the anti-clip circuit is set to correspond roughly to 3 percent distortion at the M-1.5t's outputs, and any condition within the amplifier that gives rise to that amount of distortion will cause it to act. If the LED indicators that monitor its activity (see Section III, OPERATION) consistently blink at power levels that could not possibly be approaching the clip point, it is a possible indication of malfunction within the amplifier that should be attended to as soon as possible.

2) Shut-down protectors

All the other protective mechanisms within the M-1.5t are designed to effect automatic and immediate turn-off of the amplifier, at least for a temporary period. Having the M-1.5t be either totally on or totally off avoids the problems of some other protective circuits, whose "halfway" measures often result in the protective circuit's action modulating the music signal.

The amplifier will shut down if: (1) the chassis temperature reaches 70 degrees C; (2) excessive **out-of-phase** infrasonic/low-frequency signals (such as might result from a dropped tone arm) appear at the inputs; (3) excessive ultrasonic/high-frequency signals of a steady-state (i.e., non-musical) nature appear at the inputs; (4) one or both channels exhibit significant quiescent DC offset; (5) the voltages from the low-level power supplies become unbalanced; the high-level supply voltage exceeds its regulated maximum. In the case of the first three conditions, the amplifier will return to normal operation shortly after the thermal or signal situation is corrected. In the case of the last three, internal malfunction is suggested and repairs may be necessary. Note that for protections (2) and (3), thresholds of the detector circuits have been carefully and empirically set so that no conceivable music signal will be interfered with. These protections are there to guard loudspeakers from the effects of noise signals from ungrounded line-level connectors, oscillation, equipment accidents, and the like. Even so, you should not expect these precautions to be adequate to safeguard **every** loudspeaker from the traumas of excessive overdrive.

3) Saving speakers

A final protection mechanism of the M-1.5t deserves special mention. Sensors at the amplifier outputs detect and integrate the voltage-current product going to the loudspeakers and stores the integrations over a time base of about 3 minutes. This stored information accurately reflects the amount of power the loudspeakers are receiving over long time periods and, indirectly, suggests just how hot their voice coils have had a chance to become. If the amplifier decides that speaker temperatures are approaching the point of potentially destructive excess, it shuts itself off for a period ample to permit cooling down of the voice coils, at which point it resumes normal operation.

Of course, in doing this the amplifier must make certain assumptions about the actual power-handling capabilities of the loudspeakers in use; and in the case of the M-1.5t, the assumption is that the speakers will be comparably rugged to high quality, high fidelity loudspeakers intended for reproduction of music in the home. It's therefore unlikely that the amplifier will shut itself off in this way unless there is a real and immediate need to do so. On the other hand, it's just as unlikely that the M-1.5t will shut itself down in time to save any speaker of inferior power handling that is being wantonly overdriven.

KEY TO PROTECTION — CIRCUIT OPERATION

Symptom: Topmost "Headroom Exhausted" LEDs blink at extremely high levels

Cause	Cure
Amplifier running out of power.	Reduce volume level.

Symptom: Topmost "Headroom Exhausted" LEDs blink well before main level display reaches "0" dB.

Cause	Cure
(1) Low-frequency abberations accompanying music.	(1) Check for rumble or acoustic feedback from turntable. (2) Seek service.
(2) Amplifier generating distortion internally.	(2) Seek service.

Symptom: Fault Indicator LED lights or blinks, "Headroom Exhausted" and main level display blinks regularly, audio alert sounds, amplifier shuts down.

Cause	Cure
(1) Excessive out-of-phase low frequency signals at inputs.	(1) Locate and remove source of offending signals (usu. tonearm).
(2) Excessive steady-state high frequency signal(s) at inputs.*	(2) Locate and remove source of offending signals (usu. mic. feedback or preamp oscillation).
(3) Loudspeaker overheating protection circuit activated.	(3) Reduce volume, leave power on. Amplifier will resume operation after cooling interval for speakers.
(4) Shorted speaker wire.	(4) Check all speaker-wire connections at amplifier and speakers for any wire strands which may not be firmly inserted in the connector. Check any splices in speaker wire.
(5) DC offset at output of one or both channels. **	(5) Remove input connection from preamp. If fault persists, seek service.
(6) Faulty internal voltage regulation, high-level supply.	(6) No external connection changes will restore proper operation. Seek service.
(7) Faulty low-level supply circuitry.	(7) No external connection changes will restore proper operation. Seek service.

Symptom: Amplifier turns completely off. No LEDs lit, no audio alert.

Cause	Cure
(1) Blown line fuse. Remove and inspect fuse only after system power has been turned off.	(1) Switch system power off. Replace with same value (or different value, see Section II, 6, "Installation, AC Power). If new fuse blows when power is applied, seek service.
(2) Amplifier overheated.	(2) First check for open fuse. If fuse is intact, touch amplifier (esp. sides, rear, and bottom). If hot to touch, wait for thermal protector to "click" in (usu. at least 1 minute). Assure adequate ventilation.

* Only very high level, high frequency signals which are not characteristic of music will cause the high frequency protector to activate.

** In some cases troublesome DC offset can originate in a preamplifier with leaky or absent output capacitors. Disconnecting the preamp's input to the M-1.5t will restore proper operation (bottom display LED's on steady, Fault Indicator LED off) if this is the cause. Another symptom of this can be unusual activity of the "Headroom Exhausted" LEDs.

The protection circuits which light the Fault Indicator have a reset time-constant of at least 2-3 seconds, depending on the nature of the fault. To determine the cause of shutdown, try each "cure" suggestion, and make sure you give the protection circuits a few seconds to deactivate before concluding that you have to go further in troubleshooting. If little or no input signal is present, resumption of proper operation will be indicated by the Fault Indicator LED turning off, and the lowermost level LEDs coming on steady.

V. BACKGROUND

Design rationale

Despite what its size and weight suggest, the Carver M-1.5t is, by any rational standard you'd care to apply, the most powerful stereo amplifier ever offered for the reproduction of music. Such a statement begs two questions: (1) **Why** does it have to be so powerful? (2) **How** can it be so powerful? We'll take them in order.

Why. Music is full of surprise packages such as skyrocketing transients that come and go like lightning (and with comparable intensity), crest factors resulting from a combination of multiple music waveforms that nobody could have anticipated, and the explosive levels that some musical instruments are capable of putting out all by themselves when vigorously labored. We hear all this in live music; it's part of the experience. Yet we don't perceive these bursts of intensity as being shatteringly loud because they are usually short-lived, and the ear is a bit of a laggard in fully registering sonic-energy levels, requiring an exposure of about 100 milliseconds before it really starts to get the point.

But amplifiers cannot afford to be sluggish in their responses. Tracking the music waveform, wherever it decides to go, is basic to high-fidelity reproduction. If an amplifier cannot provide the power to surmount rigorous musical peaks when they are presented to its inputs, it makes a sound of its own devising. This may be an inoffensive — even virtually inaudible — "click" if the amplifier is able to tolerate severe overloads and recover gracefully in almost no time. But it can be an annoying "snap" or "brap" — the sound of hard clipping — if power-supply design is less than ideal or protective circuits are overly protective.

These sonic artifacts, although potentially harmful to speakers, are not necessarily intolerable to listeners if they occur only infrequently, and are reasonably well-handled. But we maintain that an amplifier is not meritorious by virtue of its recovery characteristics or the sophistication of its protective circuits, but by its ability to stick with the drive signal through thick and thin, up to and beyond the power-handling capability of any existing or foreseeable loudspeaker. This the Carver M-1.5t does.

Up until now, we've been isolated from many of the demands that live music accurately recorded can put on a music-reproduction system. Equipment in recording-studio control rooms and record-cutting facilities can be overloaded as readily as good home equipment, but in the past it was the role of the sound engineer to see that overload potential ended as soon as he discovered it. Today, however, we're confronting recording systems capable of encompassing enormous dynamic range, together with recording engineers who are inclined to use it all. And when they do, there is no place for an underpowered amplifier to go and hide.

How. Three factors contribute to the size- and cost-efficiency of the Carver M-1.5t. (1) The magnetic field principle itself enables a compact, lightweight power supply to process unprecedented amounts of energy, and to store energy reserves in a unique, highly efficient way. Large supply capacitors are not needed, and a bulky, expensive power transformer of the conventional sort would actually be inappropriate.

(2) The demand-responsive nature of the M-1.5t's supply permits biasing the output stages to near class A under idle conditions with very little quiescent current, while still affording instantaneous increases in supply-rail voltages when signal conditions require it. Accordingly, the M-1.5t dissipates little of the energy it processes as heat, and heat sinks as such are not used for the output transistors.

(3) Ultra-linear semiconductors and circuitry have sharply reduced the need for power-consuming negative feedback, with attendant benefits in design simplicity, stability and (possibly) levels of transient-induced distortion. While we at Carver Corporation have so far found no harm in properly applied feedback techniques, we see no reason to overuse them, especially if other aspects of performance can be enhanced by not doing so.

VII. Technical Profile

1) Power ratings

As indicated on its rear panel, the M-1.5t carries a number of power-output ratings. The most familiar of these, established according to the FTC's requirements for disclosure of maximum continuous-power output, is 350 watts r.m.s. per channel, 20 to 20,000 Hz, both channels driven into 8 ohms, with a rated distortion of 0.5 percent. However, we believe it is the other ratings that tell the true story of this amplifier, and best reflect its design objective of being the most **performance-effective** amplifier of music signals available.

The M-1.5t's power supply is regulated by micro computer circuitry to charge the output stages for a maximum total drive of 1,200 watts when the program material calls for it. The supply can provide this amount of energy on a continuous, uninterrupted basis. It could provide more if asked to. The reason it does not is that, given the least efficient and most rugged speakers we have encountered, we know of no speaker that needs more or could stand more, nor any sort of musical material that requires more.

Under laboratory conditions, with steady-state sinusoidal test signals, the M-1.5t has been quite deliberately designed **not** to put out 600 watts per channel on a **continuous** basis. After the initial application of the test signal (which **will** at first give rise to the 600-watt-per-channel output), the amplifier's output will be gradually clamped down

VI Continued

upon until, after a period of several seconds, it arrives at a level of 350 watts per channel and stabilizes there. Several seconds is a long time in the life of a music waveform. Any peaks requiring anything like 600 watts of power will come and go in a fraction of that time, and the M-1.5t will do them full justice — without running the risk of subjecting the loudspeakers to a **continuous** 600 watts such as might be developed by a spurious non-music signal. However, let the test signal be interrupted for as little as 10 milliseconds and the amplifier resets itself, ready to provide the full 600 watts per channel again.

Note, please, that this behavior has nothing to do with the "music power" ratings achieved by some amplifiers of the past, whose unregulated power supplies were good for a brief instant at some exaggerated power level, but whose supply voltages quickly sagged under continuous drive. Even at 600 watts per channel the M-1.5t's power supply is operating rather conservatively, not being sucked dry and then forced to recover. Instead, the output stages are deliberately pulled back for the sake of conservation of speakers. Also note that although the M-1.5t's self-regulation is immediately evident in the test lab, it will never operate with the transient-endowed signals typical of music, with which it behaves as a perfectly "conventional" 600-watt-per-channel amplifier.

Because of the tremendous capacity of the M-1.5t's power supply, there has been no need to provide supply isolation between the audio channels to prevent cross-modulation effect. Accordingly, when pressed hard, either channel is free to borrow up to an additional 150 watts from the other (for a total of 750 watts), so long as the summed output of both channels does not exceed the regulated 1,200-watt maximum.

2) The magnetic field amplifier

The M-1.5t is the third instrument to employ Carver Corporation's principle of magnetic-field amplification. While the concept has fully proven itself over what is by now an extensive history of high fidelity applications, there are those who remain curious about what it does and how. Here is a brief — and somewhat oversimplified — explanation.

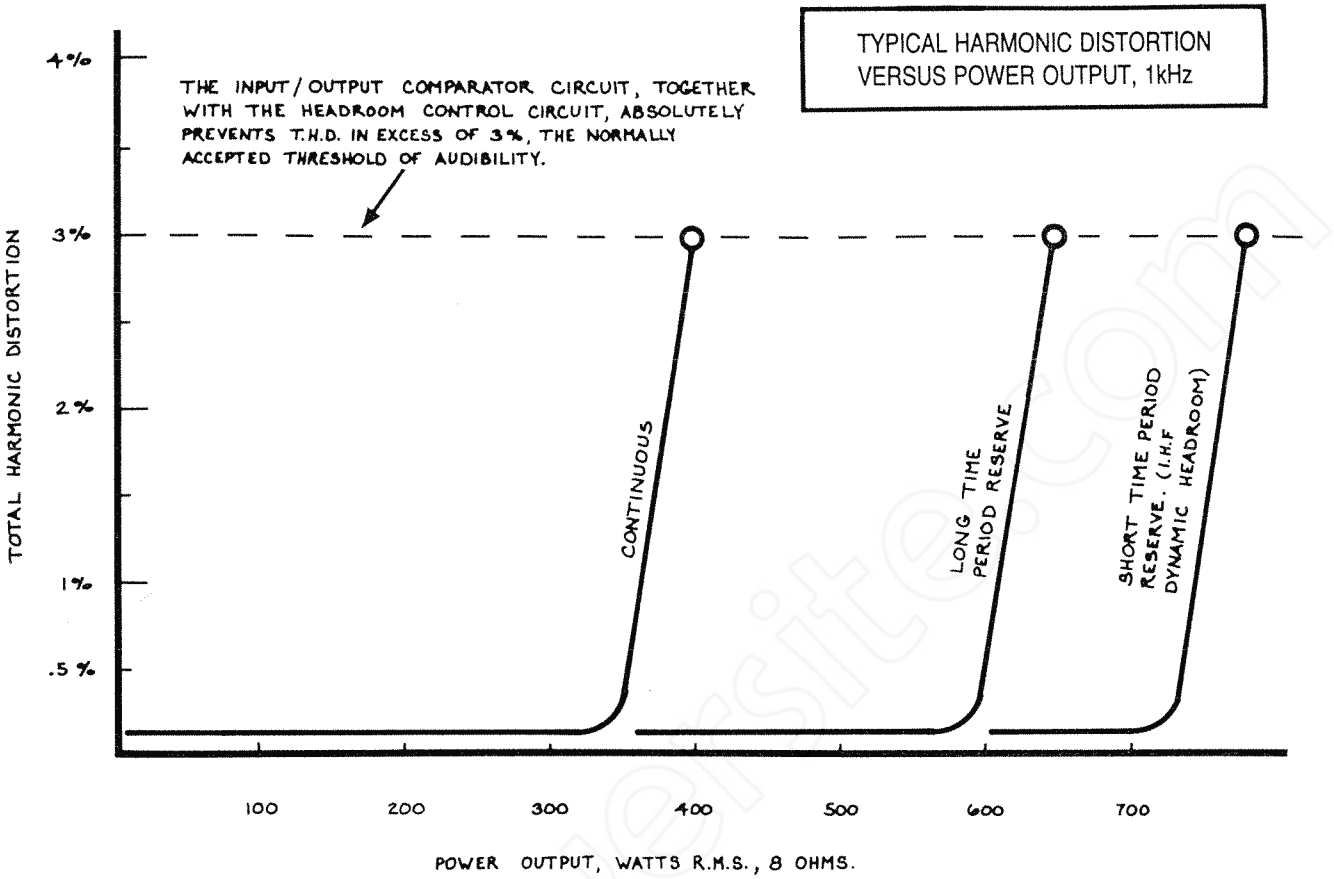
The power supply of a conventional amplifier is able to conduct energy from the AC power line (and thus store power for use by the amplifier's audio circuits) only during the brief voltage peaks that occur twice in every cycle of the 60-Hz (or 50-Hz in some countries) power-line signal. For the rest of the power-line cycle, it must meet the demands of the amplifier with whatever reserve energy it was able to take in and store during the instants of conduction. The amount of this available reserve will depend on such factors as the internal impedance of the power transformer and the size of the storage capacitors. Hence, as conventional amplifiers grow more powerful, their transformers and supply capacitors must grow proportionally larger.

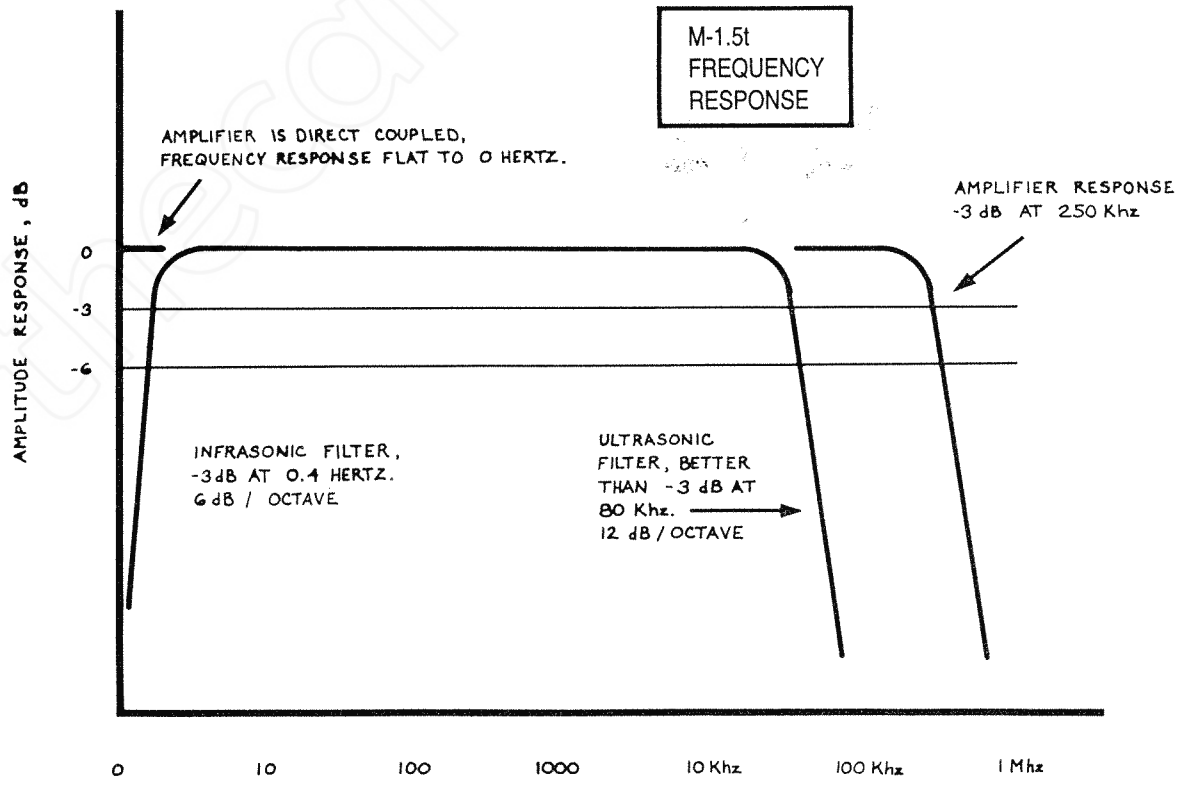
The conduction period of the magnetic field amplifier's power supply is governed by electronic control circuits that are directly responsive to the moment-to-moment power requirements of the audio sections. For low power demands, conduction actually begins near the minimum voltage points for the AC line signal, and is relatively brief in duration. As more drive becomes needed, conduction begins earlier and lasts longer. For maximum power output, conduction lasts almost a full half cycle of the AC line frequency, and begins at higher and higher line-voltage points. The long time period over which the supply can draw power from the AC line dramatically reduces the need for storage capacity within the supply; and the mode in which conduction switching works enables the amplifier to be voltage-selective relative to what is required to keep its supply rails at the demanded potential.

Forming the heart of the magnetic field amplifier's power supply are the Triac commutator (the conduction switch) and the special power transformer, which is called a magnetic field coil. Unlike a conventional power transformer, which must step down the peak voltages from the AC power line to usable quantities, the magnetic field coil is a step-up device that spends most of its time **raising** the near-minimum voltage values of the AC line to usable levels, and is called upon to handle the maximum line voltages only at times of maximum power demand. Also unlike a conventional transformer, the magnetic field coil is built to afford a deliberately loose coupling between primary and secondary. This form of construction, usually considered most undesirable, introduces what appear to be losses and lags in transfer characteristic because of leakage inductance. However, energy cannot be lost, for conservation reasons, and that energy which seems to have disappeared has in fact merely been stored in the "leakage" inductance associated with the core. Ordinarily it would dissipate itself in hysteresis, forming "core loss," but if we can get to it before that happens, we can still get some useful work out of it.

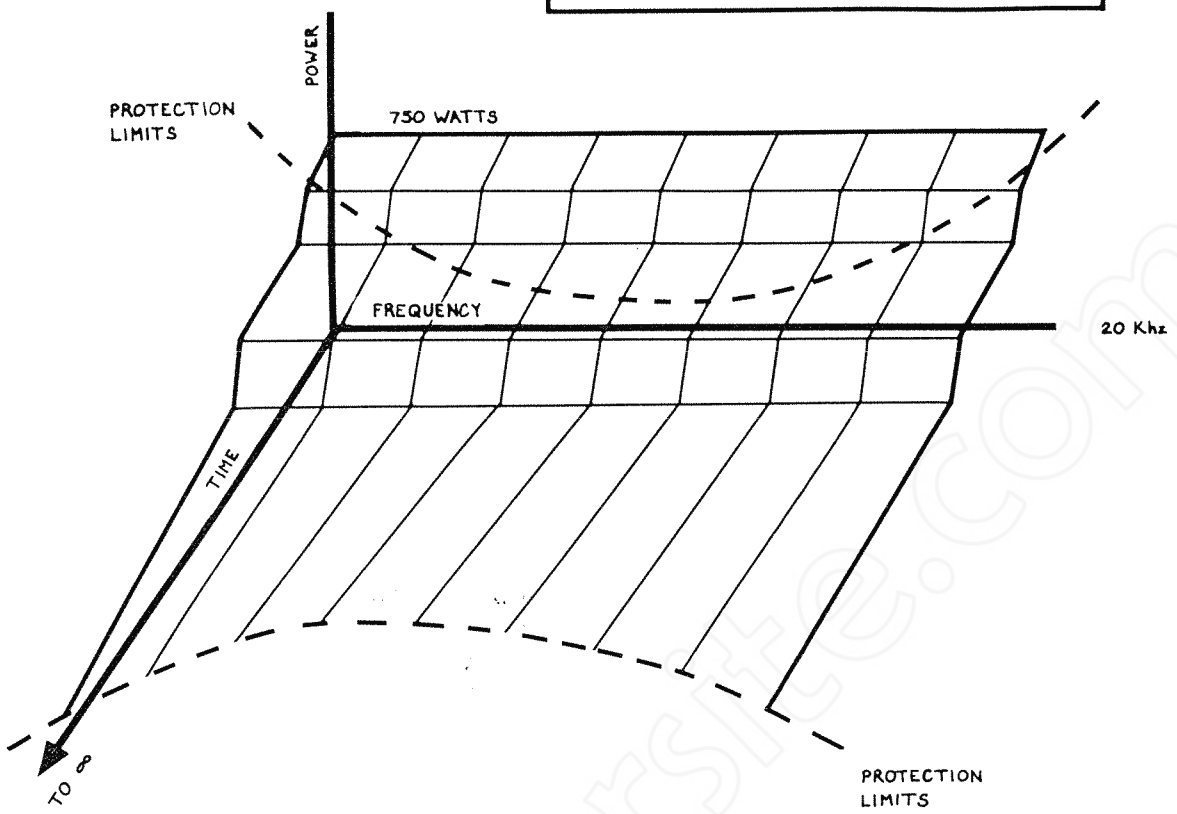
In the M-1.5t, this stored energy is used as a reserve that steps in when the Triac is not in one of its conducting positions. If the supply voltage should then sag because of some sudden power drain, the "losses" incurred in the magnetic field coil will suddenly reappear as usable energy, and the demands of the audio sections will be met. A further, if incidental, benefit of the magnetic field coil's loose coupling is that it serves as an effective filter for power-line transients.

As for its audio-signal sections, the Carver M-1.5t could be described as a highly linear 35-watt-per-channel amplifier, biased almost to class A, that is modulated on a signal-demand basis by a supply-rail voltage source capable of turning it into a 600-watt-per-channel-plus amplifier as required. Despite its exalted bias condition, the 35-watt amplifier generates little heat because its quiescent supply-rail voltages are so low. The 600-watt-plus amplifier generates little heat because almost all the electrical power coming in is being used to generate electrical power going out. The result is high efficiency, together with an unprecedentedly large output capability.


TYPICAL HARMONIC DISTORTION VERSUS POWER OUTPUT, 1kHz
THE INPUT/OUTPUT COMPARATOR CIRCUIT, TOGETHER WITH THE HEADROOM CONTROL CIRCUIT, ABSOLUTELY PREVENTS T.H.D. IN EXCESS OF 3%, THE NORMALLY ACCEPTED THRESHOLD OF AUDIBILITY.
TOTAL HARMONIC DISTORTION
4%
3%
2%
1%
.5%
CONTINUOUS
LONG TIME PERIOD RESERVE
SHORT TIME PERIOD RESERVE. (I.H.F DYNAMIC HEADROOM)
100
200
300
400
500
600
700
POWER OUTPUT, WATTS R.M.S., 8 OHMS.


M-1.5t FREQUENCY RESPONSE
AMPLIFIER IS DIRECT COUPLED, FREQUENCY RESPONSE FLAT TO 0 HERTZ.
AMPLIFIER RESPONSE -3 dB AT 250 Khz
AMPLITUDE RESPONSE, dB
0
-3
-6
INFRASONIC FILTER, -3dB AT 0.4 HERTZ. 6 dB / OCTAVE
ULTRASONIC FILTER, BETTER THAN -3 dB AT 80 Khz. 12 dB / OCTAVE
0
10
100
1000
10 Khz
100 Khz
1 Mhz
FREQUENCY, HERTZ

CONCEPTUAL POWER - TIME - FREQUENCY MAP WITH LIMIT THRESHOLDS



VII. IN CASE OF DIFFICULTY

Aside from obvious things such as loss of a channel, gross distortion and the like, the first indications of any malfunction of the M-1.5t are likely to be given by suspicious activity of the top "Headroom Exhausted" LEDs in the level display, as described in Section III, OPERATION. If these LEDs exhibit any tendency to become unusually busy, there is reason to suspect that distortion (although perhaps inaudible at first) is being generated within the amplifier as the result of some malfunction. Further symptoms may appear as well, such as amplifier overheating or the loss of some level in one channel. Any or all of these developments are good reason to consult your dealer or Carver Corporation directly.

System malfunctions that do not cause the "Headroom Exhausted" LEDs to blink are very likely the fault of some other component. Try first reversing the left and right channels at the inputs, and second at the speaker outputs. If either reversal causes the problem to switch channels, it is not in the amplifier but elsewhere.

If the problem clearly lies with the amplifier, contact your Carver Corporation dealer or the factory. We may suggest some further trouble-shooting ideas. 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. Details are given in the warranty.

In no case should anyone other than the factory or its designated service stations disassemble or attempt repairs on the M-1.5t. We want to inspect for cause and to assure proper future operation.

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

Customer Service Department
Carver Corporation
P.O. Box 1237
Lynnwood, WA 98046

Please copy the following information for your possible future use.

Owner _____

Serial # _____

Dealer _____

Address of Dealer _____