THE FISHER AUDIO AMPLIFIER

INSTALLATION AND OPERATING INSTRUCTIONS

MODEL 70-AZ

WITH Z-MATIC

PRICE: $1.00

FISHER RADIO CORPORATION • NEW YORK
THE FISHER Audio Amplifier Model 70-AZ will meet the requirements of the most exacting user. Complete fidelity of reproduction and absence of listener fatigue are a direct result of the extremely low harmonic and intermodulation distortion at all power levels, as well as excellent transient response, wide frequency range and good linearity. Hum and noise are virtually non-measurable, thus allowing operation at all listening levels without the distraction of extraneous noise. The great reserve power handling capacity of the Model 70-AZ makes it capable of reproducing the complete dynamic range area of a full symphony orchestra. All components in this compact unit have been selected for long life and installed with maximum accessibility in mind, for easy servicing.

THE FISHER Z-MATIC CONTROL

The loudspeaker system has long been recognized as one of the most important limiting factors in the faithful reproduction of high fidelity sound. Where a loudspeaker bears the typical specification — Voice Coil Impedance: 16 ohms — it should be noted that this specification really applies only to a limited portion of the total frequency range. The reason is that a speaker voice coil impedance actually varies quite markedly, and according to the particular point of the audible spectrum involved. Thus, a typical 12" speaker rated at 15 ohms actually has a 15-ohm impedance at 400 cycles. At 15 cycles the voice coil impedance could be anywhere from 0 to 90 ohms, and at 10,000 cycles from 50 to 50 ohms. See Figure 8.

The steep rise in voice coil impedance in the 40-400 cycle region is particularly serious, for in it exactly in this portion of the audible spectrum that we need a good impedance match between voice coil and amplifier in order to reproduce with full excellence such instruments as the tympany, bass viol, cello, organ, and the bottom octaves of the piano. And the steep rise in voice coil impedance at the high end dictates stable response.

All typical amplifiers of better quality build today have not taken the above elements into account in their circuit design. In this respect, the FISHER Z-Matic Control has been designed to overcome this typical limitation, and not only to keep the impedance constant regardless of frequency, but also to be able to handle the power absorbed by the loudspeaker without distortion, because it is a function of both voltage and load resistance.

As an example, let us assume that a 400-cycle tone (Middle A on the piano) is introduced to the loudspeaker. At this frequency the voice coil impedance is actually 16 ohms, as specified by the speaker manufacturer. Let us imagine further that the voltage reaching the ear consists of a voltage of 135 volts (1500 cycle) and an operating frequency of 400 cycles. The impedance of the loudspeaker at this frequency would be that of a 1500 cycle at 2000 cycles. This means that the only 1/4 of the power will actually be absorbed and utilized by the speaker on the aforementioned tone.

It therefore follows that the ideal goal is to produce an amplifiers containing special circuits that recognize the non-uniform impedance of loudspeakers and provide the means of eliminating this inherent mismatch. We are proud to announce that this dream-sought-after goal has now been reached in FISHER Amplifiers. These special circuits are what comprise THE FISHER Z-MATIC Control.

THE FISHER Z-Matic circuit will not only supply constant power to a loudspeaker regardless of its load impedance but, further, will act as a control feedback to provide additional compensation to balance the tendencies of the loudspeaker or its enclosure.

WHAT THE FISHER Z-MATIC CONTROL DOES

The unique design of THE FISHER Z-Matic correctly the correct the impedance mismatch condition described earlier. The Z-Matic Control is so designed that it is a unique variable component, which overrides the requirements of the particular program being reproduced, as affected by the existing speaker system, speaker enclosure — in fact, the entire electrical and acoustical system. See Figure 9.

The Z-Matic Control automatically makes the corrections for varying load impedance to the exact degree desired to insure to meet his particular acoustical and environmental conditions. The results are truly revolutionary and thrilling to hear, for Z-Matic offers a wave, new sound on high fidelity sound reproduction.

IMPORTANT NOTE: THE FISHER Z-Matic Control does what an ordinary Bass Tone Control, or Loudness Balance Control, cannot do. The Z-Matic Control removes to full frequency only those tonal frequencies that suffered annihilation because of speaker system characteristics. For this reason, no "bassy" bass is created. Proof of this desirable achievement is instantly apparent upon listening to the male speaking voice, the most usual source of "bassy" bass.

THE FISHER Model 70-AZ may be used directly with a FM-AM tuner, such as THE FISHER Model 90-R, a typical phonograph cartridge or any other device which is capable of producing a one-watt signal. Where magnetic phonograph cartridges, microphones or similar low-level devices are employed, pre-amplification is necessary. Especially suited to these latter applications is THE FISHER Master Audio Amplifier Model 70-AZ, available as a companion unit to THE FISHER Audio Amplifier, Model 70-AZ.

THE Model 70-AZ has four separate feedback loops, resulting in low internal impedance, extremely low distortion and excellent feedback stability. Two type 3851 tubes, connected as triodes, are employed in the power stage. The unique cathode screen feedback circuit offers all the advantages of triode performance, together with efficiency of triodes. The carefully designed output transformer consists of three interleaved windings in conjunction with a gain-oriented steel core, assuring the finest results.

INSTALLATION

Since THE FISHER Model 70-AZ is designed for use as a basic amplifier it can be installed wherever there is adequate ventilation. Once properly installed and adjusted, access to its controls will not be required for normal operation of the equipment. Chassis mounting dimensions are shown in FIGURE 5. THE FISHER Model 70-AZ power line cord should be connected to an auxiliary AC receptacle working of a master switch. Thus the amplifier is turned on together with the tuner or amplifier. THE FISHER Model 70-AZ requires 170 watts at 105-125 volts, 50-60 cycles AC.

The Z-Matic Control and Cable Assembly will be found packed in the top "binder" of the amplifier cabinet. The installation plug should be installed in the proper receptacle on the amplifier chassis.

1. Note that the middle terminal of the three speaker terminals on the amplifier has been discontinued. Connect the loudspeaker leads to the two remaining terminals (these are labeled "8" or "10" and "Gnd," respectively). The latter ground must not be used or connected to the basic ground of the entire electrical system.

2. To select the proper nominal matching impedance for the speaker system being used, set the impedance switch correctly.

3. The Z-Matic Control shaft can be mounted on your main control panel by drilling a 1/4" hole therein.

4. Remove all the elements from the Z-Matic Control shaft, except the final hex-nut. Insert the Control in the panel (from the rear), and adjust the aforementioned hex-nut so that sufficient threads protrude past the front surface to accommodate the Z-Matic designation plate as well as the remaining hex-nut. Before tightening, mount the Control knob on the shaft, turn it to the left as far as it will go, and then rotate the portion of the Control on the rear of the panel so that the white dot on the knob falls at the corresponding "min." dot on the designation plate. Now, by rotating the knob, tighten the final hex-nut and slip the knob back on again.

INPUT CONNECTION

Connection to the INPUT of the Model 70-AZ is made by means of a standard BETA transformer plugged into the equipment. If the signal source is approximately one volt, the LEVEL ADJUSTMENT control should be wound clockwise. For signal sources in excess of one volt, turn the LEVEL ADJUSTMENT correspondingly lower (counter-clockwise) depending on the maximum voltage of the signal source. When using THE FISHER Master Audio Amplifier as a preamplifier, set the LEVEL ADJUSTMENT of the Model 70-AZ to maximum (clockwise).

HOW TO ACHIEVE MAXIMUM INFLUENCE OF THE FISHER Z-MATIC CONTROL

When the Z-Matic Control is set at minimum, the amplifier will operate in the conventional manner, producing constant voltage regardless of load.

Let us now arbitrarily set the Control with the idc at the top. In this position the constant voltage will be led to the loudspeaker regardless of variations in speaker impedance. High quality results in constant power and all effectiveness will perform best when the Control is in this position.

Where optimum speaker systems and speaker enclosures are not available, the acoustic shortcomings of the system can be overcome by using the Z-Matic Control toward maximum, according to the needs of the situation. Any changes past the top position produces increasing multiplication of the electrical factors necessary to overcome the deficiencies of the speaker system and speaker enclosure.

The Z-Matic effect will, of course, be most apparent in the maximum position and, in many cases, represents the closest approach to truly uniform response in terms of audible power, which is after all the ultimate criterion.
It should be noted that the three positions described were arbitrary, for the purposes of the discussion. There are an infinite number of intermediate positions available, according to your taste and needs. May we suggest that you experiment with the Control so familiarize yourself with its tremendous possibilities for increasing the enjoyment of your equipment.

IMPORTANT NOTE: With some speakers, rotating the Z-MATIC Control may result in an overall volume change. This condition is caused by a slight mismatch between speaker and amplifier. (A nominal 16-ohm voice coil may not be exactly 16 ohms at mid-frequency.) As long as the change in volume is not severe, the Z-Matic circuit will operate effectively.

PHASE INVERTER BALANCE ADJUSTMENT

The phase inverter balance adjustment positioner R-6, is inside the side apron of the chassis. This positioner has been carefully pre-set at our factory. Adjustment is required only when components in the phase inverter circuit are replaced and should never be attempted unless a low distortion audio generator, and a wave analyzer or distortion analyzer, are available. If this adjustment becomes necessary, proceed as follows:

1. Connect the audio generator to the amplifier input.
2. Disconnect the speaker and connect a 16-ohm, 20 watt resistor to "GND" and "8 or 16".
3. Switch IMPEDANCE SELECTOR to "16".
4. Rotate Z-MATIC Control fully counterclockwise.
5. Connect the wave analyzer or distortion analyzer across the 16-ohm resistor.
6. Set the audio generator to 1000 cycles and adjust the attenuator so that the amplifier produces 20 watts output (17.83 volts RMS) across the 16-ohm resistor.
7. Tune the wave analyzer to the second harmonic of 1000 cycles, or, if a distortion analyzer is used, tune it for minimum reading at 1000 cycles.
8. With extreme care adjust the phase inverter balance control for minimum distortion.

TECHNICAL SPECIFICATIONS

HIGH OUTPUT, with less than 0.5% distortion at 25 watts (less than 0.15% at 20 watts; less than 0.05% at 10 watts) INTERMODULATION DISTORTION less than 0.5% at 20 watts and less than 0.2% at 10 watts; see FIGURE 3. FREQUENCY RESPONSE is uniform within 0.1 db from 20-20,000 cycles and it is within 1 db from 10-50,000 cycles; see FIGURE 3. POWER OUTPUT is constant within 1 db or 25 watts from 15-35,000 cycles; see FIGURE 3. MUSICAL NOISE level is below 95 db below full output. INTERNAL IMPEDANCE with Z-MATIC Control counterclockwise is 0.01 ohms for 16-ohm operation, giving a damping factor of 20. PHASE SHIFT is less than 15° at 20 cycles and less than 18° at 20,000 cycles; see FIGURE 2. A schematic diagram is shown in FIGURE 7. LINEARITY RESPONSE (input versus output) is plotted in FIGURE 4.

GENERAL SPECIFICATIONS

The entire amplifier and power supply are built on one compact, steel chassis, thus simplifying installation. Handsome, professional styling includes black, baffle-enclosed transformer cases. TUBE COMPLEMENT: 1-12AT7, 1-12AU7, 2-5881, 1-546. OUTPUT IMPEDANCES: 8 or 16 ohms. INTERMODULATION DISTORTION: 0.01% at 200 cycles. DIMENSIONS: 45" x 27" x 14½" wide, 64½" high. SHIPPING WEIGHT: 23½ pounds.

AT YOUR SERVICE

It is the constant desire of Fisher Radio Corporation to have your FISHER equipment give you its best possible performance. Toward that objective, we solicit your correspondence on any special problems that may arise. After you have had an opportunity to familiarize yourself with THE FISHER equipment you purchased, we would appreciate your letting us know how it is meeting your requirements.

SPECIAL NOTE: To maintain your equipment at peak performance, may we suggest that you avail yourself of the facilities and factory trained personnel at our Service Department.

FISHER RADIO CORPORATION

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