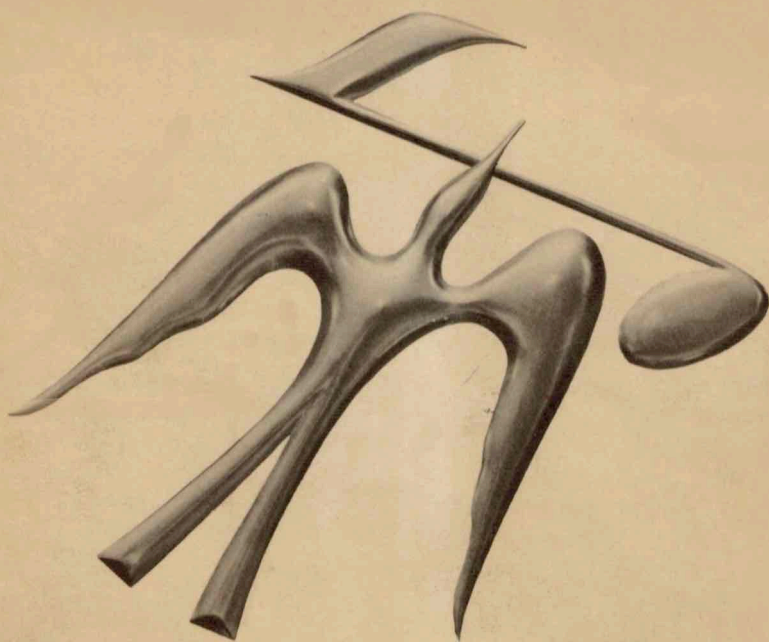


OPERATING INSTRUCTIONS AND WARRANTY



THE FISHER

400-CX

STEREOPHONIC
MASTER AUDIO CONTROL

WORLD LEADER IN HIGH FIDELITY

CONGRATULATIONS!

WITH your purchase of a FISHER instrument you have completed a chain of events that began many months ago, in our research laboratories. For it is there that the basic concept of the equipment you have acquired came into being—its appearance, its functions, its quality of performance.

But the end step—your purchase—is merely a beginning. For you and your family, it will provide years of musical pleasure. The FISHER is from its inception designed to give long and trouble-free service. Some of the instruments we made twenty-two years ago are still in use today!

It is our continuing desire that your FISHER give you always the best performance of which it is capable. If you need our assistance at any time toward that objective, we are always at your service.

IN CLOSING . . .

Many hours have been spent by our engineers and technical writers to create this instruction book for your guidance and enjoyment. If you want the most out of your FISHER, there is only *one* way to obtain it. With the equipment before you, *please read this booklet carefully*. It will be time well-spent.

Avery Fisher

FISHER 'FIRSTS' – Milestones In Audio History

- 1937 First high fidelity sound systems featuring a beam-power amplifier, inverse feedback, acoustic speaker compartments (infinite baffle and bass reflex) and magnetic cartridges.
- 1937 First exclusively high fidelity TRF tuner, featuring broad-tuning 20,000 cycle fidelity.
- 1937 First two-unit high fidelity system with separate speaker enclosure.
- 1938 First coaxial speaker system.
- 1938 First high fidelity tuner with amplified AVC.
- 1939 First Dynamic Range Expander.
- 1939 First 3-Way Speaker in a high fidelity system.
- 1939 First Center-of-Channel Tuning Indicator.
- 1945 First Preamplifier-Equalizer with selective phonograph equalization.
- 1948 First Dynamic Range Expander with feedback.
- 1949 First FM-AM Tuner with variable AFC.
- 1952 First 50-Watt, all-triode amplifier.
- 1952 First self-powered Master Audio Control.
- 1953 First self-powered, electronic sharp-cut-off filter system for high fidelity use.
- 1953 First Universal Horn-Type Speaker Enclosure for any room location and any speaker.
- 1953 First FM-AM Receiver with a Cascode Front End.
- 1954 First low-cost electronic Mixer-Fader.
- 1954 First moderately-priced, professional FM Tuner with TWO meters.
- 1955 First Peak Power Indicator in high fidelity.
- 1955 First Master Audio Control Chassis with five-position mixing facilities.
- 1955 First correctly equalized, direct tape-head master audio controls and self-powered preamplifier.
- 1956 First to incorporate Power Monitor in a home amplifier.
- 1956 First All-Transistorized Preamplifier-Equalizer.
- 1956 First dual dynamic limiters in an FM tuner for home use.
- 1956 First Performance Monitor in a high quality amplifier for home use.
- 1956 First FM-AM tuner with TWO meters.
- 1956 First complete graphic response curve indicator for bass and treble.
- 1957 First Gold Cascode FM Tuner.
- 1957 First MicroRay Tuning Indicator.
- 1958 First Stereophonic Radio-Phonograph with Magnetic Stereo Cartridge
- 1959 First high-quality Stereophonic Remote Control System.
- 1959 First complete Stereophonic FM-AM Receiver (FM-AM tuner, audio control, 40-watt amplifier).

THE FISHER 400-CX

Stereophonic

MASTER AUDIO CONTROL

The introduction of stereophonic sound, while opening new vistas in high fidelity music reproduction, has raised audio engineering to a new level of complexity. In addition to the high quality standards normally required of monophonic instruments, stereophonic design must also insure perfectly balanced dual-channel operation to achieve the maximum stereophonic effect. The FISHER 400-CX represents more than two decades in the development of Laboratory Standard audio components, and provides the ultimate in a control instrument — the electronic heart of your stereophonic sound system.

On one compact chassis, engineered to meet the exacting requirements of the finest associated components, are dual-channel preamplifier-equalizers and tone controls, and a self-contained power supply. Eighteen inputs are available to accommodate every type of monophonic or stereophonic record player and changer, tape recorder, tape deck, tuner, and high impedance microphone. On the front panel are 21 controls and switches. These are grouped and marked for functional simplicity, permitting the instant selection of any program source, and the adjustment of volume and tonal characteristics of the sound through every gradation of the audio spectrum. A Center Channel output is provided to which a third amplifier and loudspeaker can be connected to improve the localization of the stereophonic sound pattern. Provision is also made for the connection of the FISHER RK-1 Remote Control, which makes possible the adjustment of volume and the maintenance of stereophonic balance from the prime listening area.

Once you have connected the appropriate amplifiers and loudspeakers and operated the 400-CX, you will realize why FISHER products have achieved a world-wide reputation. The quality underlying this reputation will assure you of years of trouble-free operation and unsurpassed listening pleasure.

(A Table of Contents is provided on the following page.)

A NOTE ON STEREOPHONIC SOUND

The development of stereophonic sound has brought us close to achieving "Concert Hall" realism in the home. This dual-channel system offers a distinct advantage over monophonic (single-channel) systems by virtue of two important audio characteristics: the dimensions of *direction* and *depth*. These live sound qualities are for the most part missing in monophonic systems because recordings are made and reproduced over a single channel. This is somewhat analogous to listening to music with one ear. Stereophonic recording techniques, however, utilize two separate banks of microphones which are positioned in the left and right sections of the orchestra. In this arrangement, the microphones receive the musical sounds in much the same manner as the two ears of a listener. The sound picked up by each bank of microphones is then fed to independent channels and recorded on disks or tape, or transmitted over separate channels of a stereophonic broadcast.

Therefore, to reproduce a stereophonic recording or broadcast in the home, two separate sound channels are required. The stereophonic sound output of a

record player, tape recorder or tuner is fed to two separate amplifier channels, which in turn drive two separate speaker systems. Thus, instruments located on the left and right sides of the orchestra are heard predominantly in the left and right speakers, respectively; while instruments located in the center appear to be heard mid-way between the two speaker systems. The result is a startling sense of *presence* heretofore realized only at a live orchestral performance.

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INSTALLING THE 400-CX

The 400-CX may be installed in any convenient location that is adequately ventilated. If you wish to install it in your own custom cabinet, directions and diagrams are provided in the last section of this booklet. (Two FISHER cabinets, Models MC-1 in metal, and 10-U in walnut and mahogany, available from your FISHER dealer, will convert the 400-CX into an attractive part of your room decor.) Temporarily, place the unit in its approximate location to permit an estimate of the cable lengths to associated components.

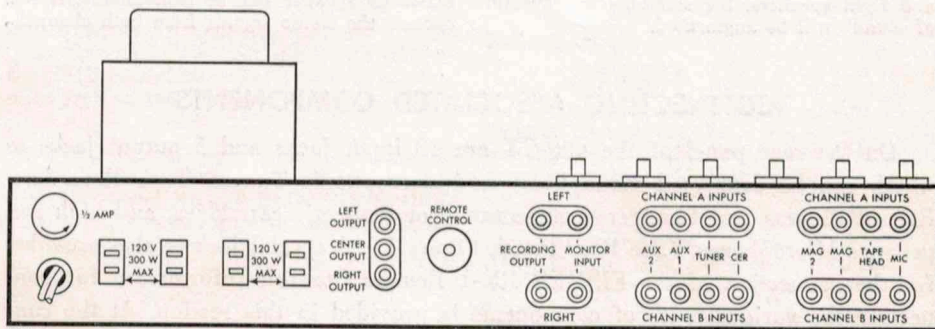


FIGURE 1 - Rear panel of 400-CX

Connections to Amplifiers . . .

Each channel of the 400-CX is equipped with an output jack to which separate amplifier sections can be connected. Basic power amplifiers with input level controls only are sufficient, since all necessary audio controls are incorporated in the 400-CX. Two amplifiers of equal power, (15 to 30 watts per channel,) or a dual-channel amplifier, will be adequate for the average home installation.

Connect standard shielded audio cables from the LEFT OUTPUT and RIGHT OUTPUT jacks on the rear panel of the 400-CX (see Figure 1) to the left and right (Channel A and B) input jacks of the amplifier sections. (NOTE: The "left" and "right" designations refer to the arrangement as seen from the listening area.) Because of the unusual cathode follower design in the output stages of the 400-CX, these connecting cables may be up to 100 feet or more in length.

Location of Loudspeakers . . .

To obtain optimum stereophonic performance from your FISHER equipment, use two speaker systems as nearly alike as possible. Stereophonic sound utilizes the left and right speaker systems to coincide with the music originating on the left and right sides of the orchestra, respectively. To recreate the original orchestral arrangement in your room, connect the speaker on your left (viewed from the listening area) to the Left Channel amplifier section, and connect the speaker on your right

to the Right Channel amplifier section. Certain precautions should be observed in the final location of these speakers.

Where possible, speakers should be placed against a flat wall and separated by a *minimum* of five feet. As a rule of thumb, the best listening area will be at a distance about $1\frac{1}{2}$ times as great as the separation between the speakers. For example: if the speakers are six feet apart, listening will be best in an area about nine feet from, and opposite, the two systems. Because of varying acoustical conditions, however, the speakers may have to be repositioned to achieve the best stereophonic results.

If you place wall-type speaker systems in the room corners, undesirable effects may be introduced. Try placing them, instead, on the same wall, a short distance from the corners.

If you own two corner-type speaker systems, experiment by leaving one in a corner and placing the other against a flat wall. Then compare this arrangement with the original one.

In a long narrow room, placing the speakers on the long wall may bring better results than placing them on the short one.

Connecting A Center Channel . . .

In large rooms, where it may be necessary to space loudspeakers farther apart, a "hole" may develop in the center. This apparent lack of sound in the center will become more noticeable as the distance between the two

speaker systems is increased. It is possible to fill in this gap with the addition of a center channel amplifier and speaker system.

The 400-CX is equipped with an output jack which is connected to an output stage receiving a portion of the signal from the left and right channels. Equal portions of the audio output signal from each channel are thus combined to provide a signal for a third "phantom" channel. By connecting an additional amplifier and loudspeaker to this output jack, and positioning the speaker between the left and right speakers, the stereophonic "curtain of sound" will be augmented.

The additional amplifier need not be equipped with audio controls since these are provided by the 400-CX. A Center Channel Volume Control on the front panel is provided to adjust the signal level at the output jack. Connect standard audio co-axial cable (up to 20 feet in length) from the CENTER OUTPUT jack on the rear panel to the input of the third amplifier.

NOTE: The third speaker can also be placed in an adjoining room or some other remote location. Although the sound output from this extension speaker will be monophonic, it will contain the stereo signals from both channels.

CONNECTING ASSOCIATED COMPONENTS

On the rear panel of the 400-CX are 18 input jacks and 5 output jacks to which can be connected monophonic and stereophonic Tuners, Tape Recorders, Record Players and Changers with ceramic or magnetic cartridges, and high impedance Microphones. (See Rear Panel, Figure 1.) A special jack is also provided for the connection of the FISHER RK-1 Remote Control. Information for connecting the various types of components is provided in this section. At the conclusion of this section is a table listing all inputs, their impedances, and the components that may be connected to them, other than those outlined here.

Auxiliary AC Receptacles . . .

The four auxiliary receptacles on the rear panel may be used as power outlets for your associated components. The combined power consumption of these components should not exceed 700 watts. Power to these receptacles is supplied only when the power to the 400-CX is turned on.

Record Players and Changers . . .

MAGNETIC STEREO CARTRIDGES: Connect the A and B output cables from the Record Player to the A and B MAG 1 or MAG 2 input jacks.

MAGNETIC MONOPHONIC CARTRIDGE: Connect the output cable from the Record Player to the A or B MAG 1 or MAG 2 input jack.

MAGNETIC HIGH LEVEL CARTRIDGES: Make connections to the A and B CER input jacks. Because the impedance of this type of cartridge may vary with different manufacturers, a resistor must be strapped across the output terminals to insure the correct impedance match. Table 1 will serve as a guide. Remember to strap a resistor across *each* output of a stereophonic cartridge.

CERAMIC STEREO CARTRIDGE: Connect the A and B output cables from the Record Player to the A and B CER input jacks.

CERAMIC MONOPHONIC CARTRIDGE: Connect the output cable from the Record Player to the A or B CER input jack.

IMPORTANT: MAG 2 and CER input jacks are electrically paralleled. Under certain

conditions, connecting record players to both of these inputs at the same time may overload the input circuit. If you connect a ceramic cartridge to the CER input jack, it is suggested that you use the MAG 1 input jack for connecting a magnetic cartridge. You can, of course, connect magnetic cartridges to *both* MAG 1 and MAG 2 input jacks if the CER jacks are not being used.

Cartridge loading impedance required	Value of resistor to be added
100K	none required
82K	680K
68K	220K
56K	120K
47K	100K
39K	68K
33K	47K
27K	39K
22K	27K

Table 1. Matching high level magnetic cartridges to ceramic input.

Tape Recorders . . .

A standard stereophonic or monophonic Tape Recorder (equipped with its own pre-amplifier) may be used with the 400-CX in two ways. First, it can be used to record the output of any component being played through

the 400-CX. Secondly, it can play through the 400-CX previously recorded program material. Permanent connections between the Recorder and the 400-CX can be made to carry out these functions.

RECORDING CONNECTIONS:

STEREOPHONIC RECORDER: Connect cables from the LEFT and RIGHT RECORDING OUTPUT jacks on the 400-CX to the left and right (A and B) recording input jacks on the Recorder.

MONOPHONIC RECORDER: Connect a cable from the LEFT or RIGHT RECORDING OUTPUT jack on the 400-CX to the recording input jack on the Recorder.

NOTE: Any program source connected to the A or B input jacks can be fed to either or both LEFT and RIGHT RECORDING OUTPUT jacks, depending on the position of the Mono-Stereo switch.

PLAYBACK CONNECTIONS:

STEREOPHONIC RECORDER: Connect cables from the left and right (A and B) output jacks on the Recorder to the A and B AUX 1 or 2 input jacks on the 400-CX. (AUX 2 input jack is equipped with a level control.)

MONOPHONIC RECORDER: Connect a cable from the output jack on the Recorder to the A or B AUX 1 or 2 input jack on the 400-CX. (AUX 2 input jack is equipped with a level control.)

MONITORING CONNECTIONS:

NOTE: Applies only to Tape Recorders equipped with separate recording and playback heads.

STEREOPHONIC RECORDER: Connect cables from the left and right (A and B) output jacks on the Recorder to the LEFT and RIGHT MONITOR INPUT jacks on the 400-CX.

MONOPHONIC RECORDER: Connect a cable from the output jack on the Recorder to the LEFT or RIGHT MONITOR INPUT jack on the 400-CX.

NOTE: Although you can play back recorded material through the MONITOR INPUT jacks, you will lose the use of the Mono Stereo and Rumble Filter switches. It is suggested, therefore, that the cables be transferred to the AUX 1 or 2 input jacks for playback, when not actually monitoring during the recording process.

Tape Decks . . .

A Tape Deck is the tape transport mechanism minus the preamplifier and audio con-

trols. To provide playback for recorded tapes, it must be connected to a control amplifier. These facilities are furnished by the 400-CX.

STEREOPHONIC TAPE DECK: Connect left and right (A and B) output cables from the Tape Deck to the Channel A and B TAPE HEAD input jacks on the 400-CX.

MONOPHONIC TAPE DECK: Connect an output cable from the Tape Deck to channel A or B TAPE HEAD input jack on the 400-CX.

Tuners . . .

The 400-CX is equipped to accommodate various combinations of Tuner outputs. These include monophonic FM, monophonic AM, monophonic FM-AM, stereophonic FM-AM, and stereophonic FM-Multiplex.

MONOPHONIC FM AND/OR AM: Connect an output cable from the FM tuner to Channel A TUNER input jack, and a cable from the AM Tuner to Channel B TUNER input jack.

MONOPHONIC FM-AM: Connect an output cable from the Tuner to Channel A or B TUNER input jack.

STEREOPHONIC FM-AM: Connect a cable from the FM section of the Tuner to Channel A TUNER input jack, and a cable from the AM section to the Channel B TUNER input jack.

NOTE: The FM portion of an FM-AM stereophonic broadcast is heard on Channel A (left speaker), while the AM portion of the broadcast is heard on Channel B (right speaker.) If you are using a monophonic FM-AM Tuner, you must connect an additional AM or FM Tuner to the 400-CX to listen to FM-AM stereo broadcasts.

STEREOPHONIC FM-FM: Connect a cable from one FM Tuner to Channel A TUNER input jack, and a cable from the second FM Tuner to the Channel B TUNER input jack.

NOTE: Since the FM Tuners connected to Channel A and B inputs will be heard on the left and right speaker systems, respectively, determine from your newspaper the station to which each Tuner should be tuned, in order to insure the proper stereophonic sound arrangement.

STEREOPHONIC FM-MULTIPLY: To receive the FM-Multiplex signal, your FM tuner must be equipped with an adaptor, such as the FISHER MPX-10 or MPX-20. Connect the adaptor and Tuner to the 400-CX as described in the operating instructions for these units.

Microphones . . .

Any standard high impedance microphones

can be connected to the MIC input jacks on the 400-CX. Where the microphone, (or microphones,) has an impedance switch, it must be set in the high impedance position. When using low-impedance microphones, a step-up transformer should be connected having a secondary impedance of 20,000 ohms or higher. (step-up ratio of 1:10 or higher.)

Other Program Sources . . .

If you wish to connect a short-wave Tuner or the audio output from your TV set to the 400-CX, use the channel A or B AUX 1 or 2 input jacks. Consult with your service man if you are uncertain about making connections from your TV set.

TABLE 2. INPUT IMPEDANCES

INPUT	IMPEDANCE†	LEVEL	COMPONENTS
AUX 1	500K	HIGH	Tape Recorder with common head; FM, AM or FM-AM Tuner; Multiplex Adaptor, TV sound; Short-Wave Tuner.
AUX 2*	250K	HIGH	
TUNER	500K	HIGH	
CER	100K	MEDIUM	Ceramic or Crystal Cartridge (constant amplitude response only), High Level Magnetic cartridge.
MAG 1	47K	LOW	Magnetic cartridge.
MAG 2	47K	LOW	Magnetic cartridge.
TAPE HEAD	470K	LOW	Tape Deck.
MIC	120K	LOW	High Impedance Microphone; or low level flat signal source.
MONITOR	200K	VERY HIGH	High level Tape Recorder or other high level signal source.
<p>*NOTE: Use AUX 2 if component is not equipped with a signal level control, since this jack is equipped with one.</p> <p>†These input impedances may be altered, to accommodate components with different output impedances, by strapping appropriate resistors across input jacks inside the chassis.</p>			

A SHORT OPERATING GUIDE FOR 'THE MAN IN A HURRY'

The following guide is provided for those who would like to make a preliminary check of the 400-CX, after connecting the amplifiers, loudspeakers, and associated components. Like any fine electronic instrument, the FISHER will perform at its full potential only if used properly. We therefore urge you to read the rest of this booklet.

- 1— Plug line cord into outlet supplying 105-120 volts AC only, at 50-60 cycles.
- 2— (Upper Controls) Set all slide switches to OFF position. Turn Stereo Dimension to MAX and Center Channel to OFF.
- 3— (Lower Controls) Turn Balance, Bass and Treble to NORMAL. Set the Loudness switch

to OFF. Turn the Master Volume slightly clockwise from the AC OFF position until it clicks.

LISTENING TO A STEREOGRAPHIC RECORD: Depress the Pushbutton marked TAPE-PHONO-MIC. Set the Equalization switch to RIAA 1 or 2 (depending on whether the record player

is connected to the MAG 1 input jacks, or the MAG 2/CER input jacks.) Set the Mono-Stereo switch to STEREO. Adjust Master Volume control.

LISTENING TO A MONOPHONIC RECORD (through a stereo cartridge): Same as above, except set Mono-Stereo switch to MONOPHONO.

LISTENING TO A STEREOPHONIC BROADCAST: Depress the Pushbutton marked TUNER. (The

Equalization switch is not used.) Set the Mono-Stereo switch to STEREO. Adjust Master Volume control.

LISTENING TO A MONOPHONIC BROADCAST: Depress Pushbutton marked TUNER. Do not use Equalization switch. To listen to an FM broadcast, set Mono-Stereo switch to A. For AM broadcasts, set Mono-Stereo switch to B. If you are using an FM/AM *monophonic* tuner, set the Mono-Stereo switch to the channel to which the tuner is connected.

HOW TO USE THE CONTROLS

After you have made all required connections, plug the power cable extending from the rear panel into a wall outlet supplying 105 to 120 volts *AC only*, at 50 to 60 cycles. (Where line voltage is lower or higher, a step-up or step-down transformer will be necessary.) Total power consumption for this unit, *not including associated components*, is 50 watts. With the exception of the Level Controls, located above the rear panel, all operating controls are on the front panel as illustrated in Figure 2. An explanation of the function of each control is provided in this section.

NOTE: A simplified Step-By-Step Operating Guide is furnished at the conclusion of this section. This Guide will enable you to select any program source you wish to hear and to set all necessary controls in a matter of seconds.

AC-Off . . .

The AC-OFF Switch supplies power to the 400-CX and is combined with the Master Volume Control. Turning this switch slightly clockwise from the OFF position will supply power to the unit, as well as to any components connected to the auxiliary AC receptacles. Two or more of the Channel Indicator lights will go on; (their purpose is explained under "Mono-Stereo.")

Pushbutton Selectors . . .

The four pushbuttons are the component selectors. Each button, when depressed, connects a particular input jack, or group of input jacks, to the input circuits. These Pushbuttons operate as follows:

TAPE-PHONO-MIC: Selects all components connected to the low-level input jacks — MIC, TAPE HEAD (not Tape Recorder,) MAG 1, MAG 2, and CER.

TUNER: Selects a Tuner or Tuners, connected to the TUNER input jacks.

AUX 1: Selects any component connected to the AUX 1 input jacks.

AUX 2: Selects any component connected to the AUX 2 input jacks.

Tape Monitor . . .

IMPORTANT: The Tape Monitor switch is used in the ON position only to monitor while recording, or to play back recorded material from a Tape Recorder equipped with *separate* recording and playback heads. This switch must be returned to OFF position *at all other times*; otherwise the 400-CX will be inoperative.

Equalization . . .

The Equalization switch is utilized *only* if you have depressed the TAPE-PHONO-MIC pushbutton. Its purpose is to provide proper equalization for each type of program source connected to the low-level input jacks — whether record, tape, (or microphone) — and for the variety of recording standards associated with these media. Each position of this switch is used as follows:

MIC: Use this position for operating any high impedance microphone.

TAPE HEAD: Use this position if you wish to play back tape from a Tape Deck.

78 1: Play *European* 78 RPM records on this position, on a Record Player connected to the MAG 1 input jacks.

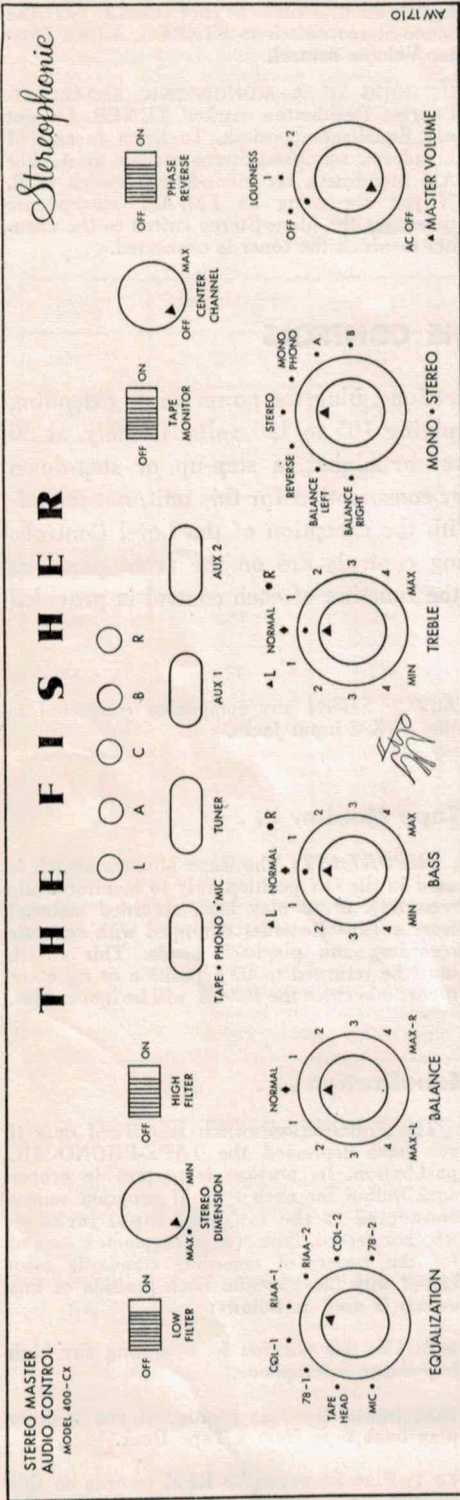


FIGURE 2 - Front panel of 400-CX

COL 1: Use this position for playing records having the old Columbia (old NAB) equalization curve, on a record player connected to the MAG 1 input jacks. (This includes old Columbia LP and 78 RPM records made before 1955, as well as other LP records made before this period.)

RIAA 1: Use this position for playing records having the RIAA equalization curve, on a Record Player connected to the MAG 1 input jacks. (This includes modern LP records made from 1955 on, and RCA 78's.)

78 2: Provides same equalization as 78 1, for a Record Player connected to MAG 2 or CER input jacks.

COL 2: Same equalization as COL 1, for a Record Player connected to MAG 2 or CER input jacks.

RIAA 2: Same equalization as RIAA 1, for a Record Player connected to MAG 2 or CER input jacks.

Mono Stereo . . .

After you have selected a particular program source with the pushbutton selectors, (and set the Equalization switch, if necessary,) the Mono-Stereo switch must be set in accordance with the *type* of program source—whether monophonic or stereophonic. The first two positions of this seven position switch can also be used to achieve channel balancing by ear. At each position of this switch, different combinations of Channel Indicator Lights will go on, as explained farther on.

BALANCE LEFT AND RIGHT: In the BALANCE RIGHT position, the signals in both A and B channels are mixed and fed to the right loudspeaker; while in the BALANCE LEFT position, the mixed signal is fed to the left loudspeaker. By switching back and forth between these two positions, and adjusting the volume to equal levels, you can balance the two output channels.

NOTE: Although (as explained farther on in this section) it is possible to balance the volume at both loudspeakers with the Balance Control, make certain that the Level Controls at the rear of the 400-CX, as well as the level controls on your associated components, have been properly adjusted. See "Level Controls" and "Sonic Null Balancing."

REVERSE: In this stereo position, the signal from Channel A is switched to the Right output, while the signal from Channel B is switched to the Left Output. Use this position only if the stereo arrangement at the program source is reversed.

STEREO: This is the normal listening position for all stereophonic program sources (Channel

A input to Left speaker system, and Channel B input to Right speaker system.)

MONO PHONO: Use this position to play *monophonic* records through a *stereophonic cartridge*. The monophonic signal will be fed to both channels for a superior monophonic effect. Rumble and noise components due to vertical stylus movement will be completely eliminated. (This position may also be used to make rapid A and B comparisons between stereophonic and monophonic sound with any input; except MONITOR.)

A: In this position, the signal from any component connected to the input jacks in Channel A is fed to both Left and Right output channels, resulting in a superior monophonic effect.

B: In this position, the signal from any component connected to the input jacks in Channel B is also fed to both output channels.

Channel Indicator Lights . . .

The five colored jewels provide a visual indication of the position at which the Mono-Stereo switch is set and will light in different sequences depending upon the type of circuit operation. The L and R jewels represent the left and right speakers; while the A and B jewels represent Channel A and B inputs. The C jewel will light only when the Stereo Dimension control is used. The following table is a guide to the different light sequences. For example: for BALANCE RIGHT, the A, B and R jewels will light. This means that the signals at the Channel A and B inputs will appear at the right speaker.

	L	A	C	B	R
BALANCE RIGHT	○	●	○	●	●
BALANCE LEFT	●	●	○	●	○
REVERSE	○	●	○	●	○
STEREO	●	○	○	○	●
MONO PHONO	●	●	○	●	●
A	●	●	○	○	●
B	●	○	○	●	●

● = ON ○ = OFF

NOTE: "C" LIGHT GOES ON WHEN STEREO DIMENSION CONTROL IS USED

TABLE 3 - Channel indicator lights

Master Volume . . .

The Master Volume control varies the level of sound simultaneously on both channels.

Turning this control in a clockwise direction increases the sound level at both speaker systems.

Balance . . .

This control is used to obtain equal sound levels at both speaker systems—an important consideration for achieving the optimum stereophonic effect. (This is also advantageous for monophonic operation where two channels are used.) With the Balance control pointing to NORMAL, the volume at the left and right speaker systems should be the same, theoretically. However, an imbalance may occur due to room acoustics, record characteristics, listener position, different speaker efficiencies etc. This imbalance can be corrected easily by turning the control slightly toward MAX-L or MAX-R to increase the volume level at the left or right speaker systems, as required. It should be pointed out that this is not a volume control; for, as the level of sound is increased on one speaker system, it is decreased on the other, maintaining the same overall sound output.

NOTE: It is possible to cut off the sound entirely from the left or right speaker system by advancing the Balance control to the extreme MAX-R or MAX-L positions.

Phase Reverse . . .

The Phase Reverse switch is used, initially, to determine if the two speaker systems are properly phased; that is, whether the speaker cones of both speaker systems are moving in the same direction at the same time. In addition, this switch provides a means of correcting for improperly-phased program sources. These are necessary steps for deriving the best performance from either stereophonic or monophonic operation.

SPEAKER PHASING: An easy way to determine whether speakers are in phase is to play some *monophonic* program source, containing predominantly low frequency material, with the Phase Reverse switch in the OFF position. Then move the switch to ON. The signal in Channel A will be reversed 180 degrees. If there is a noticeable *decrease* in volume, your speakers are in phase. If there is an *increase* in volume, your speakers are out of phase. In which case, reverse the leads of the *Left* speaker system. (Return the switch to OFF.) Your speaker systems will then be permanently in phase.

PROGRAM PHASING: Once the loudspeaker systems have been phased, the Phase Reverse switch is returned to the OFF position. From then on, it can be used to correct for improperly phased *stereophonic* program material. This condition will occur infrequently and is less easily recognized. If it is suspected, or known, that a program source—whether a record, tape, or broadcast—is out of phase, turn the Phase Reverse switch to ON. If there is a noticeable improvement in the bass tones, or if the center of the stereophonic curtain of

AW 1647

sound is "filled," you can assume that the program source was out of phase. Practice and experience will enable you to detect out-of-phase program material readily. As stereophonic recording techniques are improved and standardized, the problem of phasing will diminish considerably.

Stereo Dimension . . .

With the Stereo Dimension control you can combine, or blend, the signals from both channels to any desired degree. When you are listening to a stereophonic program, this control can be used to reduce, or completely eliminate, any "ping-pong" effect (exaggerated separation between channels.) In this way, you can obtain the amount of separation that is most suitable for your speaker arrangement and listening position, and utilize the added dimension of stereophonic sound to its fullest.

At the OFF position, complete separation exists between the sound outputs on both channels. As you advance the control in a clockwise direction, the signals of each channel are progressively combined to fuse the total sound curtain.

Center Channel Volume . . .

If a third amplifier, and loudspeaker system, is connected to the 400-CX, (as described on page 3,) use this control to adjust the amount of signal being fed to the Center Channel Output jack. Since the ultimate purpose of the Center Channel is to eliminate the "hole" between the stereo sound output of widely-spaced speaker systems, the volume of the center speaker system should be increased just enough to establish a uniform curtain of sound, without destroying the stereophonic effect. This control may, of course, also be used to adjust the level of a third speaker system at a remote location.

Bass and Treble . . .

The Bass Controls regulate the intensity of the low frequency, or bass, tones; while the Treble Controls regulate the high frequency, or treble, tones. Each set of Controls consists of dual knobs mounted one behind the other—the small knob with the gold triangle for the left channel, and the outer knob with the dot for the right channel. Turning either knob will turn the other, for they are "friction-loaded." If you wish to adjust the tones for each channel separately, hold one knob while turning

the other. To increase or decrease bass or treble intensity, turn these knobs toward MAX or MIN, as required.

When a component connected to the low level inputs is being played, the Tone Controls should be in flat position (markers pointing up) to derive full advantage of the compensation provided by the settings of the Equalization Switch. Similarly, leaving these Controls in flat position will insure that the program material from the other components will be reproduced exactly as recorded or transmitted. It should be remembered, however, that these Controls may be set at any position dictated by personal listening preference or room acoustics.

Loudness . . .

As the relative volume of sound is reduced, our natural hearing sensitivity drops off at both ends of the audio frequency range. The Loudness Switch enables you to decrease the volume without losing these important high and low frequencies (treble and bass tones.)

If you wish to listen at low volume, turn the Loudness Switch (located behind the Master Volume Control) clockwise from OFF to position 1 or 2. At position 1, a certain amount of compensation will be introduced to restore the highs and lows to a level with your middle-frequency hearing sensitivity. The amount of compensation is greater on position 2. In general, it is suggested that the Loudness Switch be used only at medium-low to low volume. Use position 2 only when volume is very low; otherwise, unrealistic sound will result.

High Filter . . .

Use the High Filter Switch in the ON position to eliminate record surface noise, distant AM or FM station interference, and other undesirable high frequency noises originating in your Record Player or Tape Recorder. Keep this switch in OFF position at all other times.

Low Filter . . .

Use the Low Filter Switch in the ON position to eliminate turntable rumble, or other low frequency interference. Leave this switch in OFF position at all other times.

ADJUSTMENT OF LEVEL CONTROLS

Three pairs of Level controls, located on top of the chassis at the rear, establish the amount of signal fed to the 400-CX from the associated components connected to the input jacks. These controls have been set at the factory for full

signal strength (fully clockwise.) They may require resetting when the 400-CX is first installed, but are not normally used in subsequent operation.

Because of different levels of signal strength from the associated components, some program material may appear louder than others at the speaker systems when you change the Pushbutton settings. This undesirable condition can be eliminated by equalizing the signal levels at the input jacks using the Level controls.

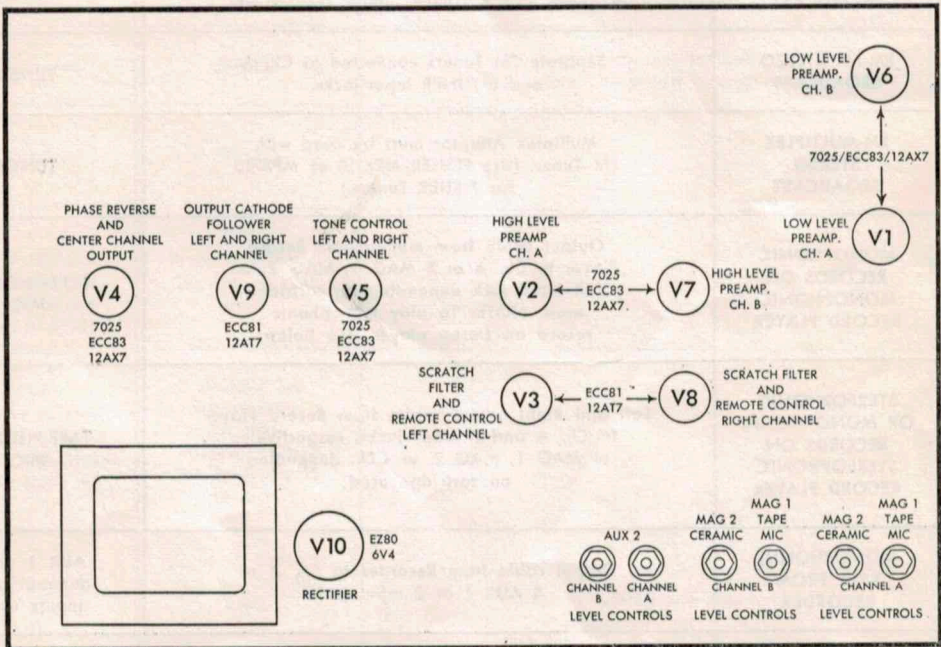
Signal strength from a component can be adjusted by ear by turning the appropriate Level control fully *counter clockwise*, and turning the Volume control on the 400-CX to full maximum. Then turn the Level control clockwise until the volume level reaches a point that is as loud as you will ever wish to hear

it. Do this for each component, depressing Pushbuttons alternately and listening to the comparative levels. Readjust the Level controls where necessary.

MAG 1, TAPE, MIC: These controls vary signals from components connected to the MIC, TAPE HEAD and MAG 1 input jacks.

MAG 2, CERAMIC: Use these controls to adjust signals from components connected to the MAG 2 and CERAMIC input jacks.

AUX 2: These controls are used to adjust the signal from a component connected to the AUX 2 input jacks.



AW1692.

FIGURE 3 - Tube layout of 400-CX

SONIC NULL BALANCING

Although it is possible to balance the stereophonic output of the 400-CX by ear alone, the results may only be approximate. Consequently, an aural and electronic method has been devised to insure precise dual-channel balance. This method, known as "Sonic Null Balancing," provides a simple means of adjusting the preamplifier and power amplifier sections, in conjunction with the front panel controls and level controls. Each set of level controls is adjusted separately for each program source. Once the correct operating points for these controls have been determined, only an occasional front panel adjustment will be necessary to correct for out-of-balance records or room acoustics. (If you prefer to adjust the level controls by ear, the procedure is described in the preceding section.)

STEP-BY-STEP OPERATING

PROGRAM YOU WISH TO HEAR	REQUIRED CONNECTIONS TO ASSOCIATED COMPONENTS	DEPRESS PUSHBUTTON MARKED:
FM BROADCAST	FM Tuner output cable connected to Ch. A TUNER input jack.	TUNER
AM BROADCAST	AM Tuner output cable connected to Ch. B TUNER input jack.	TUNER
FM-AM STEREO BROADCAST	FM and AM Tuner output cables connected to Ch. A and B TUNER inputs, respectively.	TUNER
FM-FM STEREO BROADCAST	Separate FM Tuners connected to Ch. A and B TUNER input jacks.	TUNER
FM-MULTIPLEX STEREO BROADCAST	Multiplex Adaptor must be used with FM Tuner. (Use FISHER MPX-10 or MPX-20 for FISHER Tuners.)	TUNER
MONOPHONIC RECORDS ON MONOPHONIC RECORD PLAYER	Output cable from <i>monophonic</i> Record Player to Ch. A or B MAG 1, MAG 2, or CER input jack depending on cartridge used. NOTE: To play monophonic record on stereo player, see below.	TAPE-PHONO-MIC
STEREOPHONIC OR MONOPHONIC RECORDS ON STEREOPHONIC RECORD PLAYER	Left and Right output cables from Record Player to Ch. A and B input jacks, respectively, of MAG 1, MAG 2, or CER, depending on cartridge used.	TAPE-PHONO-MIC
MONOPHONIC TAPE FROM RECORDER	Output cable from Recorder to Ch. A or B AUX 1 or 2 input jack.	AUX 1 or 2, depending on inputs used.
STEREOPHONIC TAPE FROM RECORDER	Left and Right output cables from Recorder to Ch. A and B, respectively, of AUX 1 or 2 input jacks.	AUX 1 or 2, depending on inputs used.
MONOPHONIC TAPE FROM TAPE DECK	Output cable from Tape Deck to Ch. A or B TAPE HEAD input jack.	TAPE-PHONO-MIC
STEREOPHONIC TAPE FROM TAPE DECK	Left and Right output cables from Tape Deck to Ch. A and B, respectively, of TAPE HEAD input jacks.	TAPE-PHONO-MIC

GUIDE FOR 400-CX

SET EQUALIZATION SWITCH TO:	SET MONO-STEREO SWITCH TO:	• OTHER REQUIRED CONTROL SETTINGS • IMPORTANT: Tape Monitor Switch must be in OFF position at all times, except as noted.
Not Required	A	NOTE: If you are using an FM-AM monophonic Tuner, set Mono-Stereo Switch to A or B, depending upon channel to which Tuner is connected.
Not Required	B	
Not Required	STEREO	If AM Tuner has Bandwidth switch, use BROAD position.
Not Required	STEREO	See local newspaper for Left and Right stereo broadcast arrangement.
Not Required	STEREO	
78 1, COL 1, or RIAA 1 if Player is connected to MAG 1 jacks. 78 2, COL 2, or RIAA 2 if Player is connected to MAG 2 or CER jacks. (see page 4.)	A or B depending on channel used.	
	STEREO for Stereophonic records; MONO-PHONO for monophonic records.	
Not Required	A or B depending on channel used.	For Recording and Monitoring connections see Page 4. (Set Tape Monitor Switch to ON only when MONITOR INPUTS are used.)
Not Required	STEREO	
TAPE HEAD	A or B depending on channel used.	
TAPE HEAD	STEREO	

IMPORTANT: The level controls must be adjusted approximately as described in the preceding section before making the adjustments outlined below.

Balancing the Preamplifiers . . .

MAG 1, TAPE, MIC LEVEL: 1—Set the Bass, Treble and Balance controls to NORMAL; the Low Filter, High Filter, Tape Monitor, and Loudness switches to OFF; the Stereo Dimension control to MIN, the Phase Reverse switch to ON, and the Mono-Stereo switch to STEREO.

2—Play a *monophonic* record through a *stereo* cartridge, or a *monophonic* tape through a *stereo* tape head, connected to the MAG 1 or TAPE HEAD input jacks. Then adjust one level control against the other for sonic null; that is, minimum sound at the speakers. In some cases, sound will disappear entirely.

MAG 2, CERAMIC LEVEL: Play a *monophonic* record through a *stereo* cartridge connected to the MAG 2 or CERAMIC input jacks. Continue as described above.

AUX 2 LEVEL: Connect a *stereophonic* tuner (or two monophonic tuners) to the AUX 2 jacks. Tune in FM and AM stations that are broadcasting the same program. Then make adjustments as described above.

EXTERNAL LEVEL CONTROLS: (On stereo tuners, recorders etc.) Connect the stereophonic component to the TUNER or AUX 1 jacks on the 400-CX. Playing a monophonic program selection, adjust the level controls on the component for sonic null as described above.

Balancing Power Amplifiers . . .

1—Momentarily connect a loudspeaker between the two 16-ohm speaker terminals of the two amplifier sections. (If separate amplifiers are used, connect the two ground terminals together temporarily.) You may also use a pair of earphones or a voltmeter.

2—Set the Phase Reverse switch to OFF, and the Stereo Dimension control to MIN. Adjust the input level controls of the power amplifiers for sonic null at the loudspeaker or earphones, or minimum at the meter.

NOTE: If loudspeakers are widely dissimilar in efficiency, this balancing procedure should not be used. If amplifiers do not have input level controls, it is suggested that these be incorporated in the units. However, sonic null balancing can still be achieved by adjusting the Level controls of the 400-CX (as outlined in Step 2 above) for sonic null at the amplifier output terminals.

REPLACING INDICATOR LAMPS

It is not necessary to remove the 400-CX from its cabinet to replace a Channel Indicator lamp. Lamps can be replaced easily by removing the front panel. First disconnect the AC power cable as a precaution. Remove all knobs, but not the pushbuttons or slide switch knobs. Remove the two hex nuts located at the points occupied by the Balance control and Mono-Stereo switch. Then lift off the front panel.

The lamps are the "bayonet" type, and are removed by pressing in with the fingers and making 1/8 turn *counterclockwise*. Conversely, lamps are replaced by pressing the base pins into the slots in the socket and making a 1/8 turn *clockwise*. Lamps are G.E. No. 47, or equivalent, and are available locally.

CUSTOM INSTALLATION

Two special custom cabinets, designed to accommodate the 400-CX, are available from your FISHER dealer. These are the Model MC-1 metal cabinet, and the Model 10-U wood cabinet (in walnut and mahogany.) Both are attractively designed to enhance room decor. The 400-CX may also be mounted in your own custom cabinet. Directions and illustrations are provided in this section.

Because adequate ventilation is an absolute essential for trouble-free operation, never install the 400-CX in a totally enclosed space, on top of an amplifier or too close to other heat-producing equipment.

The 400-CX may be installed in two ways: with cleats, to raise it above the floor of the

cabinet to provide ventilation; or, without cleats, in which case cut-outs must be made in the cabinet floor. The two types of installation follow.

Installation With Cleats . . .

1—Obtain a strip of wood $\frac{3}{4}$ inches square

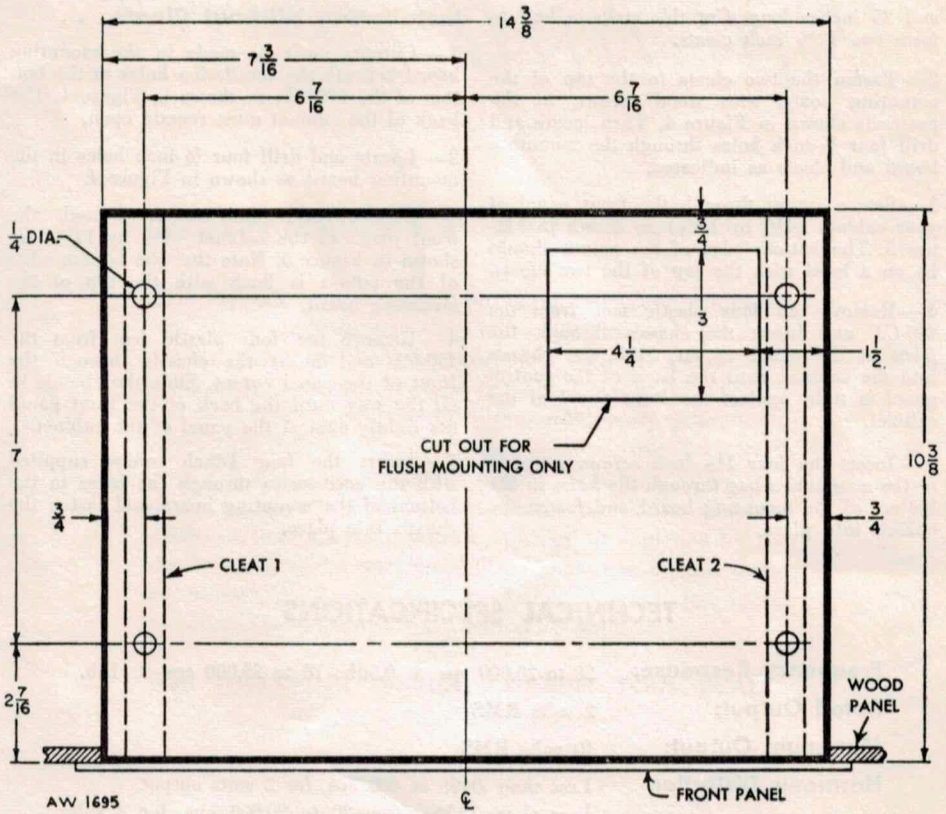


FIGURE 4 - Top view of custom cabinet installation

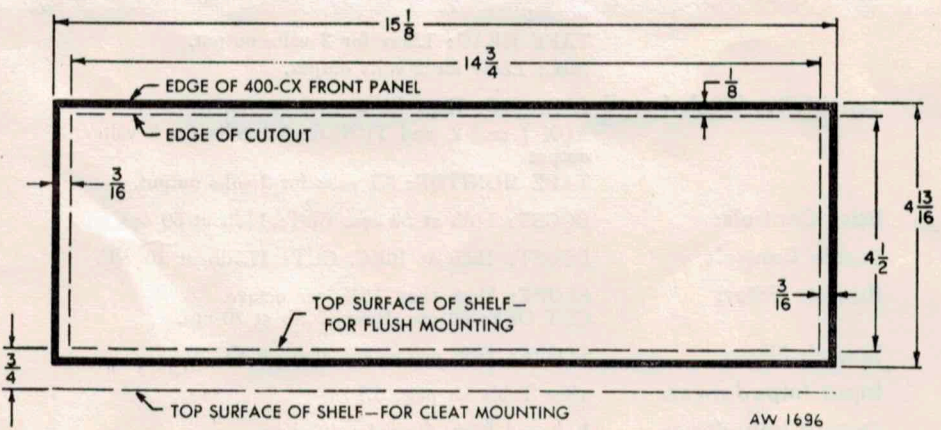


FIGURE 5 - Front panel cutout

and 25 inches long. Cut this strip in half to form two 12½ inch cleats.

2—Fasten the two cleats to the top of the mounting board with wood screws, in the positions shown in Figure 4. Then locate and drill four ¼-inch holes through the mounting board and cleats as indicated.

3—Saw a cutout through the front panel of your cabinet (4½ by 14¾) as shown in Figure 5. The bottom edge of the cutout should be on a level with the top of the two cleats.

4—Remove the four plastic feet from the 400-CX and insert the chassis through the *front* of the panel cutout. Slide the chassis into the cabinet until the back of the control panel is tight against the front panel of the cabinet.

5—Insert the four 1½ inch screws supplied in the accessories bag through the holes in the bottom of the mounting board and fasten the chassis into place.

Installation Without Cleats . . .

1—Cutouts must be made in the mounting board beneath the ventilation holes in the bottom of the 400-CX, as shown in Figure 4. The back of the cabinet must remain open.

2—Locate and drill four ¼-inch holes in the mounting board as shown in Figure 4.

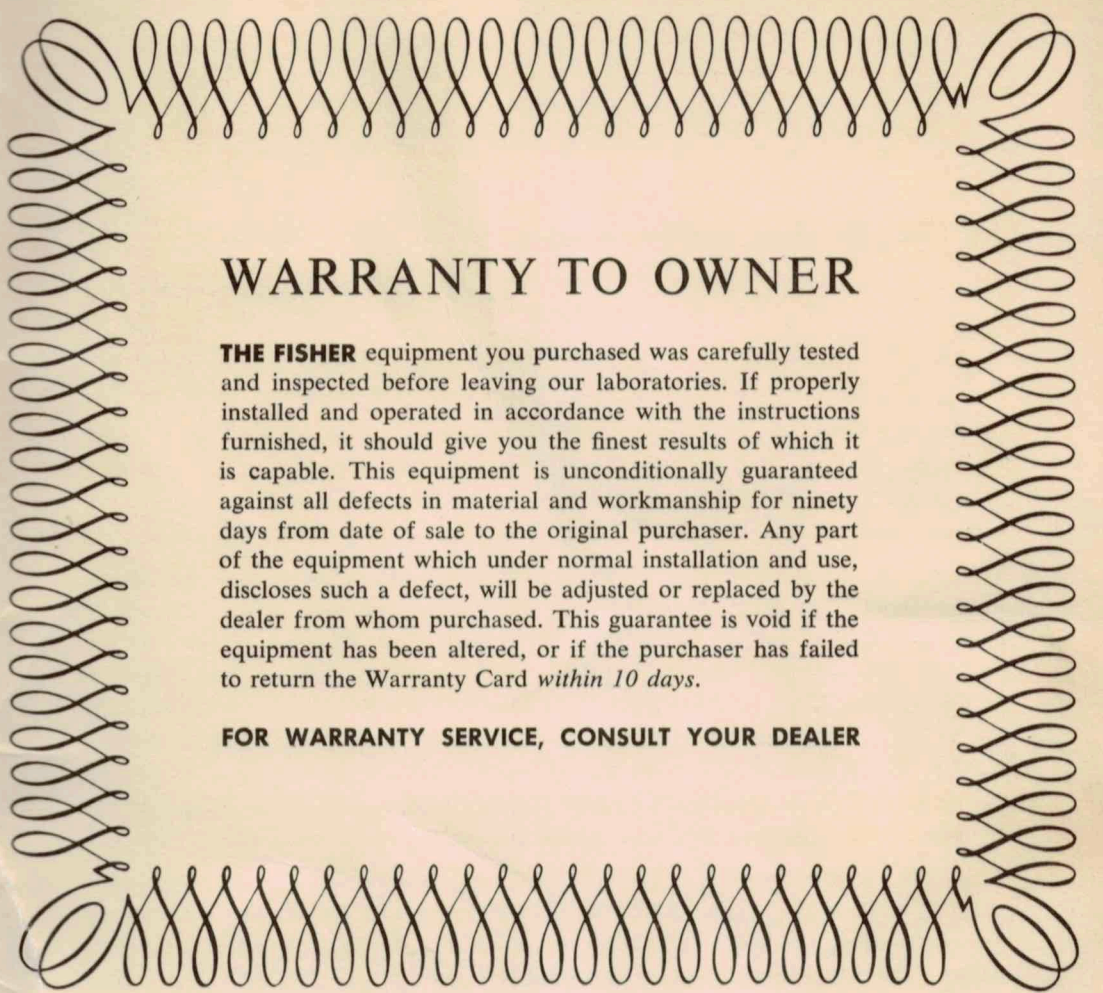
3—Saw a rectangular cutout through the front panel of the cabinet (4½ by 14¾) as shown in Figure 5. Note that the bottom edge of the cutout is flush with the top of the mounting board.

4—Remove the four plastic feet from the 400-CX and insert the chassis through the *front* of the panel cutout. Slide the chassis in all the way until the back of the front panel fits tightly against the panel of the cabinet.

5—Insert the four 1-inch screws supplied with the accessories through the holes in the bottom of the mounting board and fasten the chassis into place.

TECHNICAL SPECIFICATIONS

Frequency Response:	20 to 20,000 cps \pm 0.5db; 10 to 25,000 cps \pm 1db.
Rated Output:	2 volts RMS
Maximum Output:	10 volts RMS
Harmonic Distortion	Less than .04% at 400 cps, for 2 volts output. Less than 0.15% from 20 to 20,000 cps, for 2 volts output
Hum and Noise:	Better than 80db below rated output for high level inputs. Equivalent to 3 microvolts at low level inputs.
Channel Separation:	60db at 1KC
Sensitivity: (Low Level)	MAG 1 and 2 (RIAA 1 and 2): 2.8mv for 2 volts output TAPE HEAD: 1.5mv for 2 volts output. MIC: 1.5mv for 2 volts output.
Sensitivity: (High Level)	CERAMIC: 75mv for 2 volts output. AUX 1 and 2, and TUNER: 0.2 volts for 2 volts output TAPE MONITOR: 0.7 volts for 2 volts output.
Bass Controls:	BOOST: 14db at 50 cps. CUT: 14db at 50 cps.
Treble Controls	BOOST: 15db at 10KC. CUT: 17.5db at 10 KC.
Rumble Filter:	SLOPE: More than 16db per octave. CUT OFF: 60 cps. Down 24db at 20 cps.
Scratch Filter:	SLOPE: 21db per octave above 8 KC.
Input Impedances:	(See Table on page 6.)
Output Impedance	Left and Right Outputs: 40 ohms Center Output: 9000 ohms Recording Outputs: 12,000 ohms
Power Consumption:	50 watts.
Voltage Requirements:	105-120 volts at 50-60 cycles.



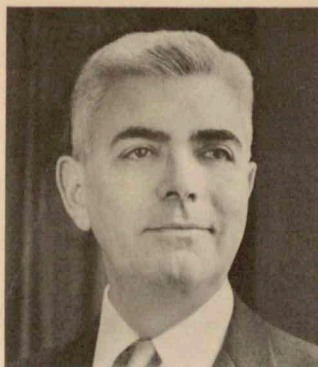
WARRANTY TO OWNER

THE FISHER equipment you purchased was carefully tested and inspected before leaving our laboratories. If properly installed and operated in accordance with the instructions furnished, it should give you the finest results of which it is capable. This equipment is unconditionally guaranteed against all defects in material and workmanship for ninety days from date of sale to the original purchaser. Any part of the equipment which under normal installation and use, discloses such a defect, will be adjusted or replaced by the dealer from whom purchased. This guarantee is void if the equipment has been altered, or if the purchaser has failed to return the Warranty Card *within 10 days*.

FOR WARRANTY SERVICE, CONSULT YOUR DEALER

The Man Behind the Product

AVERY FISHER
Founder and President,
Fisher Radio Corporation



TWENTY-TWO YEARS AGO, Avery Fisher introduced America's first high fidelity radio-phonograph. That instrument attained instant recognition, for it opened a new era in the faithful reproduction of records and broadcasts. Some of its features were so basic that they are used in all high fidelity equipment to this day.

The engineering achievements of Avery Fisher and the world-wide reputation of his products have been the subject of descriptive and biographical articles in *Fortune*, *Time*, *Pageant*, *The New York Times*, *Life*, *Cornet*, *High Fidelity*, *Esquire*, *The Atlantic*, and other publications. Benefit concerts for the National Symphony Orchestra in Washington and the Philadelphia Orchestra, demonstrating recording techniques, and the great advances in the art of music reproduction, used FISHER instruments both for recording and playback, to the enthralled audiences. FISHER equipment formed the key part of the high fidelity demonstration at the American National Exposition in Moscow, July 1959.

The FISHER instrument you have just purchased was designed to give you many years of pride and enjoyment. If you should desire information or assistance on the performance of your FISHER, please do not hesitate to write directly to Avery Fisher, President, Fisher Radio Corporation, Long Island City 1, New York.

	output
	TAPE HEAD: 1.5mv for 2 volts output.
	MIC: 1.5mv for 2 volts output.
Sensitivity: (High Level)	CERAMIC: 75mv for 2 volts output.
	AUX 1 and 2, and TUNER: 0.2 volts for 2 volts output
	TAPE MONITOR: 0.7 volts for 2 volts output.
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