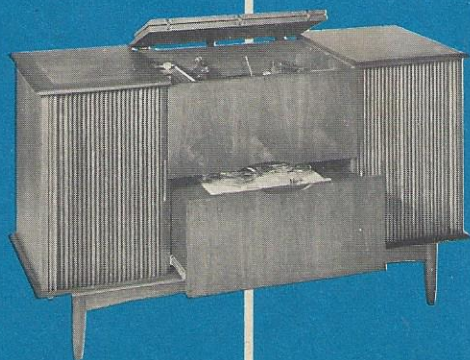


# AMPEX

## OWNER'S REFERENCE BOOK



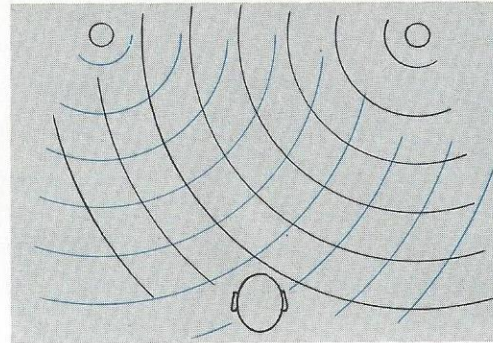
AMPEX CRESCENDO  
HOME MUSIC SYSTEM



# Ampex Stereophonic Sound

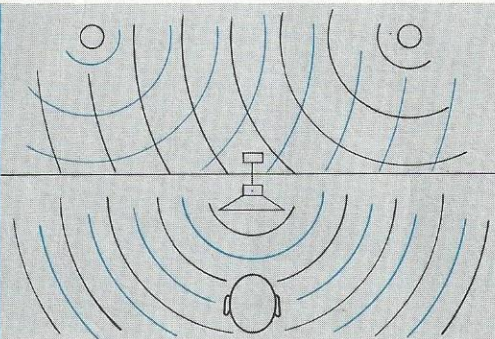
Stereophonic sound is as different from ordinary "high fidelity" as a 3-D stereo photograph in full color is different from a black and white snapshot.

The 3-D picture seen with both eyes shows perspective and depth. When you close one eye, the illusion of space and depth disappears. In effect, ordinary high fidelity or single-channel recording, no matter how well it's recorded, is very much like closing off one ear. Your sense



Reaching the listener from many sources and directions, live sound has genuine dimension and "presence." Two separate sources of sound are here represented by the two colors.

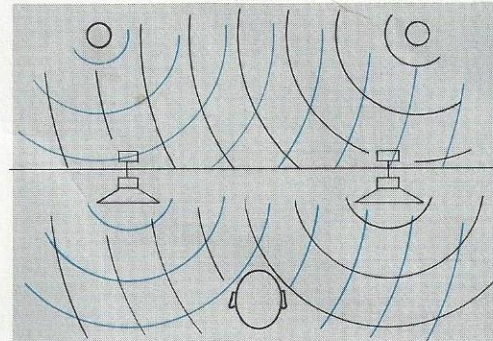
Monophonic, or single-channel sound reaches the ears from only one direction. All of the sound's original directional characteristics have been lost by "mixing" in a one-eared sound system.



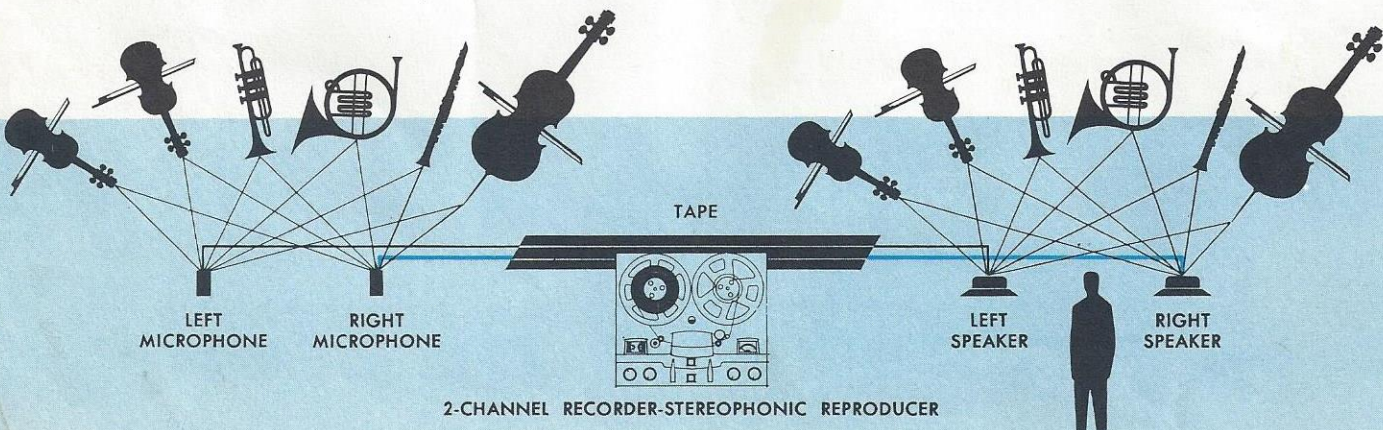
of direction can determine where the loudspeaker is located, but the sounds being reproduced remain flat and without perspective, because they all originate at a point instead of being spread across the audio panorama in their natural relationships. Ampex Stereophonic Sound is sound for *both* ears. Two separate microphones (and sometimes more) are used to record separate tracks on the tape. Played back through two separate amplifiers and

speakers, the original spatial relationship is preserved to bring you absolute directional realism.

Listening to an Ampex-recorded symphony orchestra, for example, you hear the strings to the left, the brasses to the right, the soloist front and center. The combined effect of the two speaker systems is to produce sounds not merely from two specific directions, but from *all* directions . . . and not just *between* the speakers, but *beyond* them.



Stereophonic sound preserves the original directional characteristics and thus enables the listener to orient himself into the original sound environment as if he were actually there.





# Ampex Crescendo Stereo Console

With the Crescendo you can hear and enjoy sound from magnetic tape, FM or AM radio, or from discs of any speed. Further, you have the ability to record from any of these sources, or directly from live sound—all with pushbutton simplicity. No special wiring, installation or location is needed. The Ampex-engineered Crescendo is acoustically at home in any size or shape room.

Every Ampex Crescendo contains only the highest quality of component items:

- Professional quality Ampex magnetic tape recorder/reproducer capable of playing all varieties of commercial pre-recorded reel-to-reel tapes, and of recording sound from any source.
- Pushbutton audio control center/preamplifier
- Ampex 2-channel AM and FM stereo tuner
- Garrard 4-speed record changer with high quality stereo pickup

Two matched Ampex electro-acoustic transducers, each consisting of:

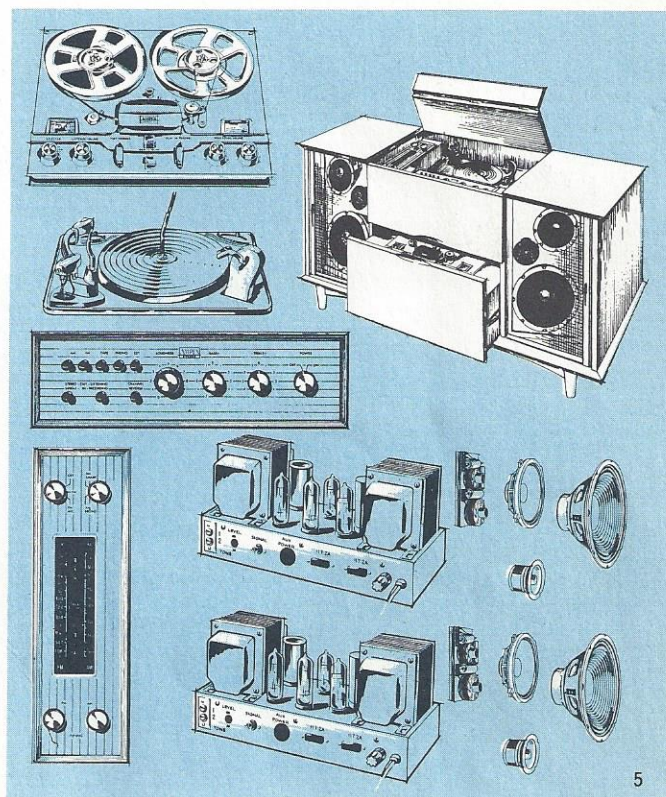
- 15-watt linear power amplifier (30 watts peak)
- 12-inch bass speaker
- Separately enclosed 8-inch mid-range speaker
- Omni-directional high frequency speaker

for a combined total of 6 high-performance speakers.

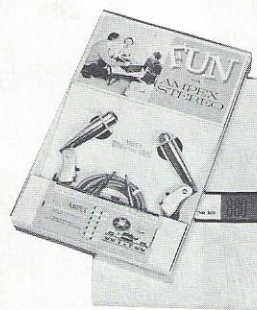
## OPTIONAL ACCESSORIES

**Maintenance Procedure Handbook.** This book, giving complete details on the checkout and maintenance of all stereo-system units, plus parts lists, exploded views and schematic diagrams, is available through your Ampex service center.

**Ampex Stereo Microphone Kit.** The stereo microphone kit contains two omnidirectional dynamic microphones, precision matched for stereo recording. Frequency response is from 60 to 12,000 cycles per second (cps). Each microphone incorporates an on-off switch and comes with a detachable 8-foot cable terminated in a standard 2-connector phone plug. An accessory desk-mounting base is also available.



**Ampex Stereo Headset Kit.** The headset consists of two miniature 16-ohm dynamic speakers with chamois-cushioned ear pieces and a 5-foot cable with a standard 3-connector phone plug. Included is a junction box and 12-foot extension containing two outlets so that you can plug in a second headset.



(6) Ampex 880 Kit. Includes quality dynamic microphones, Stereo-Graph, "Fun" brochure.



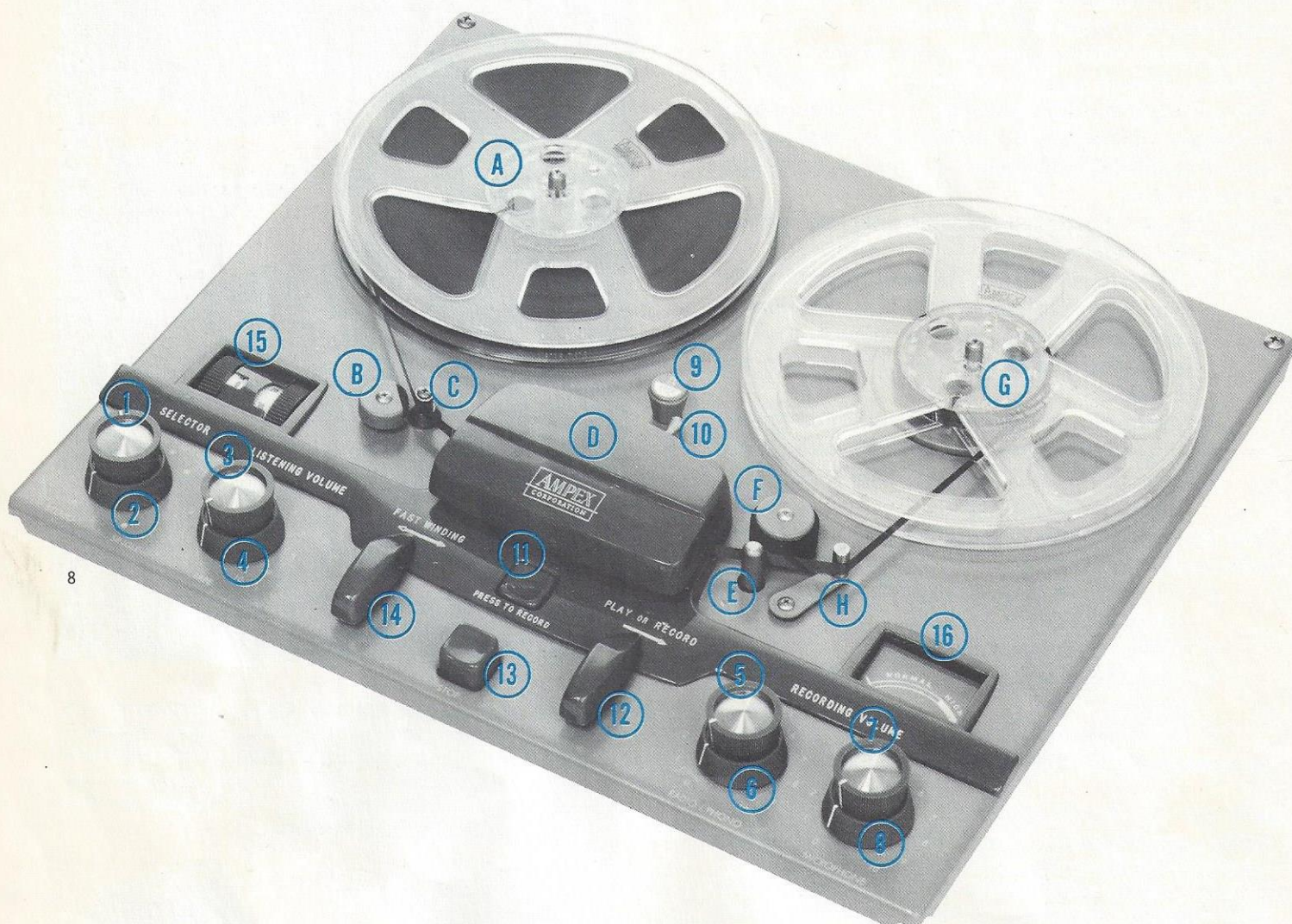
(7) Ampex 881 Kit. Includes dynamic headphones (16Ω), 12-foot extension with twin jacks, Stereo-Graph, "Fun" brochure.

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# Ampex Universal Tape Recorder/Reproducer

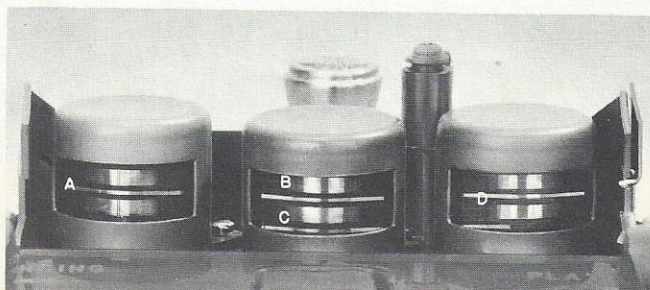


The function of the Universal recorder/reproducer is to capture and store sound on magnetic tape, and to reproduce it again upon demand. The instrument operates at either of two standard tape speeds,  $7\frac{1}{2}$  or  $3\frac{3}{4}$  inches per second (ips). It will play back two- or four-track stereophonic tapes (see page 10) or monophonic tapes, and it will record either monophonically or stereophonically.

Essential to the performance of the recorder are

the three separate precision-engineered dual-track stacked heads, for erasing, recording and playback operations. Each is engineered for optimum performance in its one specific function. At the front of each head, forming a vertical line where the tape contacts the head, is a minute gap. The tape moving past the head bridges this gap and it is here that the function of the head — erasing, recording or playback — takes place.

(9) Head assembly. A—erase head; B—Left track recording head; C—Right track recording head; D—Playback head assembly.





## LOCATION OF CONTROLS AND INDICATORS

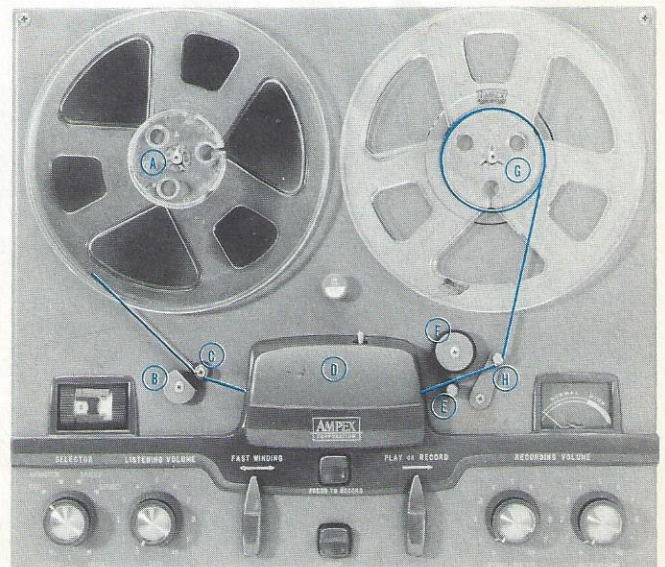
The following list outlines the items you will be concerned with on the recorder. Numbers correspond with those in figure 8. Notice that the SELECTOR, LISTENING VOLUME and RECORDING VOLUME controls have double knobs; the inside knob and the ring surrounding it are separate controls.

- 1 (Inside knob.) Switches recorder on. Selects stereo or monophonic playback or monitor. In MONITOR position, you hear the signal supplied to the recorder; in SINGLE or STEREO, you hear the signal actually recorded on the tape.
- 2 (Outside Knob) Selects monophonic or stereo recording; selects whether right or left channel input is indicated by the recording level meter. In SINGLE, input to the **left** channel only (from microphone, tuner, phono or external source) will be recorded with recording meter showing level of signal at left channel. In STEREO, inputs to both channels will be recorded simultaneously, with meter showing signal level at left channel (at L position) or at right channel (at R).
- 3 (Inside Knob) Adjusts listening volume for left-channel sound signal.
- 4 (Outside Knob) Adjusts listening volume for right-channel sound signal.
- 5 (Inside Knob) For external phono or tuner inputs; adjusts level of sound being recorded on left channel.
- 6 (Outside Knob) For external, phono or tuner inputs; adjusts level at sound being recorded on right channel.
- 7 (Inside Knob) For left-channel microphone input; adjusts recording level.
- 8 (Outside Knob) For right-channel microphone input; adjusts recording level.
- 9 Selects tape speed: up position for  $7\frac{1}{2}$  ips, down for  $3\frac{3}{4}$  ips. **Recorder must be turned on when changing tape speed setting.**
- 10 Head shift lever; press down to play 2-track tapes, pull up for 4-track tapes. (This is a precision mechanism — **DO NOT FORCE.**)
- 11 Recording pushbutton; safety-interlocked with #12—both must be actuated simultaneously to record.
- 12 Turn clockwise to move tape at normal speed from left to right. Locks machine in playback or recording mode of operation.

- 13 Stops tape motion whether recording or reproducing (playing back), regardless of direction or speed. Releases RECORD pushbutton when it is locked in the recording position. **Never try to stop tape motion by returning the FAST WINDING or PLAY control to neutral—always use the STOP button!**
- 14 Moves the tape rapidly in either direction. Turn knob in direction you want tape to go.
- 15 Indicates tape position, enables you to return to pre-determined place on the tape.
- 16 Indicates recording level of either left or right channel as selected by control No. 2.

## ELEMENTS OF THE TAPE THREADING PATH

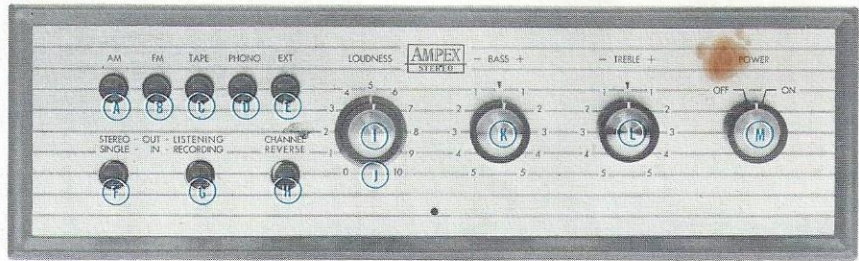
- A Supply reel; may be any standard reel up to and including 7 inches in diameter.
- B Tape holdback tension regulator
- C Tape guide
- D Head cover
- E Capstan; imparts steady forward motion to tape
- F Capstan idler; presses tape against surface of capstan
- G Takeup reel
- H Automatic-stop arm; stops machine when end of tape is reached





# Ampex Audio Control Center

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The Audio Control Center serves two purposes: it provides pushbutton switching facilities among all sources of audio inputs, and is a preamplifier for signals fed to the Crescendo's power amplifiers.

Figure 12 is a simplified diagram showing the functions of the two sections of the unit. Pushbutton controls of the signal-switching section are as follows: (Note—It is suggested that you first familiarize yourself with A through E; these are all you need to properly select the desired source of sound. Controls G and H will not be required until you are ready for advanced techniques.)

- A** Selects the output of the AM tuner for listening or recording
- B** Selects the output of the FM tuner for listening or recording
- C** Selects the output of the tape recorder for listening only
- D** Selects the output of the record changer (either stereo or monophonic) for listening or recording
- E** Selects external source connected into LINE jacks (either monophonic or stereo) for listening or recording
- F** In SINGLE (in) position, selects the signal on the left channel (with H button out; right channel with H button in) as the output through both right and left speakers. In STEREO position, provides separate signals through the left and right channels for stereophonic sound.
- G** In LISTENING (out) position, the input signal selected in A through E above is heard. Pressing button IN to RECORDING position connects the tuner, phono, or external source as selected

to the tape recorder for recording, and simultaneously connects the recorder to the speaker system for listening during recording. [NOTE that when the recorder system (#1) is in single or stereo position you are listening to that which has just been recorded. This Ampex feature—found on very few tape machines—is most important in obtaining good recordings.]

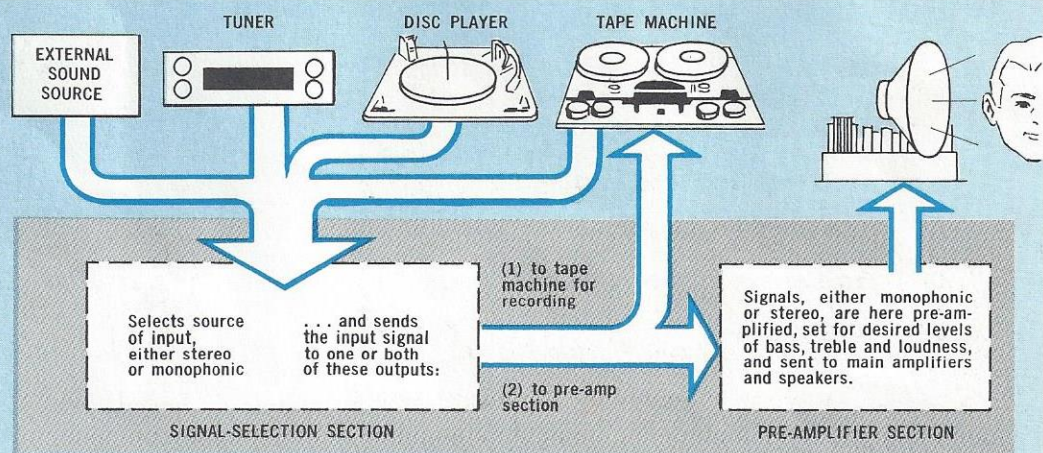
**H** Reverses left- and right-hand channels. Normal position (left-channel signal through the left speaker) is with pushbutton out. This permits correcting where AM and FM stereo channels or early stereo disc recordings are reversed from conventional right-left relationship.

The preamplifier section consists of two preamplifiers on one chassis, since stereo requires two separate sound channels—one for each amplifier-speaker system. The purpose of the preamplifiers is to amplify signals from tuner, changer, recorder or external source. Preamplifier front-panel controls are as follows:

- I** (Inside Knob) Controls the loudness of the sound through the left speaker.
- J** (Inside Knob) Controls the loudness of the sound through the right speaker.
- K** Increases or decreases BASS (low frequency) response. For normal listening, set to center of dial (12 o'clock).
- L** Increases or decreases TREBLE (high frequency) response. For normal listening, set to center of dial (12 o'clock).
- M** Master on-off control—turns on power to audio control center and to all the other units of the stereo console.

12

## FUNCTIONAL DIAGRAM OF AMPEX AUDIO CONTROL CENTER



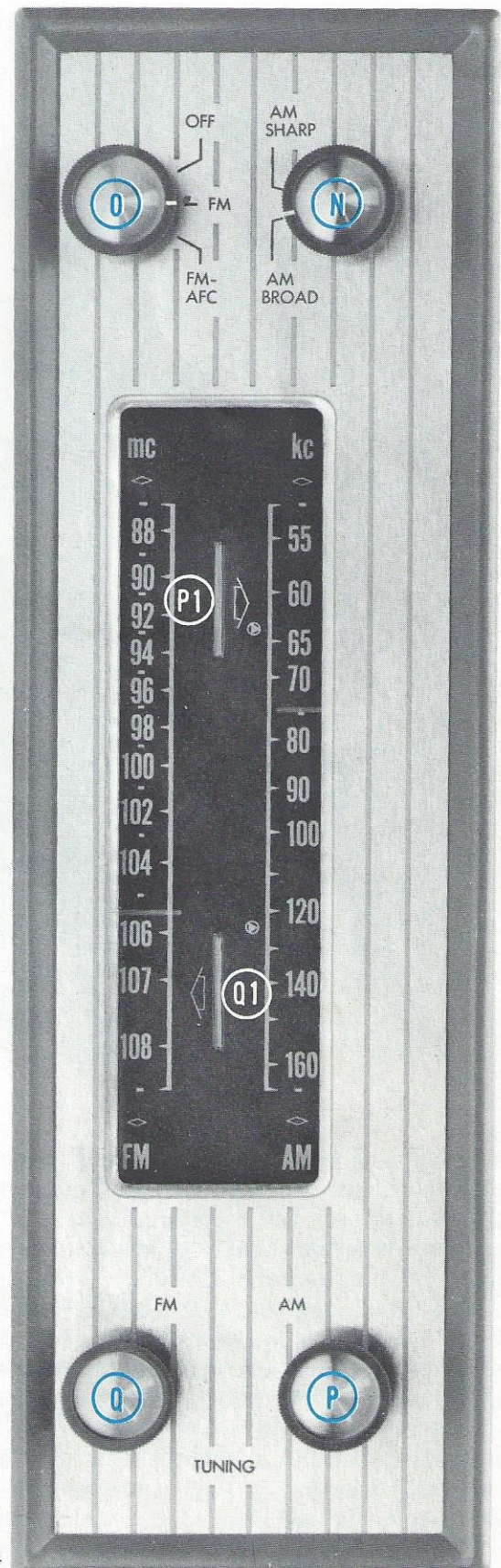
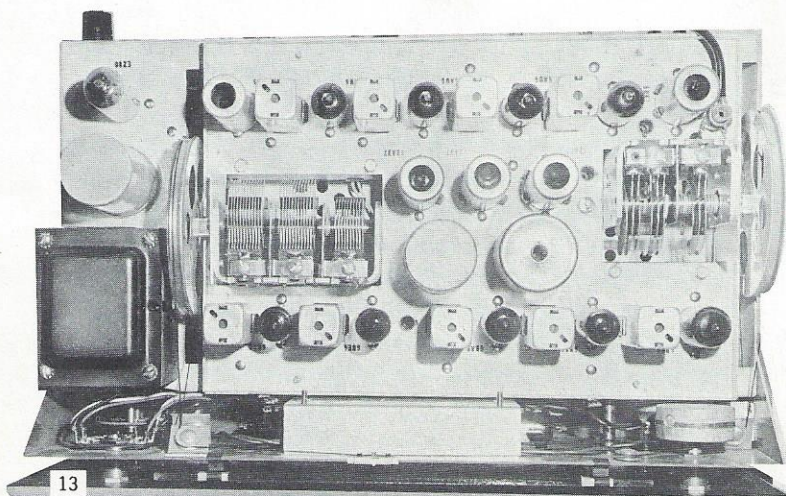


## Ampex AM & FM Stereo Tuner

The Ampex Cescendo incorporates a true stereophonic tuner — which is in effect two broadcast-studio-quality tuners, with completely independent radio-frequency, intermediate-frequency and output circuits, mounted on a common chassis. With this tuner, you can receive any monophonic AM or FM, or any AM and FM stereophonic broadcasts within transmission range. Provision is also made for FM/FM multiplex stereo. *RICK OLSEN 10x4x2 1/2*

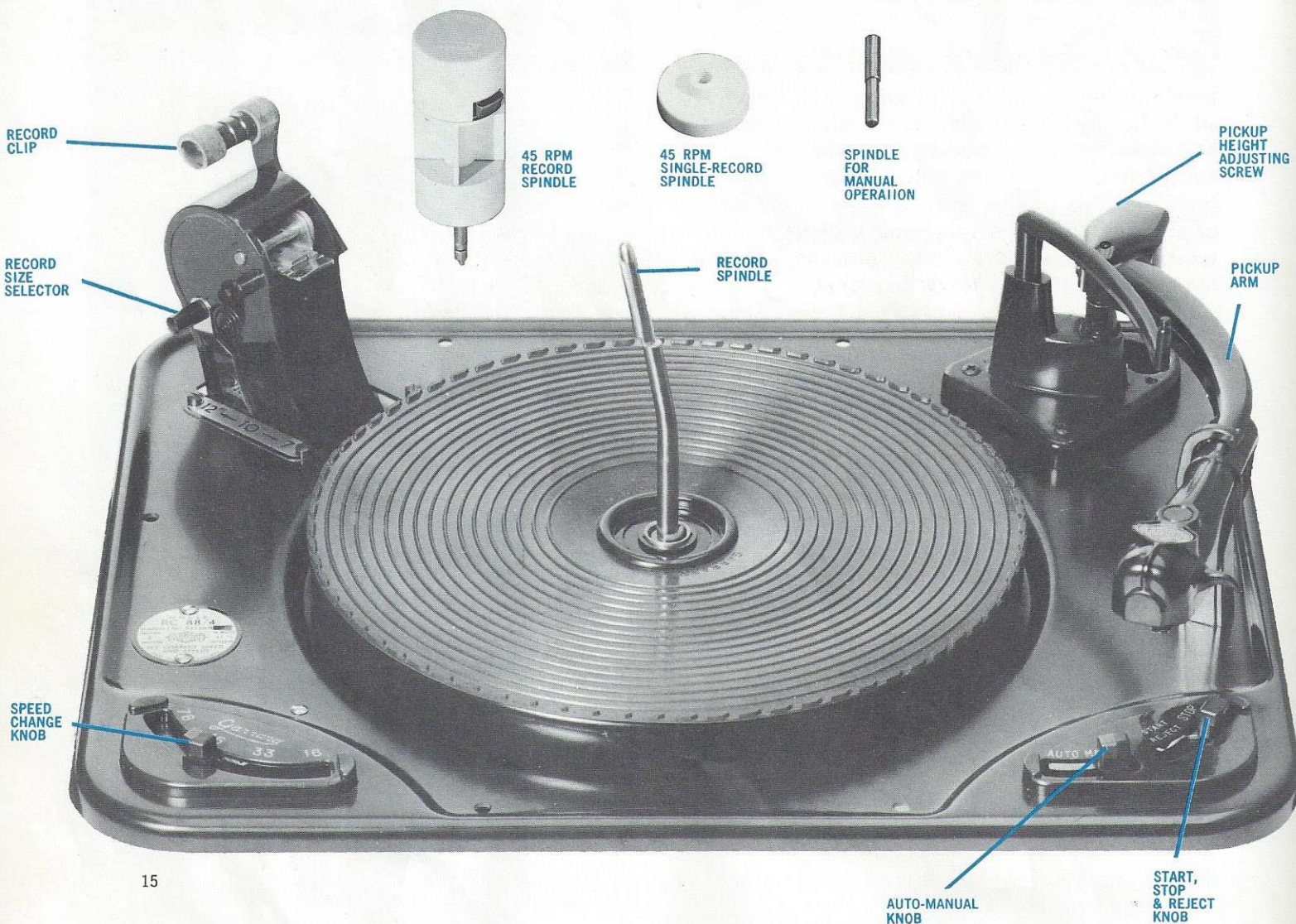
Operation is no more complex than tuning an ordinary radio. The following controls are used:

- N** AM selectivity control. Use SHARP position for tuning in station; then switch to BROAD position for maximum fidelity.
- O** Tuner On-Off switch, combined with switch for automatic frequency control in FM tuning. In FM-AFC position, tuner automatically and precisely locks to center of incoming signal and compensates for frequency drift.
- P** AM tuning control, for selecting desired AM station.
- P1** Visual tuning indicator for AM. Station is properly tuned in when minimum dark area is visible.
- Q** FM tuning control, for selecting desired FM station.
- Q1** Visual tuning indicator for FM. Station is properly tuned when minimum dark area is visible.





## Stereo/Monophonic Record Changer



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The automatic record changer in your Ampex Crescendo is capable of reproducing all modern stereo and monophonic disc recordings. The pickup arm incorporates a high quality dual-axis magnetic cartridge with diamond stylus, which reproduces micro-groove stereo and monophonic discs interchangeably. Features of the record changer include a powerful constant-speed 4-pole motor, extra-quiet heavily weighted turntable, automatic shut-off and fully adjustable pickup arm.

To reject a selection, move the right-hand knob to the REJECT position. To stop the changer before all selections have been played, simply move the lever to STOP position. If this is done while a record is

playing, that record will be rejected when changer is again placed in operation.

### Manual Control

The purpose of the manual control is to disconnect the changing mechanism so that single records can be played as on a transcription turntable. Move the MANUAL-AUTO knob to MANUAL and replace the long record spindle with the short spindle. The pickup arm will be free to move and you can play the unit as a single record player. At the completion of a record the pickup will rise and return to its rest leaving the turntable revolving. To stop motor and turntable, move the right-hand control to STOP.



**(16) TO OPERATE:**

1. Move speed change knob to desired speed.



2. Set lever for size of record to be played.



3. Place up to eight records on spindle, and lower clip.



4. Move switch to ON.

### *Special Note: 45- and 78-rpm records*

If you plan to use your record changer with 45-rpm records, first pull out the slender record spindle and install the large spindle. Place the seven-inch 45-rpm records over the large spindle and do not lower the record clip. Adjust the speed change knob to "45" and play records as you normally would.

Although the cartridge on the record changer may be used interchangeably with any microgroove record, stereo or monophonic, it would be wise not to use it with older 78-rpm records. It is recommended that you use a special cartridge, available at nominal

cost in any hi-fi store, for playing 78-rpm records. The most practical and convenient way to be able to play 78-rpm and microgroove records interchangeably is to provide yourself with not only an additional cartridge, but a plug-in housing for it as well. The entire end of the pickup arm on your record player is a plug-in assembly, containing the stereo-monophonic cartridge. If you obtain another and equip it with the 78-rpm cartridge, you will be able to change cartridges simply by pulling out one head and plugging in the other.



## MAGNETIC TAPE — THE RECORDING MEDIUM

Magnetic tape is a plastic film coated with millions of tiny particles of magnetic oxide (which give the tape its brown color). To store a sound on this tape, it is necessary to convert the sound into an electrical current. This current, flowing through the recording head on your tape machine, causes an electromagnetic field to vary in accordance with the fluctuations in the sound. The oxide particles on the tape, as they pass the recording head, are magnetized by the varying electromagnetic field.

On playback, the magnetized tape passes the playback head and induces an electrical current corresponding to the sound that the tape "remembers." This current is amplified and transformed back into sound energy.

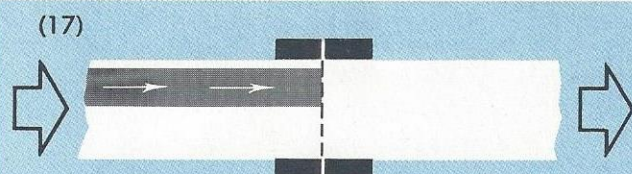
Magnetic tape's "memory" does not wear out or deteriorate with age. The tape remains magnetized indefinitely, until erased or brought into contact with a strong magnetic field. It can be erased and re-recorded innumerable times with no loss in its ability to capture and play back sound or other information which can be converted into electrical signals.

### TYPES OF PRE-RECORDED TAPES

Pre-recorded tapes are available both in monophonic and stereophonic recordings. A monophonic recording is one in which only single-channel sound is recorded on the tape . . . sometimes referred to as a "half-track" recording. A monophonic tape is generally recorded its full length and then turned over for recording back to the beginning end on its other track. In this way, by utilizing both its tracks, a monophonic recording can provide effectively twice the available recording time.

Stereophonic tapes are available in two types: 2-track and 4-track. The 2-track stereo tape has both sound tracks recorded side-by-side for the full length of the tape, and must be re-wound when the end is reached.

The 4-track stereo tape is recorded on alternate tracks. The first half of the stereo recording goes the full length of the tape, from beginning to end of the reel, and is turned over and recorded on the alternate pair of tracks back to the beginning again. In one direction, tracks 1 and 3 are played; in the other direction tracks 2 and 4 are played. When playing 4-track tapes, pull the head shift lever up (away from the recorder chassis); with all other tapes, the lever must be down.



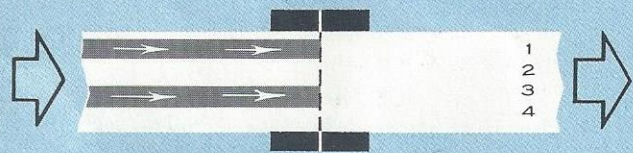
In **MONOPHONIC RECORDING**, the tape is recorded on half its width, and is sometimes called a "half-track" recording.



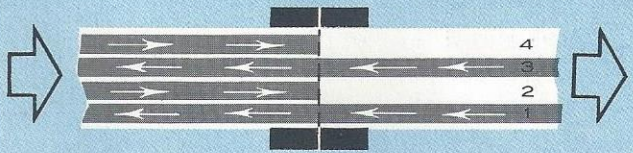
When the end of the reel is reached, the tape is turned over, and the other half of the tape is recorded in the opposite direction.



In **STEREO RECORDING**, 2-track, the tape is recorded (or played back) in one direction only. The two channels are simultaneously recorded from one end of the reel to the other, and at the end the tape is rewound.



In **4-track STEREO RECORDINGS**, the two stereo channels are recorded on non-adjacent tracks in one direction, (tracks 1 and 3 as shown above) from one end of the reel to the other.



At the end of the reel, the tape is turned over and recorded on the alternate tracks (tracks 2 and 4 as shown above).

### Handling Magnetic Tape

Tape is a strong, permanent recording medium, unaffected by ordinary handling or storage. However, it should be kept away from heat and moisture, and direct contact with other magnetic materials. Avoid stretching tape, or you will distort it and destroy the quality of the recording.



## BEFORE YOU OPERATE THE CONSOLE

### TURNING ON POWER

Your stereo console is connected in such a way that one master control turns on the power to all units of the system. This is the POWER control located to the far right on the audio control center. First, be sure to plug the console into a standard wall outlet supplying 117-volt ac. Turn ON the master POWER control, supplying system power and turning on the audio control center. Now, however, you still must turn on each unit with its own on-off control. These are as follows:

FM/AM tuner—OFF-FM-AFC switch at upper left of tuner.

Record changer—START-STOP-REJECT knob at right front.

Tape recorder—center SELECTOR control at far left.

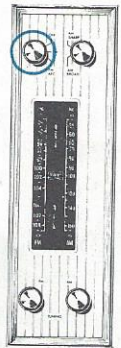
### THREADING TAPE ON THE RECORDER

To place tape on the recorder, ready for operation, refer to Figures 22a-22f and proceed as follows:

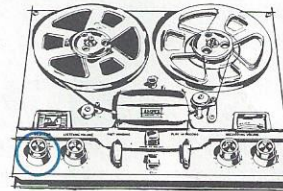
1. Place an empty tape reel on the right-hand turntable, in the position of the takeup reel in Figure 22a. Make sure the slots in the reel engage the turntable.
2. Put a full reel of tape on the left turntable (Fig. 22b). Tape must be coming off the left side of the reel. Make sure the slots in the reel engage the turntable.
3. Pull the tape off the reel without twisting it, and place it between the holdback tension regulator and the tape guide (Fig. 22c). Then slip it under the front lip of the head cover and between the capstan and the idler (Fig. 22d). Check to be sure that the shiny side of the tape faces toward you.
4. Place the tape on the lower side of the automatic stop arm (Fig. 22e). Then pull the tape up between the flanges of the takeup reel (Fig. 22f).
5. Turn the PLAY control to start tape motion. Tape should start winding onto the reel hub. Press the STOP button.
6. When editing, turn the knurled wheels on the sides of the tape-position indicator to show zero. Tape is now threaded and you are ready to operate the recorder.



(18) AUDIO CONTROL CENTER



(19) STEREO TUNER



(20) TAPE RECORDER



(21) RECORD PLAYER

### FAST WINDING

The purpose of the FAST WINDING control is to move the tape rapidly from one reel to the other. Using it, a full reel can be unwound in a little over a minute. To check fast winding operation, turn the pointer of the indicator toward the empty reel to the right. The tape should start to wind onto the takeup reel and increase rapidly in speed. After a few seconds, stop the tape by pressing the STOP button. NOTE: Always press STOP button first before turning off power switch. Otherwise brakes will not energize and tape can "spill." Then turn the pointer of the FAST WINDING indicator to the left and allow the tape to unwind off the takeup reel. When the tape has come completely off the reel, the automatic stop arm should drop, stopping all rotation of the reels.

### STOPPING TAPE MOTION

To stop the tape from moving, either at standard operating speed or at fast winding speed, merely press the STOP button at the center of the tape recorder. This automatically returns the PLAY OR RECORD control to its rest position (and releases the PRESS TO RECORD pushbutton if it has been pushed in.) Always stop tape motion with the STOP button; never use the on-off switch or try to return the PLAY OR RECORD or FAST WINDING control to rest position.

22a

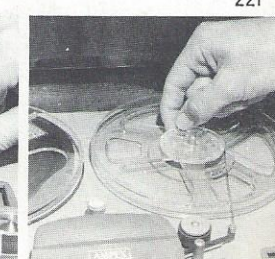
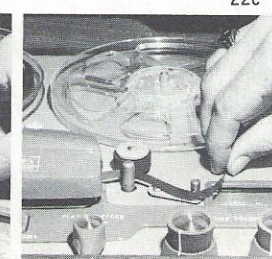
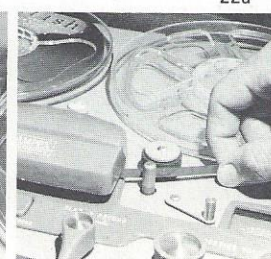
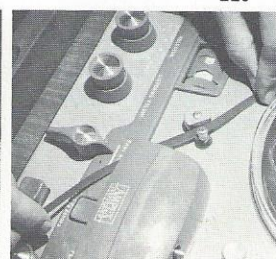
22b

22c

22d

22e

22f





## LISTENING FUNCTIONS

Operating procedures below are given in detail for all the various listening functions. It is suggested that you become thoroughly familiar with these before you begin use of recording functions and

more advanced techniques. You may find it helpful to refer to the chart on pages 16 and 17, which parallels the functions described here.

### MONOPHONIC TAPE PLAYBACK

1. At the audio control center, press IN the TAPE and STEREO-SINGLE push-buttons (C & F), and check that all other buttons are OUT. This selects the output of the tape recorder for listening. Temporarily set the LOUDNESS controls (I & J) to 10 and the BASS and TREBLE controls (K & L) to zero (centered on the dial). Turn master POWER control (M) to ON.

2. The tuner and record changer will not be used, so their power controls (O & R) may be turned OFF.

3. Use of the headset (U) is optional. If you use it, plug into the EXT SPEAKER jacks at the rear of the console, lower right and left. This automatically disconnects the speakers and channels the sound into the headset.

4. At the tape recorder, turn the playback SELECTOR (1) to SINGLE. This turns the recorder on and connects the monophonic signal from the tape to the tape-recorder output. Check the tape box or reel to see at what speed the tape is recorded. Then adjust the tape speed selector (9) for the appropriate speed (up: 7½ ips; down: 3¾ ips) and make sure the head shift lever (10) is down—it should always be down except when a 4-track stereo tape is being played. Thread the tape on the machine and turn the PLAY control (12) to the right to begin tape motion. Adjust the left-channel LISTENING VOLUME control (3) for the proper level of sound.

5. Now return to the audio control center and re-adjust the LOUDNESS, BASS and TREBLE controls (I, J, K and L) to the positions which sound best to you. The loudness controls are compensated for the natural reduced sensitivity of the human ear to bass at low listening levels. The bass "boost" is diminished as the volume is increased. In **tape playback** this compensation can be eliminated, if personal taste dictates, by setting loudness controls to 10 and controlling volume with knobs 3 and 4.

If your tape is recorded in both directions, let it play out fully one way. Then, when the whole tape has been wound onto the takeup reel, remove

the empty supply reel from the recorder. Pick up the full takeup reel, turn it over and place it on the left turntable in the position of the supply reel. Put the empty reel on the right turntable. Thread tape and play back.

### 2-TRACK STEREO TAPE PLAYBACK

1. At the audio control center, press IN the TAPE pushbutton (C), all other buttons OUT. Temporarily set LOUDNESS controls (I & J) to 5 and BASS and TREBLE controls (K & L) to center. Switch POWER control (M) to ON.

2. The tuner and record changer won't be used, so their power controls (O & R) may be switched OFF.

3. Use of the headset (U) is optional. If used, plug into EXT SPEAKER jacks at the rear of the console.

4. At the tape recorder, switch the playback SELECTOR (1) to STEREO. This connects the stereo signal from the tape to the speakers. Adjust tape speed control (9) and check that head shift lever (10) is down. Then turn the PLAY control (12) to the right and adjust the sound level with VOLUME controls (3 & 4) for balance between the two stereo output channels.

5. Now return to the audio control center and adjust the LOUDNESS, BASS and TREBLE controls (I, J, K and L) to the positions which sound best to you.

6. Re-wind tape back on to its original reel.

### 4-TRACK STEREO TAPE PLAYBACK

1. At the audio control center, press IN the TAPE pushbutton (C), all other buttons OUT. Temporarily set LOUDNESS controls (I & J) to 10 and BASS and TREBLE controls (K & L) to center. Switch POWER control (M) to ON.

2. The tuner and record changer won't be used, so their power controls (O & R) may be switched OFF.

3. Use of the headset (U) is optional. If used, plug into EXT SPEAKER jacks at the rear of the console.

4. At the tape recorder, switch the playback SELECTOR (1) to STEREO. Adjust the tape speed control (9) and pull the head shift lever (10) UP. Turn the

PLAY control (12) to the right and adjust the sound level with VOLUME controls (3 & 4) for balance between the two stereo channels.

5. Now return to the audio control center and adjust the LOUDNESS, BASS and TREBLE controls (I, J, K and L) to the positions which sound best to you.

Since 4-track stereo tapes are recorded in both directions, you will have to turn the tape over once you have let it play out fully one way. When the whole tape has been wound onto the takeup reel, remove the empty supply reel from the recorder. Pick up the full takeup reel, turn it over and place it on the left turntable in the position of the supply reel. Put the empty reel on the right turntable. Thread tape and play back.

### AM RADIO BROADCASTS

1. At the audio control center, press IN the AM and STEREO-SINGLE buttons (A & F), all other buttons OUT. This connects the output of the AM tuner to both channels for monophonic listening. Temporarily set the LOUDNESS controls (I & J) to about 2, and the BASS and TREBLE controls (K & L) to center. Turn POWER control (M) to ON.

2. At the tuner, switch the AM selectivity control (N) to AM SHARP, which gives the best selectivity, or ability of the tuner to pick out the desired signal from adjacent ones. Turn the OFF-FM switch (O) to FM to turn on the tuner, and adjust AM TUNING control (P) to tune in the desired station on the AM broadcast band; as you tune, check the AM visual tuning indicator (P1)—when the minimum dark area is visible, you have correctly tuned the station. Then switch (N) to AM BROAD, for best fidelity.

3. The record changer and tape recorder will not be used, so their power controls (R & 1) may be turned OFF.

4. Use of the headset (U) is optional. If used, plug into EXT SPEAKER jacks at the rear of the console.

5. Now return to the audio control center and re-adjust the LOUDNESS, BASS and TREBLE controls (I, J, K and L) to the positions which sound best to you.



## FM RADIO BROADCASTS

1. At the audio control center, press IN the FM and STEREO-SINGLE pushbuttons (B & F), all other buttons OUT. Temporarily set the LOUDNESS controls (I & J) to about 2 and the BASS and TREBLE controls (K & L) to center. Turn POWER control (M) to ON.

2. At the tuner, switch control (O) to FM-AFC, which causes the tuner to lock automatically onto the incoming signal and to compensate for any frequency drift. Adjust FM TUNING control (Q) to tune in the desired station; as you tune, check the FM visual tuning indicator (Q1)—when the minimum dark area is visible, you have tuned the station properly.

3. The record changer and tape recorder will not be used, so their power controls (R & 1) may be turned OFF.

4. Use of the headset (U) is optional. If used, plug into EXT SPEAKER jacks at the rear of the console.

5. Now return to the audio control center and re-adjust the LOUDNESS, BASS and TREBLE controls (I, J, K & L) to the positions which sound best to you.

## AM AND FM STEREO BROADCASTS

1. At the audio control center, simultaneously press IN the AM and FM buttons (A & B), all other buttons OUT. This connects the FM output of the tuner to the left channel, the AM output to the right channel for stereo listening. Temporarily set LOUDNESS controls (I & J) to about 2 and the BASS and TREBLE controls at center. Turn POWER control (M) to ON.

2. At the tuner, switch control (N) to AM SHARP, control (O) to FM-AFC and adjust TUNING controls (P & Q) to the AM and FM stations broadcasting simultaneous stereo programs; as you tune, check AM and FM visual tuning indicators (P1 & Q1) for indications that you have properly tuned both stations. After tuning, switch control (N) back to AM BROAD.

3. The record changer and tape recorder will not be used, so their power controls (R & 1) may be turned OFF.

4. Use of the headset (U) is optional. If used, plug into EXT SPEAKER jacks at the rear of the console.

5. Now return to the audio control center and re-adjust the LOUDNESS, BASS

and TREBLE controls (I, J, K & L) to the positions which sound best to you.

1. At the audio control center, press IN the AM and EXT pushbuttons (A & E), all other buttons OUT. This connects the signal from the AM tuner to the left channel and the signal from the TV to the right. (For FM/TV, press IN the FM and EXT pushbuttons (B & E), all other buttons OUT.) Temporarily set the LOUDNESS controls (I & J) to about 2 and the BASS and TREBLE controls (K & L) to center. Turn POWER control (M) to ON.

2. At the tuner, switch control (N) to AM SHARP, control (O) to FM and adjust AM TUNING control (P) to tune in the station; as you tune, watch the AM visual tuning indicator (P1) for indication that you have properly tuned the station. After tuning, switch control (N) back to AM BROAD. (For FM-TV, turn control (O) at the tuner to FM-AFC and adjust TUNING control (Q) to tune in the desired station.)

## AM/TV (or FM/TV) STEREO BROADCASTS

Two methods for connecting TV for monophonic and stereo AM/TV listening are as follows: First (Preferable for a permanent connection): Connect the TV input to the RIGHT AM input of the Audio Control Center. AM/TV stereo can be obtained by pressing the AM button with all other buttons OUT. Monophonic TV may be had by pressing the STEREO-MONOPHONIC and CHANNEL REVERSE buttons (F & H) IN.

Second: Connect the TV input to the external (LINE) right channel and by depressing EXTERNAL and AM simultaneously stereo is obtained. All other buttons will be OUT except the CHANNEL REVERSE (depending upon the broadcast stations' instructions). Monophonic TV will be obtained as in the first method plus using EXTERNAL button.

3. Turn on your television set, allow it to warm up and turn up the volume control on the TV set; now leave the TV volume set at that point and make all subsequent volume changes with the right-channel LOUDNESS control (J) on the audio control center. (When CHANNEL REVERSE button (H) is IN,

LOUDNESS control (I) will adjust the volume of the sound from the television.)

4. The record changer and tape recorder will not be used, so their power controls (R & 1) may be turned OFF.

5. Use of the headset (U) is optional. If used, plug into EXT SPEAKER jacks at the rear of the console.

6. Now return to the audio control center and re-adjust the LOUDNESS, BASS and TREBLE controls (I, J, K & L) to the positions which sound best to you.

MONOPHONIC PHONO RECORDS<sup>9</sup>

1. At the audio control center, press the PHONO and STEREO-SINGLE buttons (D & F) IN, all other buttons OUT—this connects the monophonic output of the record changer to both channels. Temporarily set the LOUDNESS controls (I & J) to about 2 and the BASS and TREBLE controls (K & L) at center. Turn POWER control (M) to ON.

2. The tuner and tape recorder will not be used, so their power controls (O & 1) may be turned OFF.

3. At the record changer, unfasten the metal clamp securing the pickup arm and remove the small protective plate covering the stylus. Be sure the plastic extension is in place on the end of the selector arm, or you won't be able to play records automatically. Now move the speed change knob to the proper speed for the records to be played, set the size selector for proper record size, place up to eight records on the spindle. Lower the clip so that it secures the records. Move the changer switch to ON and the player will automatically play each record in turn.

**NOTE: Before you play 45 or 78 rpm records, be sure to read the special instructions for this type of operation on page 9.**

4. Use of the headset (U) is optional. If used, plug into EXT SPEAKER jacks at the rear of the console.

5. Now return to the audio control center and re-adjust the LOUDNESS, BASS and TREBLE controls (I, J, K & L) to the positions which sound best to you.



## STEREOPHONIC PHONO RECORDS

1. At the audio control center, press IN the PHONO button (D), all other buttons OUT. This connects the stereo output of the record changer to both listening channels. Temporarily set the LOUDNESS controls (I & J) to about 2 and BASS and TREBLE controls (K & L) to center. Turn POWER control (M) to ON.

2. The tuner and tape recorder will not be used, so their power controls (O & 1) may be turned OFF.

3. At the record changer, unfasten the metal clamp securing the pickup arm and remove the small protective plate covering the stylus. Be sure the plastic extension is in place on the end of the selector arm, or you won't be able to play records automatically. Now move the speed change knob to the proper speed for the records to be played, set the size selector for proper record size, place up to eight records on the spindle.

Lower the clip so that it secures the records. Move the changer switch to ON and the player will automatically play each record in turn.

4. Use of the headset (U) is optional. If used, plug into EXT SPEAKER jacks at the rear of the console.

5. Now return to the audio control center and re-adjust the LOUDNESS BASS and TREBLE controls (I, J, K & L) to the positions which sound best to you.

## MONOPHONIC EXTERNAL SOURCE

1. Plug the external sound source (electronic organ, electric guitar, etc.) into the L LINE jack at the rear of the console.

2. At the audio control center, press IN the EXT and STEREO-SINGLE push-buttons (E & F), all other buttons OUT.

This connects the monophonic signal at the L LINE jack to both channels. Temporarily set the LOUDNESS controls (I & J) to about 2 and the BASS and TREBLE controls (K & L) to center. Turn POWER control (M) to ON.

3. The tuner, record changer and tape recorder will not be used, so their power controls (O, R & 1) may be turned OFF.

4. Use of the headset (U) is optional. If used, plug into EXT SPEAKER jacks at the rear of the console.

5. Now return to the audio control center and re-adjust the LOUDNESS, BASS and TREBLE controls (I, J, K & L) to the positions which sound best to you.

## STEREO EXTERNAL SOURCE

1. Plug the external stereo sound source into the L and R LINE jacks at the rear of the console.

2. At the audio control center, press IN the EXT pushbutton (E), all other buttons OUT. This connects the stereo external input to both listening channels. Temporarily set the LOUDNESS controls (I & J) to about 2 and the BASS and TREBLE controls (K & L) to center. Turn POWER control (M) to ON.

3. The tuner, record changer and tape recorder will not be used, so their power controls (O, R & 1) may be turned OFF.

4. Use of the headset (U) is optional.

If used, plug into EXT SPEAKER jacks at the rear of the console.

5. Now return to the audio control center and re-adjust the LOUDNESS, BASS and TREBLE controls (I, J, K & L) to the positions which sound best to you.

## PUBLIC ADDRESS SYSTEM

1. Plug a microphone into the L MIC jack at the rear of the console.

2. At the audio control center, press IN the TAPE and STEREO-SINGLE push-buttons (C & F), all other buttons out. Set the LOUDNESS controls (I & J) to about 5, the BASS control (K) at -5, and the TREBLE control (L) at +5. Turn POWER control (M) to ON.

3. The tuner and record changer will not be used, so their power controls (O & R) may be turned OFF.

4. At the tape recorder, switch the playback SELECTOR (1) to MONITOR, the left-channel RADIO/PHONO VOLUME control (5) to 10, and adjust the MICROPHONE VOLUME control (7) to the volume level you desire. This connects the sound signal from the microphone through a special preamplifier section of the tape recorder to the audio control center. There, the signal is again amplified, and the treble sounds may be accentuated for greatest clarity. For best results, keep the microphone away from the speakers as much as possible, or you may be troubled by regenerative feedback, which shows up as an uncontrollable whistling or booming. If feedback should occur, shut off the microphone and move it away from the speakers, or turn down the sound volume.



### PRESSING THE RECORD PUSHBUTTON (11)

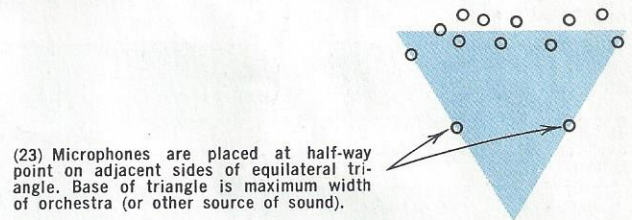
The RECORD button should be given particular note: it can only be fully depressed at the same time the PLAY OR RECORD control (12) is actuated. Recording can only take place when this button is fully in, as indicated by the lighting up of the recording level meter. To actuate, use two hands: press the RECORD pushbutton fully in with the left hand at the same time you turn the RECORD control to the right to start tape motion. Remember that when recording the erase head is activated, removing any previously recorded signals from the tape.

### PLACING THE MICROPHONES

For monophonic recording, merely place the microphone in front of the person or sound source to be recorded. Exact distance between microphone and person speaking can vary upwards from a minimum of a few inches; however, it must be close enough so that you can adjust the left-channel MICRO-

PHONE VOLUME control (7) to get a normal indication on the recording-level meter (the needle should fluctuate about a line in the center of the meter dial). You can increase the feeling of "presence" by placing the microphone closer to the person and reducing the recording level setting.

With stereo recording, the distance between the two microphones must be determined by the acoustics of the room and the preference of the person recording. A workable rule-of-thumb is the "EQUILATERAL" method of placing microphones. Form an equilateral triangle with sides equal to the maximum width of the source of sound. Place the microphones at the halfway point on the adjacent sides of the triangle.



(23) Microphones are placed at half-way point on adjacent sides of equilateral triangle. Base of triangle is maximum width of orchestra (or other source of sound).

### RECORDING MONOPHONIC TAPES FROM A MICROPHONE

1. Plug a microphone into the L MIC jack at the rear of the console. When using the microphone, be sure the switch is ON (with white dot showing).
2. At the audio control center, press IN the LISTENING-RECORDING button (G), all other buttons OUT. Temporarily set the LOUDNESS controls (I & J) to 10 and adjust the BASS and TREBLE controls (K & L) to center. These control settings connect the output of the tape recorder through the speaker channels so you can hear the recording. Turn POWER control (M) to ON.
3. The tuner and record changer will not be used, so their power controls (O & R) may be turned OFF.
4. Use of the headset (U) is recommended. Plug into EXT SPEAKER jacks at the rear of the console.
5. At the tape recorder, switch both SELECTOR controls (1 & 2) to SINGLE and turn the left channel RADIO/PHONO VOLUME control (5) to position 10. Then adjust the left channel MICROPHONE VOLUME control (7) for a normal indication on the recording level meter while you talk into the microphone in a normal tone of voice. This selects the left channel microphone input and adjusts its level for recording. Check the head shift lever (10)—it should be down—and set the tape speed level control (9) for the speed at which you wish to record. Now simultaneously press the RECORD pushbutton (11) as you turn the RECORD

- control (12), to start tape motion and begin recording. Adjust LISTENING VOLUME control (3) for the proper level of sound over the headset. The sound you are hearing is that which has been recorded and is being picked up by the playback head. To hear the sound coming into the recorder, turn playback SELECTOR (1) to MONITOR. By varying SELECTOR control (1) between MONITOR and SINGLE, you can compare the quality of the original signal and the recording.
6. Now return to the audio control center and re-adjust the LOUDNESS, BASS and TREBLE controls (I, J, K & L) to the positions which sound best to you. These controls have no effect on the signal being recorded—they affect only the sound which you hear from the speakers (or headphones).

### RECORDING STEREO FROM MICROPHONES

1. Plug microphones into L and R MIC jacks at the rear of the console. When using, be sure they are turned ON (white dot showing).
2. At the audio control center, press IN the LISTENING-RECORDING pushbutton (G), all other buttons OUT. Temporarily set the LOUDNESS controls (I & J) to 10 and adjust the BASS and TREBLE controls (K & L) to center. Turn POWER control (M) to ON.
3. The tuner and record changer will not be used, so their power controls (O & R) may be turned OFF.

4. Use of the headset (U) is recommended. Plug into EXT SPEAKER jacks at the rear of the console.

5. At the tape recorder, switch the playback SELECTOR (1) to STEREO, the recording SELECTOR (2) to STEREO L, and both RADIO/PHONO VOLUME controls (5 & 6) to 10. Adjust the left channel MICROPHONE VOLUME control (7) for a normal indication on the recording level meter while another person talks into the left channel microphone in a normal tone of voice. Now turn control (2) to STEREO R and adjust the right channel MICROPHONE VOLUME control (8) for normal on the meter, using the right channel microphone. Check the head shift lever (10)—it should be down—and set the tape speed lever control (9) for the proper recording speed. Now simultaneously press the RECORD pushbutton (11) as you turn the RECORD control (12), to start tape motion and begin recording. Adjust LISTENING VOLUME controls (3 & 4) for the proper level of sound over the headset. CAUTION: if you use the speakers to monitor instead of the headset, keep the sound volume turned down and don't get the microphones near a speaker.

6. Now return to the audio control center and re-adjust the LOUDNESS, BASS and TREBLE controls (I, J, K & L) to the positions which sound best to you. These controls have no effect on the signal being recorded—they affect only the sound which you hear from the speakers (or headphones).

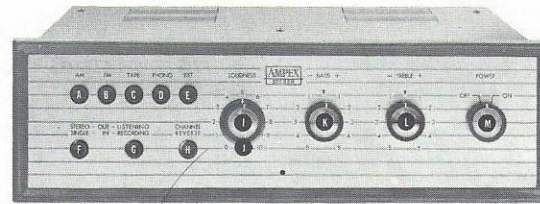


# BASIC CONTROL SETTINGS

- A Push in to select output of AM tuner for listening or recording
- B Push in to select output of FM tuner for listening or recording
- C Push in to select output of tape recorder for listening
- D Push in to select output of record changer for listening or recording
- E Push in to select external source connected into LINE jacks at rear of console for listening or recording
- F Selects either monophonic (in) or stereo (out) signal for listening or recording
- G In listening (out) position the input signal selected in A—E above is heard; in recording (in) position the signal as actually recorded on the tape is heard.
- H Reverses channels; push in to hear left channel signal thru right speaker and right channel signal thru left speaker
- I Adjusts listening volume through left speaker
- J Adjusts listening volume through right speaker
- K Increases or decreases bass response; normal when centered
- L Increases or decreases treble response; normal when centered
- M Master power on-off switch for all units in console
- N AM selectivity control—switch to sharp (maximum selectivity) for tuning; then switch to broad for maximum fidelity
- O Tuner on-off switch; selects regular (FM) or automatic (FM/AFC) FM tuning feature—
- P In AFC tuner locks on signal automatically and compensates for frequency drift.
- Q AM station selector
- R FM station selector

This chart summarizes all the operational instructions given on pages 12 to 23. Numbers and letters in color represent the numbered controls in the illustrations.

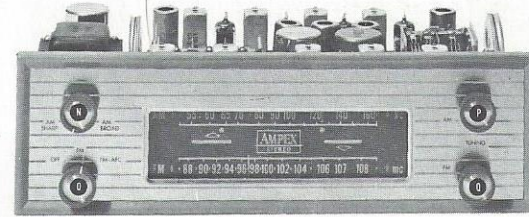
To perform the various operational functions shown here, set the controls as indicated on



PREAMPLIFIER/AUDIO CONTROL CENTER



CHANGER



FM/AM TUNER

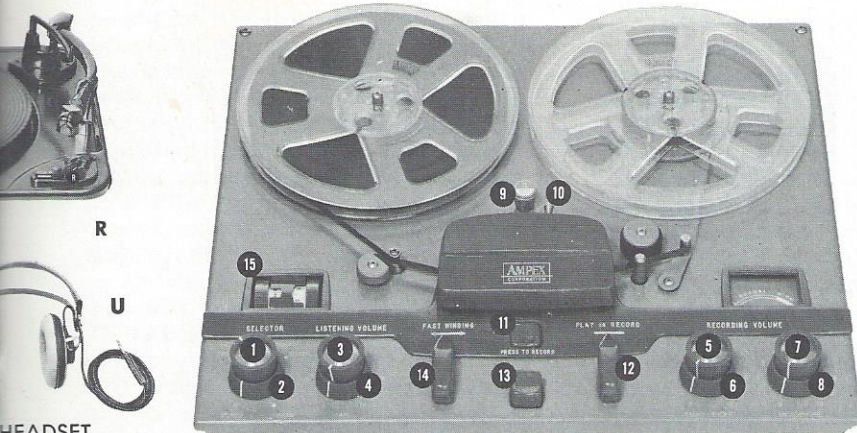


Left Right  
MICROPHONES

LISTENING FUNCTIONS	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	I
Monophonic Tape Playback	Out	Out	In	Out	Out	In	Out	Out	As Desired	As Desired	As Desired	As Desired	On		Off			Off			Optional	Single
Track Stereo Tape Playback	Out	Out	In	Out	Out	Out	Out	As Desired	As Desired	As Desired	As Desired	As Desired	On		Off			Off			Optional	Stereo
Track Stereo Tape Playback	Out	Out	In	Out	Out	Out	Out	As Desired	As Desired	As Desired	As Desired	As Desired	On		Off			Off			Optional	Stereo
Radio Broadcasts	In	Out	Out	Out	Out	In	Out	Out	As Desired	As Desired	As Desired	As Desired	On	Sharp & Broad	FM	Tune Station		Off			Optional	Off
Radio Broadcasts	Out	In	Out	Out	Out	In	Out	Out	As Desired	As Desired	As Desired	As Desired	On		FM or FM/AFC		Tune Station	Off			Optional	Off
AM & FM Stereo Broadcasts	In	In	Out	Out	Out	Out	Out	As Desired	As Desired	As Desired	As Desired	As Desired	On	Sharp & Broad	FM or FM/AFC	Tune Station	Tune Station	Off			Optional	Off
AM/TV Stereo Broadcasts	In	Out	Out	Out	In	Out	Out	As Desired	As Desired	As Desired	As Desired	As Desired	On	Sharp & Broad	FM	Tune Station		Off			Optional	Off
Monophonic phone records	Out	Out	Out	In	Out	In	Out		As Desired	As Desired	As Desired	As Desired	On		Off			On			Optional	Off
Stereo Phono Records	Out	Out	Out	In	Out	Out	Out	As Desired	As Desired	As Desired	As Desired	As Desired	On		Off			On			Optional	Off
Monophonic External Source	Out	Out	Out	Out	In	In	Out	Out	As Desired	As Desired	As Desired	As Desired	On		Off			Off			Optional	Off
Stereo External Source	Out	Out	Out	Out	In	Out	Out	Out	As Desired	As Desired	As Desired	As Desired	On		Off			Off			Optional	Off
Public Address System	Out	Out	In	Out	Out	In	Out	Out	5	5	—5	+5	On		Off			Off	On			Monitor
RECORDING FUNCTIONS	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	I
Monophonic, from Microphone	Out	Out	Out	Out	Out	Out	In		As Desired	As Desired	As Desired	As Desired	On		Off			Off	On		Recommended	Monitor or Single
Stereo, from Microphone	Out	Out	Out	Out	Out	Out	In		As Desired	As Desired	As Desired	As Desired	On		Off			Off	On	On	Recommended	Monitor or Stereo
Monophonic, from AM Radio	In	Out	Out	Out	Out	In	In	Out	As Desired	As Desired	As Desired	As Desired	On	Sharp & Broad	FM	Tune Station		Off	On		Optional	Monitor or Single
Monophonic, from FM Radio	Out	In	Out	Out	Out	In	In	Out	As Desired	As Desired	As Desired	As Desired	On		FM or FM/AFC		Tune Station	Off			Optional	Monitor or Single
Stereo, from AM & FM Radios	In	In	Out	Out	Out	Out	In	As Desired	As Desired	As Desired	As Desired	As Desired	On	Sharp & Broad	FM or FM/AFC	Tune Station	Tune Station	Off			Optional	Monitor or Stereo
AM/TV Stereo Broadcasts	In	Out	Out	Out	In	Out	In	As Desired	As Desired	As Desired	As Desired	As Desired	On	Sharp & Broad	FM	Tune Station		Off			Optional	Monitor or Stereo
Monophonic, from Phono	Out	Out	Out	In	Out	In	In	Out	As Desired	As Desired	As Desired	As Desired	On		Off			On			Optional	Monitor or Single
Stereo, from Phono	Out	Out	Out	In	Out	Out	In	As Desired	As Desired	As Desired	As Desired	As Desired	On		Off			On			Optional	Monitor or Stereo
Monophonic, from External Source	Out	Out	Out	Out	In	In	In	Out	As Desired	As Desired	As Desired	As Desired	On		Off			Off			Optional	Monitor or Single
Stereo, from External Source	Out	Out	Out	Out	In	Out	In	Out	As Desired	As Desired	As Desired	As Desired	On		Off			Off			Optional	Monitor or Stereo
Ident Monophonic Microphone to Phono, Radio or External Source on Left Channel	Press in button for sound source desired					In	In	Out	As Desired	As Desired	As Desired	As Desired	On		On If Used			On If Used	On	On	Recommended	Monitor or Single
Ident Stereo Microphones to Phono, Radio or External Source	Press in button for sound source desired					Out	In	Out	As Desired	As Desired	As Desired	As Desired	On		On If Used			On If Used	On	On	Recommended	Monitor or Stereo
ADVANCED TECHNIQUES	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	I
Language/Music Instruction	Out	Out	Out	Out	Out	Out	In		As Desired	As Desired			On		Off			Off		On	Recommended	Monitor or Stereo
A. Instructor records master track from microphone	Out	Out	Out	Out	In	In	In	In	As Desired	As Desired			On		Off			Off			Optional	Monitor or Stereo
A'. Instructor records master track direct from electronic organ, electric guitar, etc.	Out	Out	Out	Out	Out	Out	In		As Desired	As Desired			On		Off			Off	On		Recommended	Stereo
B. Student records added track from microphone	Out	Out	Out	Out	Out	Out	In		As Desired	As Desired	As Desired	As Desired	On		Off			Off	On		Optional	Stereo
C. Playback for student-instructor comparison	Out	Out	In	Out	Out	Out	Out		As Desired	As Desired	As Desired	As Desired	On		Off			Off	On		Optional	Stereo
Speech Testing Game	Out	Out	Out	Out	Out	Out	In		As Desired	As Desired	0	0	On		Off			Off	On		Required	Single
Phono-Chamber Effect	Out	Out	Out	Out	Out	Out	In		As Desired	As Desired	As Desired	As Desired	On		Off			Off	On		Don't Use	Single
Sound-on-Sound Recording	Out	Out	Out	Out	Out	Out	In		As Desired	As Desired			On		Off			Off		On	Recommended	Monitor or Stereo
A. Master track recorded from microphone	Out	Out	Out	Out	In	In	In	In	As Desired	As Desired			On		Off			Off			Optional	Monitor or Stereo
A'. Master track recorded direct from electronic organ, electric guitar, etc.	Out	Out	Out	Out	In	In	In	In	As Desired	As Desired			On		Off			Off			Optional	Monitor or Stereo
B. Setting the level of the master track.	Out	Out	Out	Out	In	In	In	Out	As Desired	As Desired			On		Off			Off			Optional	Stereo
C. Recording the second track.	Out	Out	Out	Out	In	In	In	Out	As Desired	As Desired			On		Off			Off	On		Recommended	Stereo
D. Playback	Out	Out	In	Out	Out	In	Out	Out	As Desired	As Desired	As Desired	As Desired	On		Off			Off			Optional	Single
Fade-In/Fade-Out Effect	Press in button for sound source desired					Out	In	Out					On		On If Used			On If Used	On			Single



the chart. Where a blank space appears, the corresponding control is off or inoperative, and no action is necessary to perform the desired function other than the settings actually shown. Controls marked "as desired" should be adjusted to the setting most pleasing to your ears.



TAPE RECORDER

- R Record changer on-off switch  
S Left microphone—on when white dot is showing  
T Right microphone—on when white dot is showing  
U Stereo headset—plugs into EXT SPEAKER jacks at rear of console

- 1 Switches recorder on, selects stereo or monophonic playback or monitor (inside knob)
- 2 Selects monophonic or stereo recording; selects whether right or left channel input is indicated by recording level meter (outside knob)
- 3 Adjusts listening volume for left channel (inside knob)
- 4 Adjusts listening volume for right channel (outside knob)
- 5 Adjusts recording level from left channel input (inside knob)
- 6 Adjusts recording level from right channel input (outside knob)
- 7 Adjusts recording level from left channel microphone (inside knob)
- 8 Adjusts recording level from right channel microphone (outside knob)
- 9 Tape speed selector
- 10 Head shift lever—down for 2-track, up for 4-track tapes
- 11 Recording pushbutton—safety interlocked with #12—both must be actuated simultaneously
- 12 Play-record knob—starts tape motion for playback or recording
- 13 Stop button—stops tape motion in playing, recording, or fast wind functions
- 14 Fast forward and rewind
- 15 Tape position indicator

HEADSET

2	3	4	5	6	7	8	9	10	11	12	NOTES
	As Desired						Up (7½) or Down (3¾)	Down	Out	→ Play	If tape is recorded on both sides, play second side by merely turning reel over without rewinding, placing it on left (supply) turntable, and playing through in normal fashion.
	As Desired	As Desired					Up (7½) or Down (3¾)	Down	Out	→ Play	To balance the two channels of the stereo system, vary controls 3 and 4 as required.
	As Desired	As Desired					Up (7½) or Down (3¾)	Up	Out	→ Play	To play 4-track tapes, the tape need not be rewound. Simply play first half, turn reel over, and play second half, just as in playing monophonic tapes.
											Check local station broadcast schedules for radio dial settings.
											Check local station broadcast schedules for radio dial settings.
											Check local station broadcast schedules for radio dial settings.
											Plug TV audio signal into R LINE input jack.
											Plug external source into L LINE jack at rear of console.
											Plug external source into L and R LINE jacks at rear of console.
			10		As Desired						Disregard meter reading, which will be beyond the "normal" zone. For most effective public address operation, keep microphones as far away from speakers as possible.
2	3	4	5	6	7	8	9	10	11	12	
Single	As Desired		10		Normal on Meter		Up (7½) or Down (3¾)	Down	In	→ Record	Use LEFT Microphone input. To hear input or recorded signal, switch #1 between MONITOR and SINGLE, respectively.
R & L	As Desired	As Desired	10	10	Normal on Meter (L)	Normal on Meter (R)	Up (7½) or Down (3¾)	Down	In	→ Record	Adjust #7 for normal meter reading when #2 is on L and adjust #8 when #2 is on R. To hear inputs or recorded signals, switch #1 between MONITOR and STEREO, respectively.
Single	As Desired		Normal on Meter		0	0	Up (7½) or Down (3¾)	Down	In	→ Record	Check local station broadcast schedules for radio dial settings. To hear input or recorded signal, switch #1 between MONITOR and SINGLE, respectively.
Single	As Desired		Normal on Meter		0	0	Up (7½) or Down (3¾)	Down	In	→ Record	Check local station broadcast schedules for radio dial settings. To hear input or recorded signal, switch #1 between MONITOR and SINGLE, respectively.
R & L	As Desired	As Desired	Normal on Meter (L)	Normal on Meter (R)	0	0	Up (7½) or Down (3¾)	Down	In	→ Record	Check local station broadcast schedules for radio dial settings. To hear inputs or recorded signals, switch #1 between MONITOR and STEREO, respectively.
R & L	As Desired	As Desired	Normal on Meter (L)	Normal on Meter (R)	0	0	Up (7½) or Down (3¾)	Down	In	→ Record	Plug TV audio signal into R LINE input jack. To hear inputs or recorded signals, switch #1 between MONITOR and STEREO, respectively.
Single	As Desired		Normal on Meter		0	0	Up (7½) or Down (3¾)	Down	In	→ Record	To hear input or recorded signal, switch #1 between MONITOR and SINGLE, respectively.
R & L	As Desired	As Desired	Normal on Meter (L)	Normal on Meter (R)	0	0	Up (7½) or Down (3¾)	Down	In	→ Record	To hear inputs or recorded signals, switch #1 between MONITOR and STEREO, respectively.
Single	As Desired		Normal on Meter		0	0	Up (7½) or Down (3¾)	Down	In	→ Record	External source may be radio, TV, phono or any source delivering 0.3 volts rms for program level. To hear input or recorded signal, switch #1 between MONITOR and SINGLE, respectively.
R & L	As Desired	As Desired	Normal on Meter (L)	Normal on Meter (R)	0	0	Up (7½) or Down (3¾)	Down	In	→ Record	Adjust #5 for normal meter reading when #2 is on L and adjust #6 when #2 is on R. To hear inputs or recorded signals, switch #1 between MONITOR and STEREO, respectively.
Single	As Desired		Normal on Meter		Normal on Meter		Up (7½) or Down (3¾)	Down	In	→ Record	Controls 5 and 7 regulate mix of sound. Keep #3 turned low to avoid external mix, unless using headphones—then #3 may be turned as high as desired. To hear input or recorded signals, switch #1 between MONITOR and SINGLE.
R & L	As Desired	As Desired	Normal on Meter (L)	Normal on Meter (R)	Normal on Meter (L)	Normal on Meter (R)	Up (7½) or Down (3¾)	Down	In	→ Record	Controls 5-6 and 7-8 regulate mix of sound. Keep #3 turned low to avoid external mix, unless using headphones—then #3 may be turned as high as desired. To hear inputs or recorded signals, switch #1 between MONITOR and STEREO.
2	3	4	5	6	7	8	9	10	11	12	
R	As Desired	As Desired		10		Normal on Meter	Up (7½) or Down (3¾)	Down	In	→ Record	Set tape position indicator at 0-0. Instructor uses RIGHT Microphone jack. To hear input or recorded signal, switch #1 between MONITOR and SINGLE, respectively. Rewind to 0-0 tape position and proceed to step B.
R	As Desired	As Desired		Normal on Meter	0	0	Up (7½) or Down (3¾)	Down	In	→ Record	Plug external input into R LINE input jack. To hear input or recorded signal, switch #1 between MONITOR and SINGLE, respectively.
Single	0	As Desired	0	0	Normal on Meter	0	Up (7½) or Down (3¾)	Down	In	→ Record	Student uses LEFT Microphone jack while listening to instructor with headphones (recommended) or amplifier/speaker.
	As Desired	As Desired	0	0	0	0	Up (7½) or Down (3¾)	Down	Out	→ Play	Rewind to 0-0 tape position. Vary controls 3 & 4 to balance level of student and instructor tracks.
Single	5-6	0	0	0	Normal on Meter	0	Up (7½)	Down	In	→ Record	Contestant wears headphones and recites into microphone. Volume level in headphones must be high.
Single	As Desired	0	10	0	Normal on Meter	0	Up (7½) or Down (3¾)	Down	In	→ Record	For "repeat" effect press #9 down. For "cathedral" effect pull #9 up. Echo-chamber effect can also be done in stereo.
R	As Desired			10		Normal on Meter	Up (7½) or Down (3¾)	Down	In	→ Record	Plug microphone into R Microphone jack. Next, connect RIGHT output of tape recorder to L LINE jack at rear of console. To hear input or recorded signal, switch #1 between MONITOR & SINGLE, respectively. Proceed to step B.
R	As Desired			Normal on Meter	0	0	Up (7½) or Down (3¾)	Down	In	→ Record	Plug external input into R LINE input jack and record. Then connect special circuit as in note above. Proceed to step B. To hear input or recorded signal, switch #1 between MONITOR and SINGLE, respectively.
Single	0	8	Normal on Meter	0	0	0	Up (7½) or Down (3¾)	Down	Out	→ Play	Rewind and play back master track for normal setting on meter. Cut volume at speaker (if used) to barely perceptible level. Rewind to 0-0 and proceed to step C.
Single	0	8	Normal on Meter	0	Normal on Meter	0	Up (7½) or Down (3¾)	Down	In	→ Record	Plug microphone into LEFT MIC input jack. Mix of tracks is regulated by #5 and #7. Use of headphones is recommended.
	As Desired		0	0	0	0	Up (7½) or Down (3¾)	Down	Out	→ Play	For multiple sound-on-sound (trios, quartets, etc.) don't rewind after step C; turn reel over and re-record in reverse with settings as in step B. Then turn reel over again and repeat steps B, C and D.
Single	0	0	Normal on Meter	0	Normal on Meter	0	Up (7½) or Down (3¾)	Down	In	→ Record	To fade voice in, turn #5 counterclockwise as you turn #7 clockwise. To fade voice out, reverse the process.



## RECORDING MONOPHONIC TAPES FROM AM RADIO

1. At the audio control center, press IN the AM, STEREO-SINGLE and LISTENING-RECORDING buttons (A, F & G), all other buttons OUT. This selects the AM output of the tuner for monophonic recording. Temporarily turn the LOUDNESS controls (I & J) to about 2, the BASS and TREBLE controls (K & L) to center. Switch POWER control (M) to ON.
2. At the tuner, turn control (N) to AM SHARP, control (O) to FM, and adjust TUNING control (P) to tune in the desired station. When you have the station, switch control (N) to AM BROAD for best fidelity.
3. The record changer will not be used, so its power control (R) may be turned OFF.
4. Use of the headset (U) is optional. If used, plug into EXT SPEAKER jacks at the rear of the console.
5. At the tape recorder, switch both SELECTOR controls (1 & 2) to SINGLE, both MICROPHONE VOLUME controls (7 & 8) at zero, and adjust the left channel RADIO/PHONO VOLUME control (5) for normal on the recording meter. Check that the head shift lever (10) is down and set the tape speed selector (9) for the speed desired. Now simultaneously press the RECORD pushbutton (11) as you turn the RECORD control (12), to start tape motion and begin recording. Adjust LISTENING VOLUME control (3) for the proper level of sound over speaker or headset. To hear the sound coming from the AM tuner, turn playback SELECTOR (1) to MONITOR. By varying SELECTOR control (1) between MONITOR and SINGLE, you can compare the quality of the original sound and that of the recording.
6. Now return to the audio control center and re-adjust the LOUDNESS, BASS and TREBLE controls (I, J, K & L) to the positions which sound best to you. These controls have no effect on the signal being recorded—they affect only the sound which you hear from the speakers (or headphones).

## RECORDING MONOPHONIC TAPES FROM FM RADIO

1. At the audio control center, press IN the FM, STEREO-SINGLE and RECORDING-LISTENING buttons (B, F & G), all other buttons OUT. Temporarily set the LOUDNESS controls (I & J) at about 2 and BASS and TREBLE controls (K & L) at center. Turn the POWER control (M) to ON.
2. At the tuner, switch control (O) to FM-AFC and adjust FM TUNING control (Q) to tune in the desired station.
3. The record changer will not be used,

so its power control (R) may be turned OFF.

4. Use of the headset (U) is optional. If used, plug into EXT SPEAKER jacks at the rear of the console.
5. At the tape recorder, switch both SELECTOR controls (1 & 2) to SINGLE, set both MICROPHONE VOLUME controls (7 & 8) at zero, and adjust the left channel RADIO/PHONO VOLUME control (5) for normal on the recording meter. Check that the head shift lever (10) is down and set the tape speed selector (9) for the speed desired. Now simultaneously press the RECORD pushbutton (11) as you turn the RECORD control (12), to start tape motion and begin recording. Adjust left-channel LISTENING VOLUME control (3) for the proper level of sound over speaker or headset. To hear the sound coming from the AM tuner, turn playback SELECTOR (1) to MONITOR. By varying SELECTOR control (1) between MONITOR and SINGLE, you can compare the quality of the original sound and that of the recording. Volume levels must be equal for proper comparison.
6. Now return to the audio control center and re-adjust the LOUDNESS, BASS and TREBLE controls (I, J, K & L) to the positions which sound best to you. These controls have no effect on the signal being recorded—they affect only the sound which you hear from the speakers (or headphones).

## RECORDING STEREO TAPES FROM AM AND FM RADIO

1. At the audio control center, press IN the AM, FM and LISTENING-RECORDING pushbuttons (A, B & G), all other buttons OUT. Temporarily set LOUDNESS controls (I & J) to about 2, BASS and TREBLE controls (K & L) to center, and turn the POWER control (M) to ON.
2. At the tuner, switch control (N) to AM SHARP, (O) to FM-AFC and adjust AM and FM TUNING controls (P & Q) to the AM and FM stations broadcasting simultaneous stereo programs.
3. The record changer will not be used, so its power control (R) may be turned OFF.
4. Use of the headset (U) is optional. If used, plug into EXT SPEAKER jacks at the rear of the console.
5. At the tape recorder, switch the playback SELECTOR (1) to STEREO, and the recording SELECTOR (2) to STEREO L. Set both MICROPHONE VOLUME controls (7 & 8) to zero and adjust the left channel RADIO/PHONO VOLUME control (5) for normal indication on the recording meter. Switch the recording SELECTOR (2) to STEREO R and adjust the right channel RADIO/PHONO control (8) for normal on the recording

meter. Check that the head shift lever (10) is down and set the tape speed selector (9) for the proper recording speed. Now simultaneously press the RECORD pushbutton (11) as you turn the RECORD control (12), to start tape motion and begin recording. Adjust LISTENING VOLUME controls (3 & 4) for the proper level of sound over speaker or headset. To hear the original stereo, turn playback selector (1) to MONITOR. By varying SELECTOR control (1) between MONITOR and STEREO, you can compare the quality of the original and that of the recording.

6. Now return to the audio control center and make any corrections to the settings of the LOUDNESS, BASS and TREBLE controls (I, J, K & L) you may wish. These controls have no effect on the signal being recorded—they affect only the sound which you hear from the speakers (or headphones). You may also adjust CHANNEL REVERSE button (H) for proper orientation of the stereo channels—with (H) OUT, the FM signal will be heard and recorded on the left channel and the AM signal will be on the right; with (H) IN, the two will be reversed.

## RECORDING STEREO TAPES FROM AM/TV OR FM/TV STEREO BROADCASTS

1. Connect the audio output of the television set into the R LINE jack at the rear of the console.
2. At the audio control center, press IN the AM, EXT and LISTENING-RECORDING pushbuttons (A, E & G), all other buttons OUT. This connects the signal from the AM tuner to the left channel and the signal from the TV to the right. (For FM/TV, press IN the FM, EXT and LISTENING-RECORDING pushbuttons (B, E & G), all other buttons OUT.) Temporarily set LOUDNESS controls (I & J) to about 2, BASS and TREBLE controls (K & L) to center. Turn POWER control (M) to ON.
3. At the tuner, turn control (N) to AM SHARP, control (O) to FM, and adjust TUNING control (P) to tune in the desired station. When you have the station, switch control (N) to AM BROAD for best fidelity. (For FM/TV, turn control (O) at the tuner to FM-AFC and adjust TUNING control (Q) to tune in the desired station.)
4. The record changer will not be used, so its power control (R) may be turned OFF.
5. Use of the headset (U) is optional. If used, plug into EXT SPEAKER jacks at the rear of the console.
6. At the tape recorder, switch the playback SELECTOR (1) to STEREO, and the recording SELECTOR (2) to STEREO



L. Set both MICROPHONE VOLUME controls (7 & 8) to zero and adjust the left channel RADIO/PHONO VOLUME control (5) for normal indication on the recording meter. Switch the recording SELECTOR (2) to STEREO R and adjust the right channel RADIO/PHONO volume control (8) for normal on the recording meter. Check that the head shift lever (10) is down and set the tape speed selector (9) for the proper recording speed. Now simultaneously press the RECORD pushbutton (11) as you turn the RECORD control (12), to start tape motion and begin recording. Adjust LISTENING VOLUME controls (3 & 4) for the proper level of sound over speaker or headset. To hear the original stereo, turn playback SELECTOR (1) to MONITOR. By varying SELECTOR control (1) between MONITOR and STEREO, you can compare the quality of the original against that of the recording.

7. Now return to the audio control center and re-adjust the LOUDNESS, BASS and TREBLE controls (I, J, K & L) to the positions which sound best to you. These controls have no effect on the signal being recorded—they affect only the sound which you hear from the speakers (or headphones).

#### RECORDING MONOPHONIC TAPES FROM RECORDED DISCS

1. At the audio control center, press IN the PHONO, STEREO-SINGLE and LISTENING-RECORDING pushbuttons, all other buttons OUT. Temporarily set LOUDNESS controls (I & J) to about 2, BASS and TREBLE controls (K & L) to center. Switch POWER control (M) to ON.
2. The tuner will not be used, so its power control (O) may be turned OFF.
3. At the record changer, unfasten the metal clamp securing the pickup arm and remove the small protective plate covering the stylus. Be sure the plastic extension is in place on the end of the selector arm, or you won't be able to play records automatically. Now move the speed change knob to the proper speed for the records to be played, set the size selector for proper record size, place up to eight records on the spindle. Lower the clip so that it secures the records. Move the changer switch to ON and the player will automatically play each record in turn. **NOTE: Before you play 45 or 78 rpm records, be sure to read the special instructions for this type of operation on page 9.**
4. Use of the headset (U) is optional. If used, plug into EXT SPEAKER jacks at the rear of the console.
5. At the tape recorder, switch both SELECTOR controls (1 & 2) to SINGLE, set both MICROPHONE VOLUME con-

trols (7 & 8) at zero, and adjust the left channel RADIO/PHONO VOLUME control (5) for normal on the recording meter. Check that the head shift lever (10) is down and set the tape speed selector (9) for the speed desired. Now simultaneously press the RECORD pushbutton (11) as you turn the RECORD control (12), to start tape motion and begin recording. Adjust LISTENING VOLUME control (3) for the proper level of sound over speaker or headset. To hear the sound coming from the record changer, turn playback SELECTOR (1) to MONITOR. By varying SELECTOR control (1) between MONITOR and SINGLE, you can compare the quality of the original sound and that of the recording.

6. Now return to the audio control center and re-adjust the LOUDNESS, BASS and TREBLE controls (I, J, K & L) to the positions which sound best to you. These controls have no effect on the signal being recorded—they affect only the sound which you hear from the speakers (or headphones).

#### RECORDING STEREO TAPES FROM STEREO DISCS

1. At the audio control center, press IN the PHONO and LISTENING-RECORDING pushbuttons (D & G), all other buttons OUT. Temporarily set the LOUDNESS controls (I & J) to about 2, and BASS and TREBLE controls (K & L) to center. Turn POWER control (M) to ON.
2. The tuner will not be used, so its power control (O) may be turned OFF.
3. At the record changer, unfasten the metal clamp securing the pickup arm and remove the small protective plate covering the stylus. Be sure the plastic extension is in place on the end of the selector arm, or you won't be able to play records automatically. Now move the speed change knob to the proper speed for the records to be played, set the size selector for proper record size, place up to eight records on the spindle. Lower the clip so that it secures the records. Move the changer switch to ON and the player will automatically play each record in turn.
4. Use of the headset (U) is optional. If used, plug into EXT SPEAKER jacks at the rear of the console.
5. At the tape recorder, switch both SELECTOR controls (1 & 2) to STEREO, set both MICROPHONE VOLUME controls (7 & 8) at zero, and adjust the left and right channel RADIO/PHONO VOLUME controls (5 & 6) for normal on the recording meter. Check that the head shift lever (10) is down and set the tape speed selector (9) for the speed desired. Now simultaneously press the RECORD pushbutton (11) as you turn the RECORD control (12), to start tape

motion and begin recording. Adjust LISTENING VOLUME control (3) for the proper level of sound over speaker or headset. To hear the sound coming from the record changer, turn playback SELECTOR (1) to MONITOR. By varying SELECTOR control (1) between MONITOR and STEREO, you can compare the quality of the original sound and that of the recording.

6. Now return to the audio control center and re-adjust the LOUDNESS, BASS and TREBLE controls (I, J, K & L) to the positions which sound best to you. These controls have no effect on the signal being recorded—they affect only the sound which you hear from the speakers (or headphones). To reverse channels, press IN the CHANNEL REVERSE pushbutton (H).

#### RECORDING MONOPHONIC TAPES FROM EXTERNAL SOURCE

1. Connect the external monophonic signal to the L LINE jack at the rear of the console.
2. At the audio control center, press IN the EXT, STEREO-SINGLE and LISTENING-RECORDING pushbuttons (E, F & G), all other buttons OUT. Temporarily set the LOUDNESS controls (I & J) to about 5, the BASS and TREBLE controls (K & L) to center. Turn the POWER control (M) to ON.
3. The tuner and record changer won't be used, so their power controls (O & R) may be switched OFF.
4. Use of the headset (U) is optional. If used, plug into EXT SPEAKER jacks at the rear of the console.
5. At the tape recorder, switch both SELECTOR controls (1 & 2) to SINGLE, set both MICROPHONE VOLUME controls (7 & 8) at zero, and adjust the left channel RADIO/PHONO VOLUME control (5) for normal on the recording meter. Check that the head shift lever (10) is down and set the tape speed selector (9) for the speed desired. Now simultaneously press the RECORD pushbutton (11) as you turn the RECORD control (12), to start tape motion and begin recording. Adjust left-channel LISTENING VOLUME control (3) for the proper level of sound over speaker or headset. To hear the original sound, turn playback SELECTOR (1) to MONITOR. By varying SELECTOR control (1) between MONITOR and SINGLE, you can compare the quality of the original sound and that of the recording.
6. Now return to the audio control center and re-adjust the LOUDNESS, BASS and TREBLE controls (I, J, K & L) to the positions which sound best to you. These controls have no effect on the signal being recorded—they affect only the sound which you hear from the speakers (or headphones).



## RECORDING STEREO TAPES FROM EXTERNAL SOURCE

1. Connect the external stereo signal to the L and R LINE jacks at the rear of the console.
2. At the audio control center, press IN the EXT and LISTENING-RECORDING pushbuttons (E & G), all other buttons OUT. Temporarily set LOUDNESS controls (I & J) to about 5, and BASS and TREBLE controls (K & L) to center. Turn POWER control (M) to ON.
3. The tuner and record changer won't be used, so their power controls (O & R) may be switched OFF.
4. Use of the headset (U) is optional. If used, plug into EXT SPEAKER jacks at the rear of the console.
5. At the tape recorder, switch both SELECTOR controls (1 & 2) to SINGLE, set both MICROPHONE VOLUME controls (7 & 8) at zero, and adjust the left channel RADIO/PHONO VOLUME control (5) for normal on the recording meter. Check that the head shift lever (10) is down and set the tape speed selector (9) for the speed desired. Now simultaneously press the RECORD pushbutton (11) as you turn the RECORD control 12, to start tape motion and begin recording. Adjust LISTENING VOLUME control (3) for the proper level of sound over speaker or headset. To hear the sound coming from the external source, turn playback SELECTOR (1) to MONITOR. By varying SELECTOR control (1) between MONITOR and SINGLE, you can compare the quality of the original sound and that of the recording.
6. Now return to the audio control center and re-adjust the LOUDNESS, BASS and TREBLE controls (I, J, K & L) to the positions which sound best to you. These controls have no effect on the signal being recorded—they affect only the sound which you hear from the speakers (or headphones).

## ADD MONOPHONIC MICROPHONE TO RADIO, PHONO OR EXTERNAL SOURCE ON LEFT CHANNEL

1. If an external sound source is to be used, plug it into the L LINE jack at the rear of the console.
2. At the audio control center, press IN the button (A, B, D or E) which is to supply the sound source, and also press IN the STEREO-SINGLE and LISTENING-

RECORDING pushbuttons (F & G), all other buttons OUT. Temporarily set the LOUDNESS controls (I & J) to about 5, and BASS and TREBLE controls (K & L) to center. Turn the POWER control (M) to ON.

3. If either the tuner or record changer is to be used, turn its power control ON and adjust it as described above.

4. Plug a microphone into the L MIC jack at the rear of the console. When recording, be sure the microphone switch is ON (white dot showing).

5. Use of the headset (U) is recommended. Plug into EXT SPEAKER jacks at the rear of the console.

6. At the tape recorder, switch both SELECTOR controls (1 & 2) to SINGLE and turn all the other controls to zero. Adjust the left channel MICROPHONE VOLUME control (7) for a normal indication on the recording level meter as you speak into the microphone, and then switch the microphone OFF. Now set the left channel RADIO/PHONO VOLUME control (5) for normal on the meter. Set the tape speed lever (9) for the proper recording speed and check that the head shift lever (10) is down. Turn the microphone ON again, and simultaneously press the RECORD pushbutton (11) as you turn the RECORD control (12) to start tape motion and begin recording. Adjust LISTENING VOLUME control (3) for the proper level of sound over the headset. CAUTION: if you use the speakers to monitor instead of the headset, keep the sound volume turned down and don't get the microphone near the speaker or you may get feedback. To hear the original input from the selected source, turn playback SELECTOR (1) to MONITOR.

7. Now return to the audio control center and re-adjust the LOUDNESS, BASS and TREBLE controls (I, J, K & L) to the positions which sound best to you. These controls have no effect on the signal being recorded—they affect only the sound which you hear from the speakers (or headphones).

## ADD STEREO MICROPHONES TO RADIO, PHONO OR EXTERNAL SOURCE

1. If an external stereo source is to be used, plug it into the R and L LINE jacks at the rear of the console.
2. At the audio control center, press IN the pushbutton (A, B, D or E) which

represents the sound source, and also press IN the LISTENING-RECORDING button, all other buttons OUT. Temporarily set the LOUDNESS controls (I & J) to about 2, the BASS and TREBLE controls (K & L) to center. Turn POWER control (M) to ON.

3. If either the tuner or record changer is to be used, turn its power control ON and adjust it as described above.

4. Plug microphones into the L and R MIC jacks at the rear of the console. When recording, be sure the microphone switches are ON (white dot showing).

5. Use of the headset (U) is recommended. Plug into EXT SPEAKER jacks at the rear of the console.

6. At the tape recorder, switch playback SELECTOR (1) to STEREO and recording SELECTOR (2) to STEREO L and turn all other controls down to zero. Adjust the left channel MICROPHONE VOLUME control (7) for a normal indication on the recording level meter as you speak into the left channel microphone, then switch the microphone OFF and adjust the left channel RADIO/PHONO VOLUME control (5) for normal on the meter. Now turn the recording SELECTOR (2) to STEREO R and adjust the right channel MICROPHONE VOLUME control (8) for normal on the meter as you speak into the right channel microphone. Switch off the microphone and adjust the right channel RADIO/PHONO VOLUME control (6) for normal on the meter. Switch both microphones ON. Set the tape speed lever (9) for the proper recording speed and check that the head shift lever (10) is down. Simultaneously press the RECORD pushbutton (11) as you turn the RECORD control (12) to start tape motion and begin recording. Adjust LISTENING VOLUME controls (3 & 4) for the proper level of sound over the headset. CAUTION: if you use speakers to monitor instead of a headset, keep the sound volume turned down and don't get the microphone near the speaker or you may get feedback. To hear the original input from the selected source, turn playback SELECTOR (1) to MONITOR.

7. Now return to the audio control center and re-adjust the LOUDNESS, BASS and TREBLE controls (I, J, K & L) to the positions which sound best to you. These controls have no effect on the signal being recorded—they affect only the sound which you hear from the speakers (or headphones).



## ADVANCED TECHNIQUES

After you've been through the recording and reproduction operations outlined previously, you'll probably feel ready for more advanced fields. This section is to suggest a few more detailed operations and

to show you step-by-step how they're done. When you've mastered them, you'll have an excellent basic understanding of the functioning of your stereo console.

### LANGUAGE/MUSIC INSTRUCTION

This instructional technique will allow you to compare your lingual or musical performances with those of an instructor, or to compare your proficiency with that recorded at previous lessons.

**Step A:** instructor records master track from microphone.

1. At the audio control center, press IN the LISTENING-RECORDING pushbutton (G), all other buttons OUT. Temporarily set the LOUDNESS controls (I & J) to 10 and adjust the BASS and TREBLE controls (K & L) to center. Turn POWER control (M) to ON.

2. The tuner and record changer won't be used, so their power controls (O & R) may be switched OFF.

3. Plug a microphone into the R MIC jack at the rear of the console.

4. Use of the headset (U) is recommended. Plug into EXT SPEAKER jacks at the rear of the console.

5. At the tape recorder, set the tape position indicator at 0-0, switch the playback SELECTOR (1) to STEREO and the recording SELECTOR to STEREO R. Turn the right-channel RADIO/PHONO VOLUME control (6) to 10 and adjust the right-channel MICROPHONE VOLUME control (8) for normal on the meter while speaking into the microphone.

Set the tape speed lever (9) for the proper recording speed and check that the head shift lever (10) is down. Now simultaneously press the RECORD pushbutton (11) as you turn the RECORD control (12) to start tape motion and begin recording. Adjust the right-channel LISTENING VOLUME control (4) for the proper level of sound over the headset. CAUTION: If you use the speakers to monitor instead of the headset, keep the sound volume turned down and don't get the microphones near a speaker, or you may get feedback. To hear the input sound from the microphone,

turn playback SELECTOR (1) to MONITOR. By varying SELECTOR control (1) between MONITOR and STEREO, you can compare the quality of the original and that of the recording.

6. Now return to the audio control center and re-adjust the LOUDNESS controls (I & J) to the level which sounds best to you. When you have finished, you will have recorded the microphone input onto the **right** channel of the tape, leaving the left channel for use in step 2. Rewind tape to 0-0 position on tape position indicator.

**Alternate step A:** instructor records master track from external input such as electronic organ, electric guitar, etc.

1. Plug the external input into the R LINE jack at the rear of the console.

2. At the audio control center, press IN the EXT, STEREO-SINGLE, LISTENING-RECORDING and CHANNEL REVERSE pushbuttons (E, F, G & H), all other buttons OUT. Temporarily set the LOUDNESS controls (I & J) to 10 and the BASS and TREBLE control (K & L) to center. Turn the POWER control (M) to ON.

3. The tuner and record changer won't be used, so their power controls (O & R) may be switched OFF.

4. At the tape recorder, switch the playback SELECTOR (1) to STEREO and the recording SELECTOR to STEREO R. Adjust the right-channel RADIO/PHONO VOLUME control (6) for normal on the meter while the recorder is receiving a signal from the external source. Turn the MICROPHONE VOLUME controls (7 & 8) to zero, set the tape speed lever (9) for the proper recording speed and check that the head shift lever (10) is down. Now simultaneously press the RECORD pushbutton (11) as you turn the RECORD control (12) to start tape motion and begin recording. Adjust the right-channel LISTENING VOLUME control (4) for the proper level of sound over the headset or speakers. To hear the input sound, turn playback SELECTOR control (1) between MONITOR and

STEREO, you can compare the quality of the original and that of the recording.

5. Now return to the audio control center and re-adjust the LOUDNESS controls (I & J) to the level which sounds best to you. After recording rewind the tape to 0-0 on the tape position indicator.

**Step B:** student records lesson track from microphone onto left channel.

1. At the audio control center, press IN the LISTENING-RECORDING pushbutton (G), all other buttons OUT. Temporarily set the LOUDNESS controls (I & J) to 10 and adjust the BASS and TREBLE controls (K & L) to center. Turn POWER control (M) to ON.

2. The tuner and record changer won't be used, so their power controls (O & R) may be switched OFF.

3. Plug a microphone into the L LINE jack at the rear of the console.

4. Use of the headset (U) is recommended. Plug into EXT SPEAKER jacks at the rear of the console.

5. At the tape recorder, switch the playback SELECTOR (1) to STEREO and the recording SELECTOR (2) to SINGLE. Turn the RADIO/PHONO VOLUME controls (5 & 6) to zero and adjust the left-channel MICROPHONE VOLUME control (7) for normal indication on the meter while talking into the microphone. Set the tape speed lever (9) for the proper recording speed. Now simultaneously press the RECORD pushbutton (11) as you turn the RECORD control (12) to start tape motion and begin recording. Adjust the right-channel LISTENING VOLUME control (4) for the proper level of sound over the headset.

6. Now return to the audio control center and re-adjust the LOUDNESS controls (I & J) to the level which sounds best to you. When you have finished, you will have recorded the second, or "lesson" track onto the **left** channel of the tape, with the original track still on the right. Rewind tape to 0-0 on the tape position indicator.



**Step C:** playback of both tracks for comparison.

1. At the audio control center, press IN the TAPE pushbutton (C), all other buttons OUT. Temporarily set LOUDNESS controls (I & J) to 10 and BASS and TREBLE controls (K & L) to center. Switch POWER control (M) to ON.

2. The tuner and record changer won't be used, so their power controls (O & R) may be switched OFF.

3. Use of the headset (U) is optional. If used, plug into EXT SPEAKER jacks at the rear of the console.

4. At the tape recorder, switch the playback SELECTOR (1) to STEREO and adjust all the RECORDING VOLUME controls (5, 6, 7 & 8) to zero. Set the tape speed control (9) for the speed at which you recorded the tape. Turn the PLAY control (12) to the right and adjust the LISTENING VOLUME controls (3 & 4) for the proper level of sound over headset or speakers.

5. Now return to the audio control center and re-adjust the LOUDNESS, BASS and TREBLE controls (I, J, K & L) to the positions which sound best to you. You will hear the first-recorded or "master" track over the right channel, at the same time you hear the second, or "lesson" track over the left. To reverse the two tracks, press IN the CHANNEL REVERSE button (H).

## SPEECH TESTING GAME

Here's one that's loads of fun. Just set up the controls as indicated below, have someone put on the headset and recite "Mary had a little lamb," into the microphone. You'll be surprised at the result.

1. At the audio control center, press IN the LISTENING-RECORDING pushbutton (G), all other buttons OUT. Temporarily set the LOUDNESS controls (I & J) to 10, and adjust the BASS and TREBLE controls (K & L) to center. Turn POWER control (M) to ON.

2. The tuner and record changer won't be used, so their power controls (O & R) may be switched OFF.

3. Plug a microphone into the L MIC jack at the rear of the console.

4. Use of the headset is necessary for this function. Plug into EXT SPEAKER jacks at the rear of the console.

5. At the tape recorder, set SELECTOR controls (3 & 4) at SINGLE and all other controls to zero. Now adjust the left-channel MICROPHONE VOLUME control (7) for normal on the meter while you speak into the microphone. Set the tape speed control (9) at the UP (7½ ips) position and check that the head shift

lever (10) is down. Simultaneously press IN the RECORD pushbutton (11), as you turn the RECORD control (12) to start tape motion and begin recording. Now set the left-channel LISTENING VOLUME control (3) to a setting (probably around 5 or 6) at which the sound level in the headset is high.

Hand the headset and microphone to some unsuspecting soul and watch the fun!

Here's what happens. You've adjusted the recorder so that the words spoken into the microphone are recorded and then played back into the headset. But it takes a little time for the tape to get from the recording head to the playback head (1/6 of a second), so the victim hears himself speaking, but not until 1/6 of a second after he has uttered the words.

## ECHO CHAMBER EFFECT

This is an interesting effect you can achieve either in monophonic or stereo recording. Don't record while using the headset.

One word of caution—it can get out of hand. If you are recording and you start to get a rumbling or a ringing that is steadily intensified, either move the microphone(s) away from the speaker, turn the microphone(s) off, or stop the recorder.

1. At the audio control center, press IN the LISTENING-RECORDING pushbutton (G), all other buttons OUT. Temporarily set the LOUDNESS controls (I & J) to 10 and adjust the BASS and TREBLE controls (K & L) to center. Turn POWER control (M) to ON.

2. The tuner and record changer won't be used, so their power controls (O & R) may be switched OFF.

3. Plug a microphone into the L MIC jack at the rear of the console.

4. To achieve the echo chamber effect, it's necessary that the speakers be used. Therefore, the headset cannot be employed for this function.

5. At the tape recorder, switch SELECTOR controls (1 & 2) to SINGLE and turn all other controls down to zero. Now adjust the left-channel MICROPHONE VOLUME control (7) for normal on the meter while speaking into the microphone. Turn the left-channel RADIO/PHONO VOLUME control (5) to 10 and set the tape speed control (9) for the desired tape speed. Check that the head shift lever (10) is down. Now simultaneously press IN the RECORD pushbutton (11) as you turn the RECORD control (12) to start tape motion and begin recording. Adjust the left-channel

LISTENING VOLUME control (3) to the point where you can hear sounds spoken into the microphone. CAUTION: don't turn up the sound volume too high, or you'll begin getting feedback. Try changing tape speed and notice the effect. The sounds you are recording are played back out of the speaker after a slight time delay (just as in the speech testing game) and then are re-recorded to produce the echo chamber effect.

## STEREO ECHO CHAMBER EFFECT

This technique is exactly the same as for monophonic echo chamber effect except that two microphones are used. For each control setting described above, set both left and right channel controls to the same point.

## SOUND-ON-SOUND RECORDING

Utilizing this recording technique, you can sing a duet with yourself, or even accompany a quartet of your own voice on one or several musical instruments. Sound impossible? Here's how:

**Step A:** recording the master track from the microphone.

1. At the audio control center, press IN the LISTENING-RECORDING pushbutton (G), all other buttons OUT. Temporarily set the LOUDNESS controls (I & J) to 10 and adjust the BASS and TREBLE controls (K & L) to center. Turn POWER control (M) to ON.

2. The tuner and record changer won't be used, so their power controls (O & R) may be switched OFF.

3. Plug a microphone into the R MIC jack at the rear of the console.

4. Use of the headset (U) is recommended. Plug into EXT SPEAKER jacks at the rear of the console.

5. At the tape recorder, set the tape position indicator at 0-0, switch the playback SELECTOR (1) to STEREO and the recording SELECTOR to STEREO R. Turn the right-channel RADIO/PHONO VOLUME control (8) for normal on the meter while speaking into the microphone. Set the tape speed lever (9) for the proper recording speed and check that the head shift lever (10) is down. Now simultaneously press IN the RECORD pushbutton (11) as you turn the RECORD control (12) to start tape motion and begin recording. Adjust the right-channel LISTENING VOLUME control (4) for the proper level of sound over the headset. CAUTION: If you use the speakers to monitor instead of the headset, keep the sound volume turned down and don't get the microphones



near a speaker, or you may get feedback. To hear the input sound from the microphone, turn playback SELECTOR (1) to MONITOR. By varying SELECTOR control (1) between MONITOR and STEREO, you can compare the quality of the original and that of the recording.

6. Now return to the audio control center and re-adjust the LOUDNESS, BASS and TREBLE controls (I, J, K & L) to the positions which sound best to you. Next, go to the back of the console and locate the connector panel at the rear of the tape recorder. Pull out the cable connector which is plugged into the RIGHT OUTPUT connector. Connect a cable from the RIGHT OUTPUT connector up to the L LINE jack on the rear of the console. This will allow you to play the output of the right channel into the left-channel input for recording simultaneously with the added track.

**Alternate step A:** recording the master track from external input, such as electronic organ, electric guitar, etc.

1. Plug the external input into the R LINE jack at the rear of the console.
2. At the audio control center, press IN the EXT, STEREO-SINGLE LISTENING-RECORDING and CHANNEL REVERSE pushbuttons (E, F, G & H), all other buttons OUT. Temporarily set the LOUDNESS controls (I & J) to 10 and the BASS and TREBLE controls (K & L) to center. Turn the POWER control (M) to ON.
3. The tuner and record changer won't be used, so their power controls (O & R) may be switched OFF.
4. Use of the headset (U) is optional. If used, plug into EXT SPEAKER jacks at the rear of the console.
5. At the tape recorder, switch the playback SELECTOR (1) to STEREO and the recording SELECTOR to STEREO R. Adjust the right-channel RADIO/PHONO VOLUME control (6) for normal on the meter while the recorder is receiving a signal from the external source. Turn the MICROPHONE VOLUME controls (7 & 8) to zero, set the tape speed lever (9) for the proper recording speed and check that the head shift lever (10) is down. Now simultaneously press the RECORD pushbutton (11) as you turn the RECORD control (12) to start tape motion and begin recording. Adjust the right-channel LISTENING VOLUME control (4) for the proper level of sound over headset or speakers. To hear the input sound, turn playback SELECTOR control (1) to MONITOR. By varying SELECTOR control (1) between MONITOR and STEREO, you can compare the quality of the original and that of the recording.

6. Now return to the audio control center and re-adjust the LOUDNESS, BASS and TREBLE controls (I, J, K & L) to the positions which sound best to you.

**Step B:** setting the level of the master track.

1. At the audio control center press IN the EXT, STEREO-SINGLE and LISTENING-RECORDING pushbuttons (E, F & G) all other buttons OUT. Set the LOUDNESS controls (I & J) to about 2 and the BASS and TREBLE controls (K & L) to center. Turn POWER control (M) to ON.
2. The tuner and record changer won't be used, so their power controls (O & R) may be switched OFF.
3. Use of the headset (U) is optional. If used, plug into EXT SPEAKER jacks at the rear of the console.
4. At the tape recorder, rewind the tape to 0-0, switch the playback SELECTOR (1) to STEREO and the recording SELECTOR (2) to SINGLE. Turn the right-channel LISTENING VOLUME control (4) to 8, the left-channel control (3) to zero, and both MICROPHONE VOLUME controls (7 & 8) to zero. Set the tape speed selector (9) to the proper tape speed. Turn the RECORD control (12) to the right to start tape motion and then set the left-channel RADIO/PHONO VOLUME control (5) for normal indication on the recording level meter. Turn the right-channel RADIO/PHONO VOLUME control (6) to zero. Now rewind the tape to 0-0 on the tape position indicator.

**Step C:** recording the second track.

1. Plug a microphone into the L MIC jack at the rear of the console.
2. With all controls set just as for step 2, adjust the left-channel MICROPHONE VOLUME control (7) on the tape recorder for normal on the meter while you speak into the microphone. Now simultaneously press IN the RECORD pushbutton (11) as you turn the RECORD control (12) to the right to start tape motion and begin recording. A headset is recommended for use in this step, for listening to the signal being recorded from the right track onto the left, so that you can accompany it on the microphone.

**Step D:** recording additional tracks.

1. If you wish to add a third track (or more), don't rewind the tape after you have finished the recording of step C. above. Instead, take off both tape reels, turn them over, and place the right-hand reel on the left-hand turntable and vice versa. Thread the tape.
2. With setting just as in step B, press IN the RECORD pushbutton (11) as you

turn the RECORD control (12) and let the tape run through at normal speed until it's all on the right-hand reel. Be sure the on-off button on the microphone is turned off (white dot covered). This transfers the dual recording on the left track back onto the right track. It's interesting to note that this recording is done backwards, with the tape moving in the reverse direction.

3. To add a third voice to the recording, repeat step C above. Be sure to turn the microphone on (white dot showing).

**Step E:** playing back the final recording.

After you have the final recording, you can play it back just like any monophonic recording. The sound-on-sound recording will be heard over both channels.

#### FADE-IN/FADE-OUT EFFECT

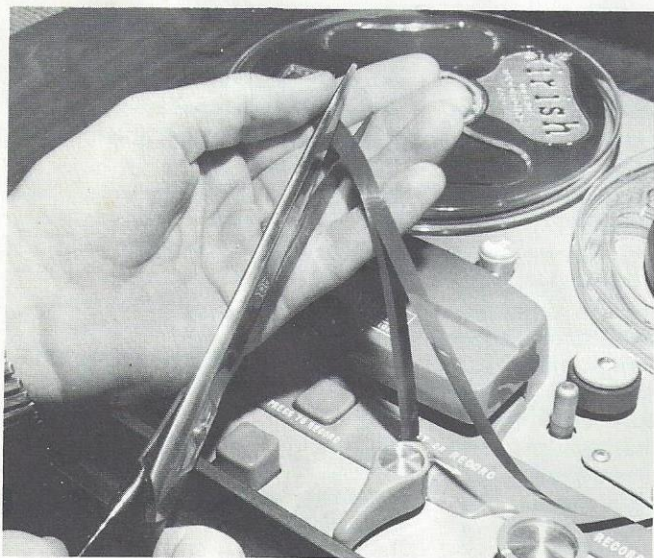
This is the effect you have heard over the radio so often when a voice gradually comes in over background music and the music slowly fades away.

1. Determine where the background sound is to come from and press IN the appropriate pushbutton on the audio control center. Also press IN the LISTENING-RECORDING pushbutton (G), all other buttons OUT. Turn the POWER control (M) to ON.
2. If either the tuner or record changer is to furnish sound, turn on the appropriate power control and operate normally.
3. Plug a microphone into the L MIC jack at the rear of the console.
4. At the tape recorder, switch SELECTOR controls (1 & 2) to SINGLE and turn all other controls to zero. Now adjust the left-channel MICROPHONE VOLUME control (7) for normal on the meter while you speak into the microphone. Note the setting. Turn the microphone OFF and adjust the left-channel RADIO/PHONO VOLUME control (5) for normal on the meter. Note the setting. Set the tape speed selector (9) for the proper tape speed and check that the head shift lever (10) is down. Turn the left-channel MICROPHONE VOLUME control (7) to zero and simultaneously press in the RECORD pushbutton (11) as you turn the RECORD control (12) to start tape motion and begin recording. To fade the background source out as you fade in your voice, turn control (5) counterclockwise to zero **at the same time** you turn up control (7) to the setting for normal recording level. To fade back again just reverse the process.



## EDITING BY ERASURE

Extraneous noise or conversation between selections can easily be erased by using the erase head on the tape recorder. Turn all RECORDING VOLUME controls (5, 6, 7 & 8) to zero and put playback SELECTOR control (1) in SINGLE or STEREO, depending on type of recording. Run the tape in the fast-winding mode to the point to be erased. (The exact place to be edited can be located by rotating the reels manually and listening to the output of the speaker. Be sure to allow for the space between recording and playback heads. Then note the points to start and stop erasing on the tape position indicator.) Press the RECORD pushbutton (11) as you turn the RECORD control (12) to start tape motion. When you reach the point where the next selection starts, press the STOP button. Another way of accomplishing this is to hold the PLAY OR RECORD control in its full clockwise position and hold the STOP button down, as the tape is moving. The RECORD pushbutton will not lock in position and can be pressed and released as desired.



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## EDITING BY CUTTING

The recorded tape can also be edited by determining the portions to be deleted, physically cutting those portions out of the tape, and then splicing the program tape together. Note that this cannot be accomplished with a monophonic tape recorded on both sides, unless one side is sacrificed.

1. Cut the two ends of the tape as shown in figure 24.
2. Butt the ends of the tape together on a flat surface with the uncoated (shiny) side up.
3. Splice the joint with splicing tape, available at any audio shop.
4. Carefully trim the spliced area to the same width as the recorded tape.

An inexpensive tape splicer will aid you in making the correct splice.



(25)  
An inexpensive tape splicer, available in any hi-fi shop, simplifies the procedures of tape editing.

## COMPLETELY ERASING RECORDED TAPES

The tape will be erased during the recording process, so it isn't necessary to completely erase before re-recording. However, if there are to be gaps between newly-recorded sections of the tape, and you wish to avoid having previously recorded material in the gaps, leave the "record" pushbutton in, with recording level at zero, between sections you are recording. Completely erasing the tape before re-recording can lessen your editing problems. If bulk erasing facilities are not available, complete erasure can be accomplished by running the tape in the recording mode at 7½ ips with all RECORDING VOLUME controls set at zero.



## PROTECTING THE FINISH OF THE CABINET

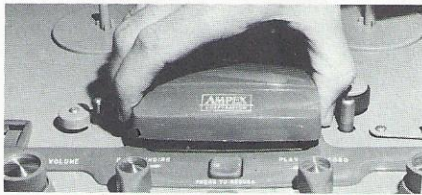
Take the same precautions with the cabinet of your Crescendo you would with any other piece of fine furniture. Avoid direct rays of the sun for any prolonged time. Dust and polish occasionally to bring out the fine quality of the woodwork. Take care of nicks and scratches right away: If the damage is slight, apply a good quality furniture scratch remover. If the console is deeply scratched, however, take it to a professional furniture finisher—only he is qualified to give your Crescendo the careful care it deserves.

## CARE OF HEADS

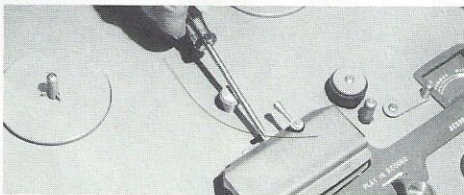
Dust and oxide from magnetic tape may accumulate on the magnetic heads of the tape recorder and impair their efficiency. To avoid this, you should periodically clean all the items in the tape-threading path.

To clean the heads, use a Q-tip moistened in a solution of Xylene and 0.1% Aerosol (available as a standard Ampex Audio accessory, #823). Be sure to remove head cover, and keep cleaning solution away from plastic parts. **DON'T USE ANY OTHER SOLVENTS ON THE HEADS**, or you may damage them. Never use an abrasive or any metallic object which might cause scratches or nicks.

For cleaning the capstan, capstan idler and tape guides, use a clean lintless cloth moistened with denatured or isopropyl alcohol.



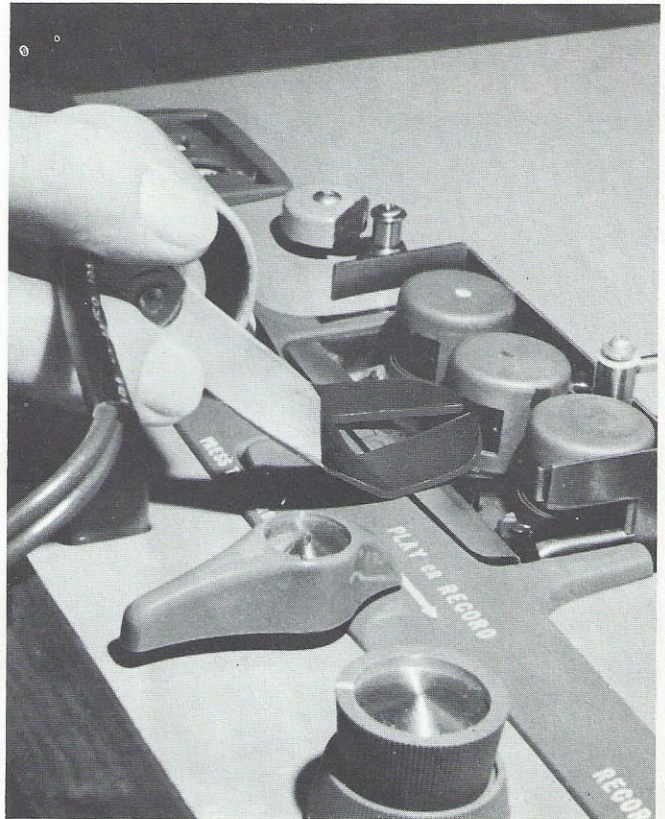
(26) Head cover is removed by slight pinching pressure on ends.



(27) Metal protective shield is removed by loosening Phillips-head screw at back.



(28) Cleaning solution is applied with cotton swab applicator.



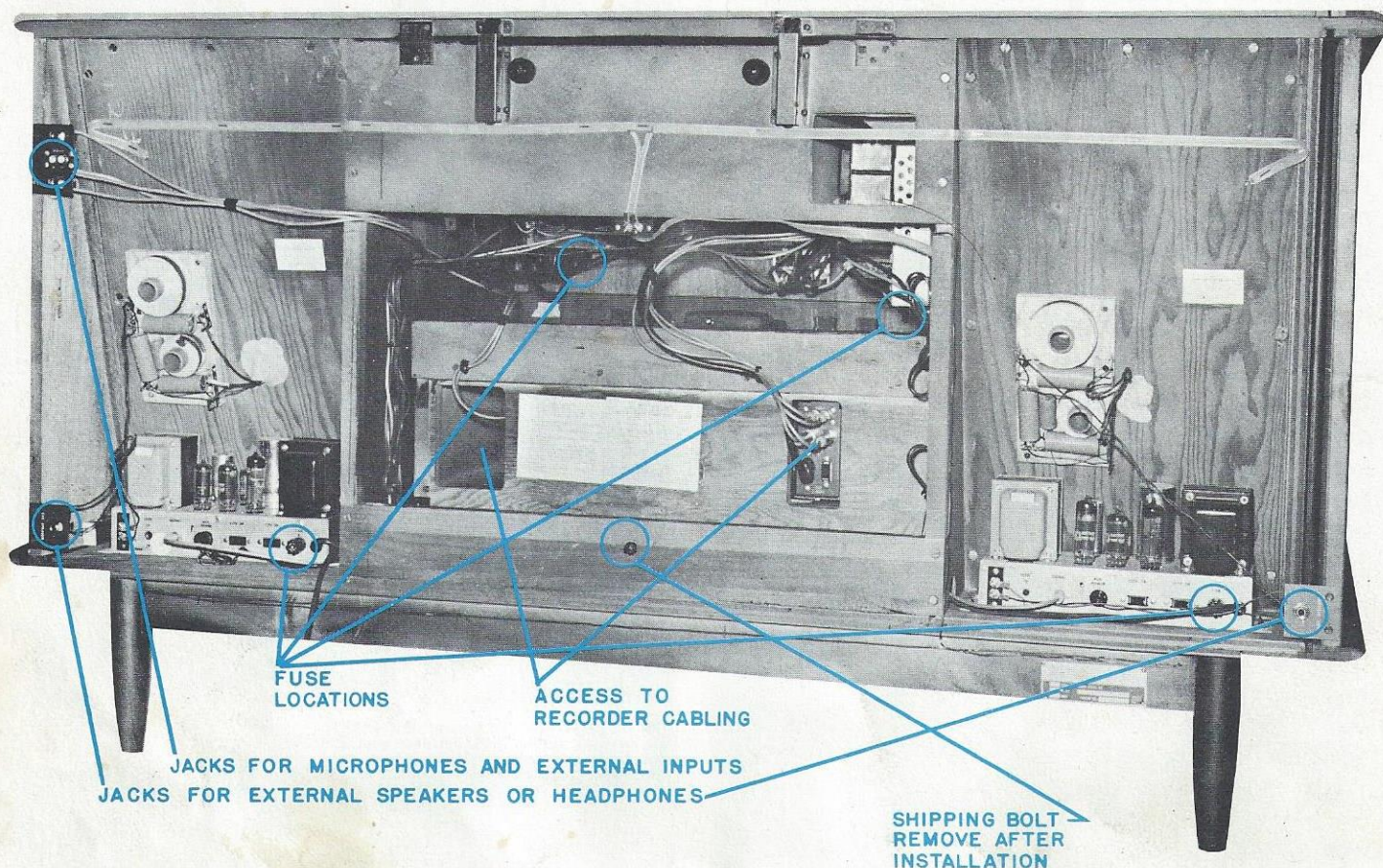
(29) In demagnetizing, tips of demagnetizer are brought within 1/16" of head gap (but not touching), and gradually moved away while being moved up and down along head gap.

## DEMAGNETIZING THE HEADS

Occasionally the heads may become slightly magnetized through continued use. If this condition is not corrected, you may find the noise level of your tapes increasing, recorded signals becoming distorted and, in extreme cases, the high frequencies on recorded tapes gradually being erased. This condition can be corrected with a Head Demagnetizer (available from your local dealer as Ampex Audio accessory #820). To use the demagnetizer:

1. Press the ends of the plastic head cover inward and remove. Loosen the Phillips-head screw at the rear of the metal head shield and lift off the shield. Switch the SELECTOR to OFF.
2. Plug the head demagnetizer into a wall outlet (117 volts ac).
3. Align the tips of the demagnetizer to the recording (center) head so that they straddle the head gap. Don't touch the surface of the head with the metal tips of the demagnetizer. Run the tips up and down the head several times and slowly withdraw the demagnetizer.
4. Repeat the above for the playback (right) head. It's not necessary to demagnetize the erase head.





## ON THE TAPE RECORDER

It is recommended that you contact your Ampex authorized service center if bulb or fuse replacement ever become necessary on your tape recorder.

## ON THE AUDIO CONTROL CENTER

The power fuse on the audio control center is located on the underside of the unit (to your left as you face it from the rear of the console) and can be reached by removing the cover on the back of the console. Twist the black fuse-holder cap and pull out. Replace with a 3AG slo-blo 0.3 amp fuse.

## ON THE FM/AM TUNER

To replace the fuse on the tuner, remove the perforated cover from the back of the console and locate the underside of the tuner assembly to your

right as you face the rear of the console. On the bottom of the tuner housing nearest the rear you will notice a black fuse-holder cap. Twist the cap and pull out. Replace with a 3AG 0.3 amp fuse. Dial lamps on the tuner are reached by removing the front panel. Pull the four control knobs straight off their shafts and remove the retaining nuts at the base of the shafts. Pull the front panel off. You will see two indicator lamps, one at each end of the dial. Replace with GE type 12 bulbs.

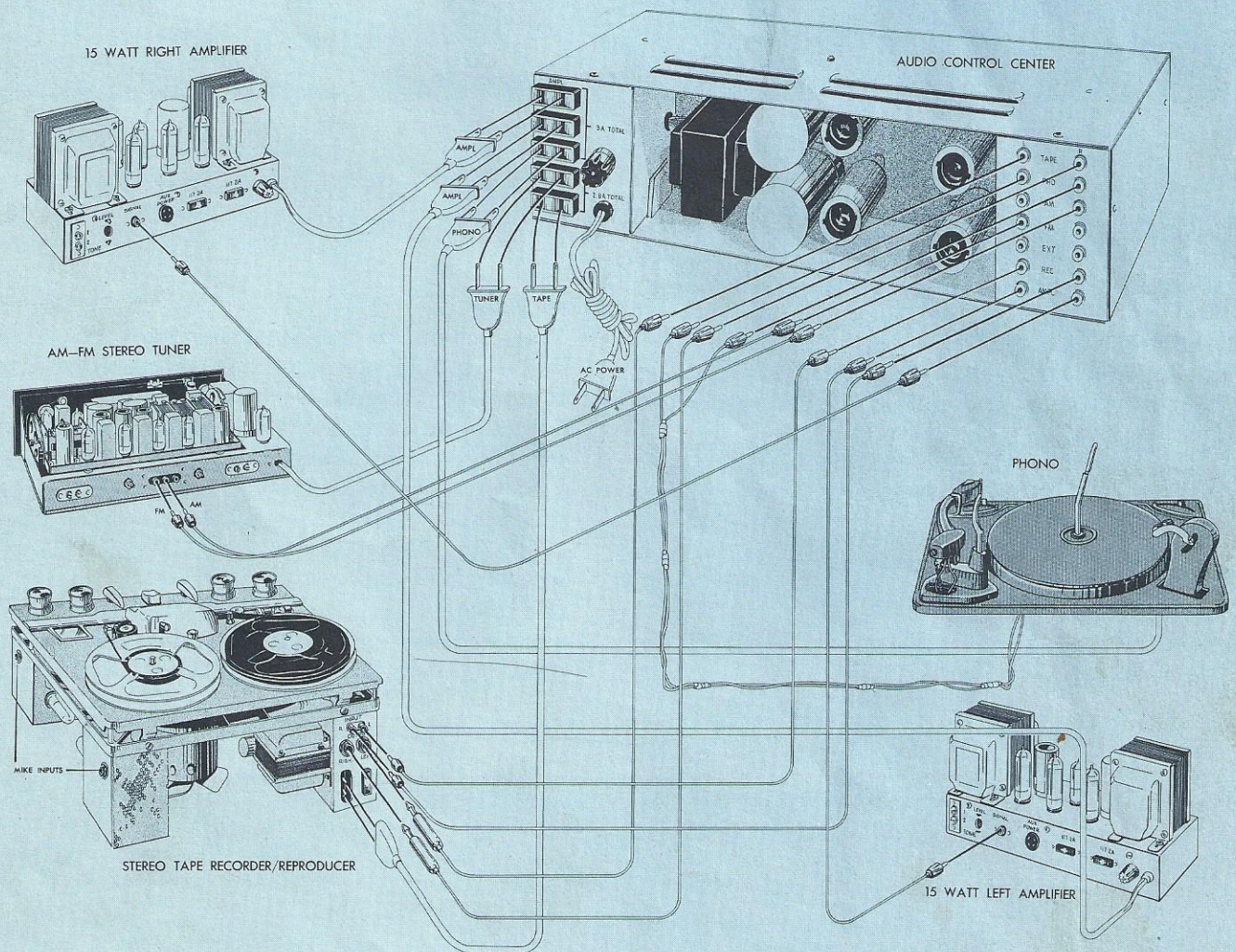
## ON THE POWER AMPLIFIERS

Fuses on the amplifiers are easily reached by taking off the perforated cover at the rear of the console. The fuse is mounted in the rear panel of the amplifier. Just twist the black fuse-holder cap and pull out. Replace with a 3AG 1½ amp fuse.



The Crescendo brings you a complete home music center with no need for concern about such things as installation, placement, etc. However, for reference, you might wish to know the cabling connections between the parts of the complete Crescendo console. Figure 31 shows cabling connections between each part of the console.

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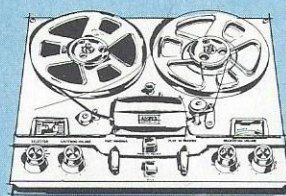




Herein are described in semi-technical terms the salient engineering and performance features of the Crescendo. If you read these descriptions with a comparative eye, it might be worthwhile noting the traditional Ampex methods as opposed to those normally followed in competitive practice. When a performance specification is advanced for Ampex

equipment, it is intentionally a conservative figure. The operation will equal or exceed the value given. Furthermore, the operation will still be within the specification even after thousands of hours of use. Ampex specifications are *engineering* specifications and as such will stand up to the most critical evaluation and scrutiny.

## RECORDER/REPRODUCER



### RECORDING INPUTS

High impedance line inputs (radio/TV/phono/auxiliary). Approx. 0.15 V rms for maximum normal recording level; high impedance microphone inputs.

### PLAYBACK OUTPUTS

Approximately 0.75 volts rms from cathode follower when using tapes recorded to maximum normal recording level.

### PLAYBACK FREQUENCY RESPONSE

30 to 20,000 cps at  $7\frac{1}{2}$  ips; 30 to 15,000 cps at  $3\frac{3}{4}$  ips.

Within  $\pm 2$  db of 50 to 15,000 cps at  $7\frac{1}{2}$  ips, 55 db dynamic range.

Within  $\pm 2$  db of 50 to 10,000 cps at  $3\frac{3}{4}$  ips, 50 db dynamic range.

### FLUTTER AND WOW

Under 0.2% rms at  $7\frac{1}{2}$  ips.

### HEADS

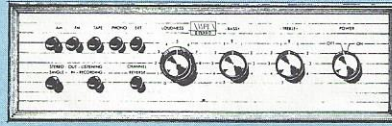
Manufactured to the same standards of precision that exist in Ampex broadcast and recording studio equipment. Surfaces are lapped flat within 10 millionths of an inch, resulting in uniform performance characteristics throughout the life of the head. Stereo head gap alignment: the one head gap in the stack with respect to the other is held within 20 seconds of arc, equivalent to less than 10 millionths of an inch—a degree of precision achieved through use of a unique process involving micro-accurate optical measurements within a controlled environment. Head gap length is 90 millionths of an inch.

### PLAYING TIMES

	2-track stereo tapes	4-track stereo tapes	half-track monophonic tapes
1200' reel, $7\frac{1}{2}$ ips	32 minutes	1 hr 4 min	1 hr 4 min
$3\frac{3}{4}$ ips	1 hr 4 min	2 hrs 8 min	2 hrs 8 min
1800' reel, $7\frac{1}{2}$ ips	48 minutes	1 hr 36 min	1 hr 36 min
$3\frac{3}{4}$ ips	1 hr 36 min	3 hrs 12 min	3 hrs 12 min
2400' reel, $7\frac{1}{2}$ ips	1 hr 4 min	2 hrs 8 min	2 hrs 8 min
$3\frac{3}{4}$ ips	2 hrs 8 min	4 hrs 6 min	4 hrs 16 min



## AUDIO CONTROL CENTER



### INPUTS

Three high-level dual inputs, approximately 0.2 megohm. One low-level dual phono input, approximately 50K ohm. Dual tape inputs, 0.33 megohm with preamplifier in circuit. 0.2 megohm with preamplifier out.

### OUTPUT IMPEDANCE

1K ohm from cathode follower. Recommended load impedance 250K ohms or greater, less than 2500  $\mu$ f.

### DISTORTION (HARMONIC)

High level input to 270K ohm load, less than 0.25% for 1 volt, at rated output; less than 0.4% for 5 volts; less than 1.0% for 10 volts.

### MAXIMUM GAIN

From high-level inputs to amplifier output,  $\pm 1.0$  db. From high-level inputs to recorder output, 0 db. From phono inputs to amplifier output, 41.5 db at 1 Kc. From tape input (with preamplifier in circuit) to amplifier output, 54 db at 250 cps.

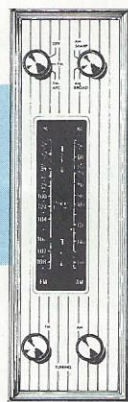
### FREQUENCY RESPONSE

With 270K ohm load, tone controls in flat centered position:  $\pm 1$  db from 20 cycles to 20,000 cycles.

### HUM AND NOISE LEVEL

At amplifier outputs 270K ohm load, for high-level inputs, better than 75 db below 2-volt signal; tape inputs, better than 60 db below 2-volt signal.

## FM/AM TUNER



### SENSITIVITY (FM)

5 microvolt sensitivity for 30 db of quieting. Maximum sensitivity is 0.95 microvolts for 0.1 volts into a 1-megohm load.

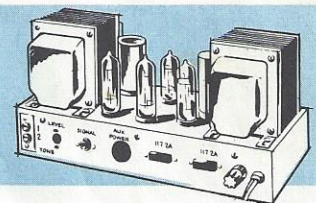
### FREQUENCY RESPONSE

FM: 20 cps to 20 Kc  
AM: 20 cps to 8.5 Kc

### DISTORTION

Total distortion under 0.5%

## POWER AMPLIFIERS



### AUDIO POWER OUTPUT

15 watts; 30 watts peak

### NOISE AND HUM

80 db below rated output

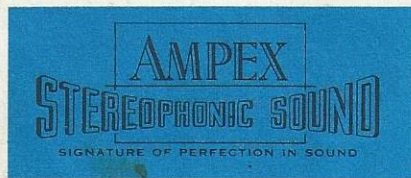
### INPUT SENSITIVITY

0.35 volts to develop rated power

### TOTAL HARMONIC DISTORTION

Less than 0.5% at rated output





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