
Module V

Audio Aids

Unit 3

Tape Recorders

Instructional Objectives:

1. Describe three functions of heads used in tape recorders.
2. State the function of each head of a tape recorder with three heads.
3. Name the two audio modes commonly used for determining the length of tape, for recording.
4. State the speed at which common cassette tape recorders are used.
5. State how playing time is determined in cassette tape recorders.
6. State the effect of speed for the quality of sound reproduction.
7. Distinguish between full track, dual track and quarter track tapes.
8. Describe how accidental erasing of tape is prevented.
9. Explain the method of erasing dual track tape when a bulk head is not used.
10. Explain the method of splicing tape.
11. Describe how tone control is operated when tapes are duplicated.
12. Explain the best method of duplicating tapes under manual conditions.

AUDIO VISUAL EDUCATION

Module V Audio Aids
Unit 3 Tape Recorders

INTRODUCTION:

Any one can learn to operate a tape recorder. Instructors are expected to have satisfactory operating skills for playing tape recorders, record players, various still and motion picture projectors and also television equipment. Most of you can learn this rapidly using the self instructional materials presented here, and those who have difficulties may ask for a demonstration or discuss your problems with your Training Officer.

For most efficient learning, study the text and illustrations, then following the step-by-step procedures, practice immediately thereafter with the equipment. Additional help will be provided to you, if you need, through demonstrations and discussions. You will take, as usual theoretical and practical tests.

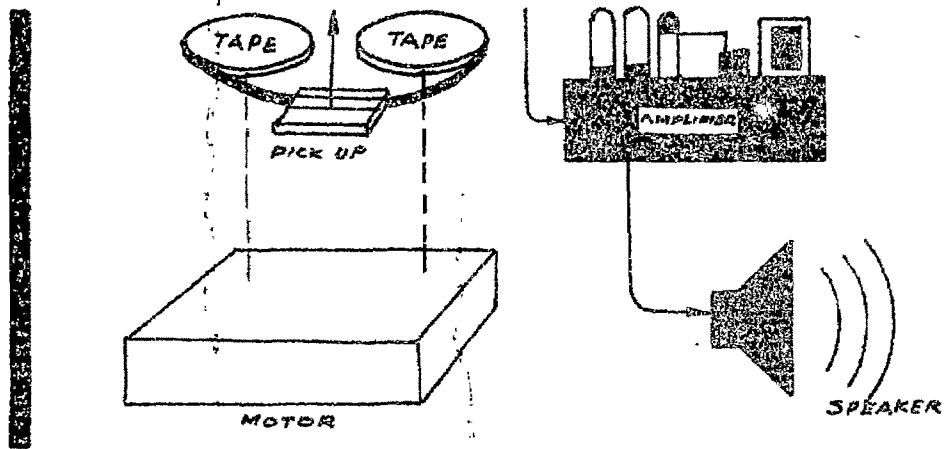
TAPE RECORDERS:

All tape recorders function similarly, only a few fundamental skills are required, to operate any of the recorders in common use today. We are presenting here only general points for operating common types of tape recorders (spool type and cassette type). There may be variations in their appearance, and some makes will have additional features. But the principle will be same, and you may be able to go through the instructional manual provided with each equipment without any difficulty. We are getting very good Indian made tape recorders these days.

The tape recorder has two major components. The motion system and sound system. The motor drives the tape reels in either direction at various speeds. The sound system consists of three conventional elements: pick up, amplifier, and speaker all enclosed in a single case. Most tape recorders contain detachable microphone, and remote control devices are also available. Special input and output jacks are usually included to provide combinations of sound equipment for recording purposes.

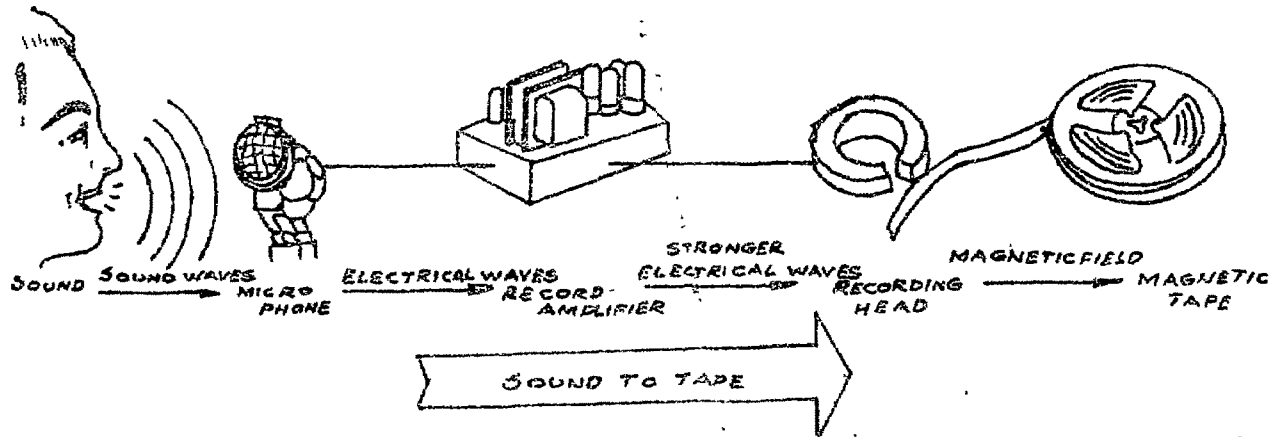
There is a major difference between tape recorders and other sound equipment. Pick up in a tape recorder are electromagnetic devices called heads. Every tape recorder has two heads, and some recorders have three. These heads record sound, reproduce sound, and eliminate sound. The latter function is actually a recording process, but since no sound remains for reproduction purposes, it is called erasing.

Recorders have a motor, amplifier and speaker. The motor control tape motion with speed selector. The amplifier controls the volume of tone.

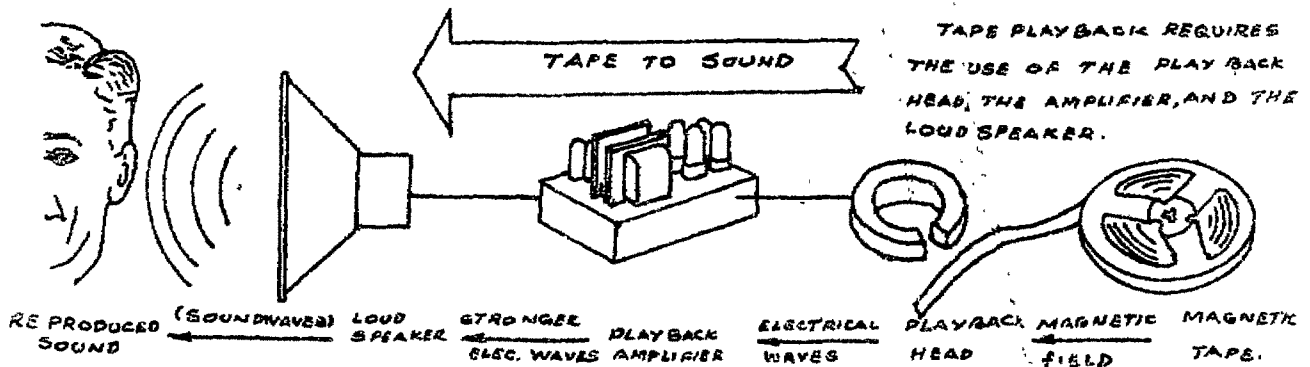


Basic components of a Tape Recorder.

Tape requires the use of the pick up, the amplifier and the recording head

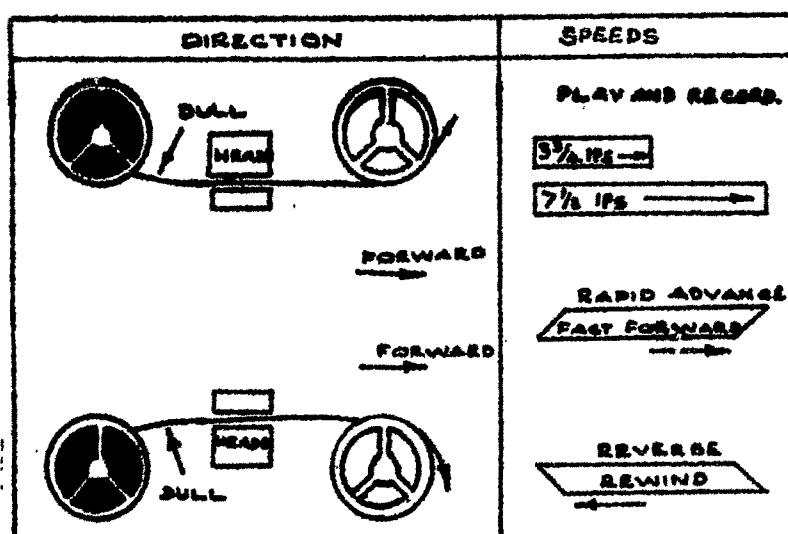


Tape Recording requires the use of the pickup
The amplifier and the recording head.



TAPES:


Whether it is reel-to-reel or cassette recorder, tape is a necessary item for recording or playing any aural matter (audio). Examine a piece of reel-to-reel or cassette tape. Feel it, break it and find out the differences and similarities. Usually reel-to-reel tapes are 1/4" or 6 mm wide and cassette tapes are 5/32" wide. One side of the tape is glossy, and other side of the tape is dull.



THE DULL SIDE OF THE RECORDING TAPE
ALWAYS FACES THE RECORDING HEADS.

Glossy side is the backing or base, and the dull side is the working side on to which is coated metallic oxide. The base is plastic or mylar. Mylar is a thin and strong base. When you record sound and tapes, magnetic fields are set up in them, and when they are played, these magnetic fields generate electrical impulses in the machine which are amplified and re-produced again as sound. Though the magnetic fields cannot normally be seen, by a special process a picture of the field is revealed as shown below.

Tapes can be replayed normally many times without audible (that could be heard by you) changes in sound quality. A recording on the tapes may be removed or what is called erased and replaced with a new recording. This erasing can be done by pressing the recording & play button. This process can be repeated a number of times.



TAPE PLAYING TIMES:

Playing time is a principal concern in the selection of tapes. This depends upon the speed at which the tape is played and upon the length of the tape.

For same length, and slower speeds, the tape playing time is longer. For faster speeds, the time taken will be less, for the same length.

As we have told you earlier, tapes are either available in reels or in cassettes. Reels can be used on reel-to-reel tape recorders while cassette can be used over cassette tape recorders.

Charts/figures for both reel to reel and cassette tapes are shown on next page which will give you an idea about the time, speed and length of various tapes.

Reel to reel tape recorders have more than one speed and cassette tape recorders have generally only one speed.

The speed of the reel to reel tape recorders vary from $1\frac{7}{8}$ to $7\frac{1}{2}$ i.e. $1\frac{7}{8}$ inch per second, it is usually written as $1\frac{7}{8}$ i.p.s. or simply $1\frac{7}{8}$; stated in SI units. $1\frac{7}{8}$ ips = 4.75 cm/sec; $3\frac{3}{4}$ ips = 9.5 cm/sec & $7\frac{1}{2}$ ips = 19 cm/sec.

You may see from the chart here that the length of the tape varies from 150 to 3,600 feet. The playing time increases when the length increases; so also when the speed is slow, the playing time is more, and when the speed is high the playing time less.

The speed of cassette tapes at present are usually fixed at $3\frac{3}{4}$ i.p.s. or 9.5 cm/Sec. Cassette are usually named as C120, C90, C60, etc., which means, that the cassette can play for 120 or 90 or 60 minutes, when both sides are played.

When we say these timings, these are uninterrupted playing time. Thus a C 60 cassette will take 30 minutes playing time in one direction and when reversed, it can also play another 30 minutes, thus making a total of 60 minutes. Similarly a 1200 ft. reel tape when played at $3\frac{3}{4}$ ips (9.5 c/s) will play either way 60 minutes. We can make recordings in more than one track and upto 4 tracks. This is discussed later in detail. When you use two tracks- one track in one direction and second track in the opposite direction it is generally called a two track recording, and two tracks in same direction and two tracks in the opposite direction is called a four track recording, the playing time can be increased. When the diameter of the tape is same, and the length is increased, as you can see from the chart given above the thickness of the tape will be reduced. For example 7" diameter reels have tapes varying from 1200 feet to 3600 feet. No doubt, with longer tapes, you can use the tapes also for a longer duration, but then, the tapes will ** fall out, and tapes can break easily. Similarly for C 120 tape in the cassette format, the tapes are extremely thin and should be used with care only when you want 60 minutes of uninterrupted playing.

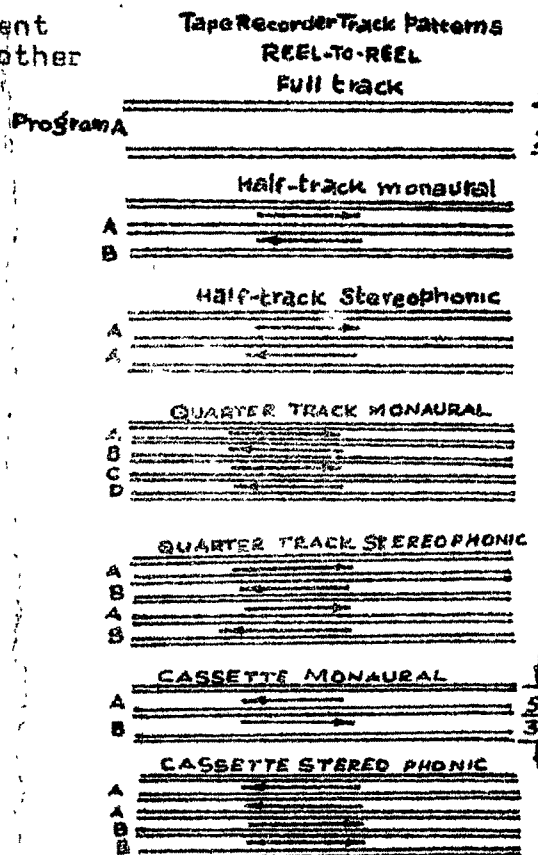
Generally the faster the tape travels, the better the quality of sound reproduction. For high quality speech recording, and HI-FI Music the higher speeds are recommended. So when selecting tapes, you should remember three important things, one is playing time second the speed you want to use and lastly the quality of the tape. For longer duration, when playing has to be uninterrupted, the tape shall be longer. When quality of recording is the criterion, you have to choose higher speeds. If you want the tape to be used for longer duration, the base material has to be thicker, in which case, you cannot choose C 120 cassette. or 7" -3600 feet reel tape, i.e. longer tapes.

TAPE TRACKS:

All of you may know that the tape recordings are of two basic types, monaural or stereo. Different types of tape recordings both in the reel-to-reel and cassette types are detailed below.

** get spoiled quicker, the oxide coating being thin will

1. Recorders that record the full width of the tape use single or full track machines.
2. When there are two parallel tracks for recordings, these are called dual track or half track recorders. This can be either monaural or stereophonic recording.
3. Many recorders provide for quarter track recording, two parallel sets of dual tracks for stereo and four independent tracks for mono recordings.
4. Thus the full track can be used only for mono, dual or two track and four track or quarter track either for stereo or mono. These are given in the figure here
5. In the case of Cassettes there are usually two types, half track with monaural, one side one direction recording, and stereophonic or quarter track, with two adjacent parallel tracks in one direction and two adjacent parallel tracks in the other direction.



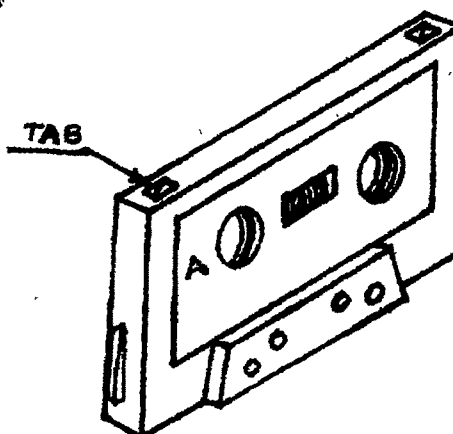
TAPE ERASERS:

Tape recordings can be erased if you want to, by recording again on the same track. This can also be done, by running the tape empty with record and play button pressed down, with the volume, tone controls at the minimum of the scale. Dual track tape must be run from end to end on both sides.

Accidental erasure of tape in a recorder is almost impossible, since any recorder require the manipulation of control RECORD and PLAY for recording or erasing.

In recent times, we get recorders, on which recordings could be done by pressing only one control viz., RECORD. Accidental erasure can also result if tapes are exposed to strong magnetic fields from any source.

Cassette tapes can be permanently safeguarded from erasure on the recorder by breaking out the small tabs on the edge opposite the open end. There is a tab to protect each track on the tape, remove the one that is on the left as you read the label for the side you want to protect. Side A in the picture. If you want to record on that side later, cover the hole with a piece of paper or thin tape.



DUPLICATING TAPES:

Recording from tape to tape requires generally two tape recorders and connecting cords. The recorder playing the original material is connected at the output and recorder that will duplicate the tape is connected at the input. Special copying recorders are available to speed up duplication of tapes. The best method under manual conditions for duplicating is to use patch cord.

You have in the market SHARP GF 555 which has two cassette compartments and in Tape I compartment you place cassette to be copied and cassette on to which you have to copy, is placed in Tape II. When you play tape I, and press RECORD & PLAY button for Tape II, you get the copy. There are many controls and devices, by which you can have external inputs from records, other tape recorders and so on.

SOME POINTS ON TAPE DUPLICATION:-

1. Tone controls operate on a tape recorder only when it is playing. So while copying, any adjustment to improve tone must be made on the recorder that is playing not the one recording.
2. To save duplicating time, on reel to reel recorders, a $3\frac{3}{4}$ i.p.s. tape may be played at $7\frac{1}{2}$ i.p.s. and the copying recorder also run at $7\frac{1}{2}$ i.p.s. and the duplicating time is reduced to half. The duplicated tape will play at $3\frac{3}{4}$ i.p.s.
3. Speed of playing may be changed in the duplicated tape. That is if your original tape is $7\frac{1}{2}$ i.p.s. two such 1200 feet tapes could be transferred to one 1200 feet tape at $3\frac{3}{4}$ i.p.s. in a reel to reel tape recorder. Similarly single track may be transferred to dual track and vice versa.

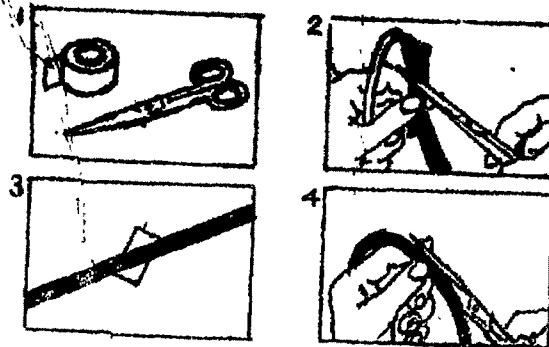
TAPE SPLICING:

To edit tape by splicing, cut and assemble the tape to eliminate, add, or combine sections. Segments of tape can be identified by writing on the

glossy side with a colour, grease pencil. Splice the sections as given below. You may join a sequence, by splicing different pieces of tapes, keep it as a master, and record on to another one. Only important consideration is that different segments should have the same speed.

To edit tape, splice the ends as follows:

1. Lap two ends of tape, then cut at a 45° angle by holding scissors diagonally in relation to the overlapped tape.
2. But the ends together smoothly, place a short length of transparent gummed tape (One side gum) over the joint. Do not use ordinary cellophane gummed tape.
3. Trim excess splicing tape, cutting into the recording tape very slightly. This eliminates the possibility of a sticky splice.



TAPE PLAYING TIMES- MINUTES

REEL - TO - REEL

reel size, inches	tape length, feet	Playing time, Minutes at speed		
		1 7/8ips	3 3/4ips	7 1/2 ips
3	150	15	7 1/2	3 1/2
4	300	30	15	7 1/2
5	600	60	30	15
5	900*	90	45	22 1/2
7	1,200	120	60	30
7	1,800*	180	90	45
7	2,400**	240	120	60
7	3,600*	360	180	90

CASSETTE

designation	per side	total
C-15	7 1/2	15
C-30	15	30
C-60	30	60
C-90	45	90
C-120	60	120

AUDIO VISUAL EDUCATION

. CRITERION TEST

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Tape Recorders

For questions 1 to 9 circle the alphabet of correct answer
and for the rest write correct answer in the space provided.

1. Cassette recorders are available at present only for a fixed speed, which one of the following speed is the speed of a cassette tape recorders ?
 - a. 4.75 cm/sec.
 - b. 9.50 cm/sec.
 - c. 19.0 cm/sec.
 - d. 7.5 ips.
2. The best reason for deciding whether you require a particular length of tape for use in your tape recorder is:
 - a. playing time
 - b. life of tape.
 - c. length of tape
 - d. spool dia of tape recorder.
3. Which one of the following tape of 7" dia will have the thin base and hence not very desirable for selection for long and continued use ?
 - a. 3600 ft.
 - b. 2400 ft.
 - c. 1800 ft.
 - d. 1200 ft.
4. Which one of the following recording system has better quality of sound reproduction ?
 - a. 4.75 cm/sec.
 - b. 9.50 cm/sec.
 - c. 19.0 cm/sec.
 - d. 1.90 cm/sec.

5. Accidental tape erasure is prevented by providing
 - a. one control for erasure.
 - b. two controls for erasure-play and fast forward being not pressed
 - c. providing strong magnets near the magnetic head.
 - d. not pressing record and play mode buttons together.
6. When you are not using a bulk tape eraser, for erasing dual track tape recorders you must:
 - a. run the tape from one end to another in one direction
 - b. run the tape from one end to another in both directions.
 - c. use the record & play button and re-record a programme in one direction.
 - d. play the record in a stereo record player in one direction.
7. The best way to splice a tape is to:
 - a. Cut them so that the cut being perpendicular to the length of the tape, and apply gum after overlapping.
 - b. cut both ends perpendicular to the length of the tape, and apply cellophane tape and press it down, smooth side in one direction.
 - c. cut the ends, by lapping them at 45° angle by a scissor diagonally and then overlap the tapes, and place short length of splicing tape over the joint and press it down.
 - d. cut both ends of the tape by lapping them at 45° by a scissor diagonally, then butt the ends together smoothly and place a short length of splicing tape over the joint, and press it down.
8. When duplicating tapes, if you want to use the tone adjustments:
 - a. make this on the machine that is playing, not on the recording machine.
 - b. make this on the recording machine, not on the playing machine.
 - c. make this on both the recording and playing machines.
 - d. none of the above.

9. You are given two tape recorders, and is asked to transfer recordings from one to another. The best way to transfer recording from one machine to another machine is to:
 - a. use the condenser microphone and play the other tape recorder.
 - b. use a separate microphone and play the other tape recorder.
 - c. use patch cords and connect the output of playing recorder to input of the other recorder.
 - d. use patch cords and connect the input of the playing tape recorder to the output of the recording machine.
10. Name the two audio modes commonly used.
 - a.
 - b.
11. What is the main difference between a tape deck and a tape recorder?
 - a.
12. State three functions of heads in a tape recorder.
 - a)
 - b).
 - c)
13. If you have a three head machine, state one separate function of each head.
 - a.
 - b.
 - c.
14. If you have only one head in your machine, which of the above function(s) can the machine perform ?
 - a.
 - b.
15. What is the single major disadvantage of using a permanent magnet as an erase head ?
 - a.
 - b.

AUDIO VISUAL EDUCATION

KEY TO
CRITERION TEST-----
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Tape Recorders

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☐ b. 9.50 cm/Sec.
☐ c. 19.0 cm/sec.
☐ d. 7.5 i.p.s.
2. The best reason for deciding whether you require a particular length of tape for use in your tape recorder is :
- ☐ a. playing time
☐ b. life of tape
☐ c. length of tape
☒ d. spool dia of tape recorder
3. Which one of the following tape of 7" dia will have the thin base and hence not very desirable for selection for long and continued use ?
- ☒ a. 3600 ft.
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☐ c. 1800 ft.
☐ d. 1200 ft.
4. Which one of the following recording system has better quality of sound reproduction ?
- ☐ a. 4.75 cm/sec.
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☒ c. 19.0 cm/sec.
☐ d. 1.90 cm/sec.

5. Accidental tape erasure is prevented by providing.
- ☐ a. one control for erasure
 - ☐ b. two controls for erasure-play and fast forward being not pressed.
 - ☐ c. providing strong magnets near the magnetic head
 - ☒ ** d. not pressing record and play mode buttons together.
6. When you are not using a bulk tape eraser, for erasing dual track tape recorders you must:
- ☐ a. run the tape from one end to another in one direction.
 - ☒ ** b. run the tape from one end to another in both directions.
 - ☐ c. use the record & play button and re-record a programme in one direction.
 - ☐ d. play the record in a stereo record player in one direction.
7. The best way to splice a tape is to:
- ☐ a. cut them so that the cut being perpendicular to the length of the tape, and apply gum after overlapping.
 - ☐ b. cut both ends perpendicular to the length of the tape, and apply cellophane tape and press it down, smooth side in one direction.
 - ☐ c. cut the ends, by lapping them at 45° angle by a scissor diagonally and then overlap the tapes, and place short length of splicing tape over the joint and press it down.
 - ☒ ** d. cut both ends of the tape by lapping them at 45° by a scissor diagonally, then butt the ends together smoothly and place a short length of splicing tape over the joint, and press it down.
8. When duplicating tapes, if you want to use the tone adjustments:
- ☒ ** a. make this on the machine that is playing, not on the recording machine.
 - ☐ b. make this on the recording machine, not on the playing machine.
 - ☐ c. make this on both the recording and playing machines.
 - ☐ d. none of the above.

9. You are given two tape recorders, and is asked to transfer recordings from one to another. The best way to transfer recording from one machine to another machine is to:
- a. use the condenser microphone and play the other tape recorder.
 - b. use a separate microphone and play the other tape recorder.
 - ** c. use patch cords and connect the output of playing recorder to input of the other recorder.
 - d. use the patch cords and connect the input of the playing tape recorder to the output of the recording machine.
10. Name the two audio modes commonly used.
- a. monophonic
 - b. stereophonic.
11. What is the main difference between a tape deck and a tape recorder ?
- a. Tape deck is without amplifier and speakers.
12. State three functions of heads in a tape recorders.
- a. record
 - b. erase
 - c. reproduce.
13. If you have a three head machine, state one separate function of each head.
- a. record.
 - b. erase.
 - c. reproduce.
14. If you have only one head in your machine, which of the above function(s) can the machine perform ?
- a. record.
 - b. reproduce.
15. What is the single major disadvantage of using a permanent magnet as an erase head ?
- a. it will produce hum.
 - b. the magnet loses the strength.