OPERATING INSTRUCTIONS

for the

Brenell

Mark 5 Series 2

TAPE RECORDER

Price: Five shillings

IMPORTANT

Before attempting to operate this instrument, be sure to study carefully these instructions. In the event of damage to the Recorder through wrong connection or other misuse, the manufacturers can accept no responsibility.

GENERAL DESCRIPTION including recording and playback sequences, together with:

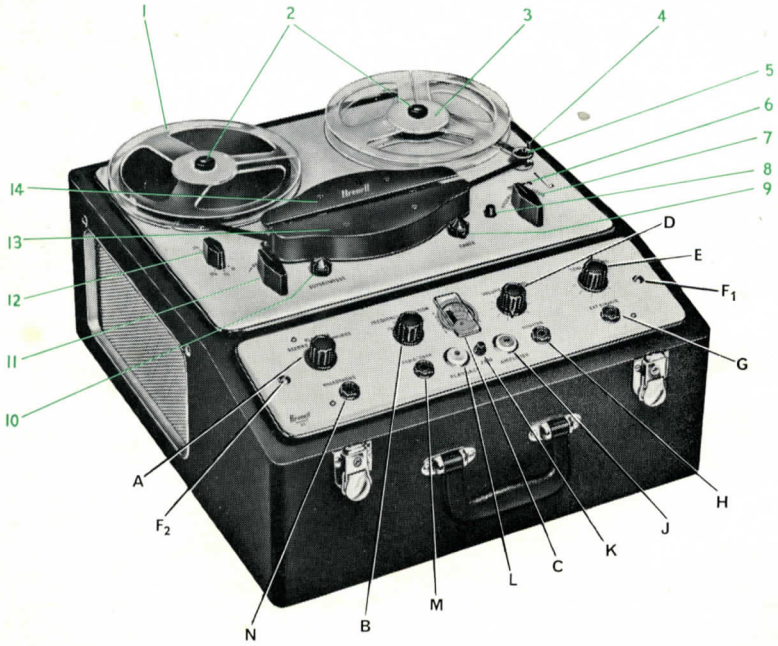


Fig. 1

1	Feed Spool
2	Spool Retaining Screws
3	Take-up Spool
4	Guide Pillar
5	Adjustable Tape Guide
6	Revolution Counter
7	Record Playback Switch
8	Record Lock Button
9	Pause Control
10	Superimpose Control
11	Rewind Switch
12	Speed Selector Switch
13	Fixed Head Cover
14	Clip-on Head Cover

A	FUNCTION SWITCH—Record, Playback, Amplifier
B	FREQUENCY CORRECTION—$1\frac{7}{8}$, $3\frac{3}{4}$, $7\frac{1}{2}$, 15
C	RECORDING LEVEL INDICATOR—Magic eye or meter
D	VOLUME CONTROL—Operative on all functions
E	TONE CONTROL—Bass boost (clockwise maximum)
F1 F2	MOUNTING SCREWS—Fixing amplifier to cabinet
G	EXTENSION SPEAKER—Preferably 15 ohms
H	MONITOR—For high impedance headphones
J	INDICATOR LAMP—Straight amplifier
K	ZERO CONTROL—When meter is fitted
L	INDICATOR LAMP—Playback
M	RADIO/GRAM. INPUT—For high-level signals
N	MICROPHONE INPUT—For low-level signals

MAINS CABLE

This is a three-cored cable which is stored in the left-hand rear compartment (viewed from the rear).

Choose a suitable three-pin mains plug and connect the green lead to the earth pin (largest) and the two remaining leads to the smaller pins. If a two-pin plug must be used, the green (earth) lead must be left disconnected and suitably insulated.

MAINS ADJUSTMENT PLUG

This is situated within right-hand rear compartment and contains the mains fuse which is easily renewed.

Ensure that the plug is set to the correct voltage position for your electricity supply.

i.e., 240 V for mains of 220 V to 250 V
210 V for mains of 200 V to 220 V
*110 V for mains of 100 V to 125 V
(the power consumption is approx. 100 watts).

** Use ONLY on the special model fitted with 117 V motors and suitable ONLY for use on 100-125 V A.C. supplies. DO NOT operate the special model on higher voltage mains supplies unless a suitable step-down transformer is used.*

A converter to enable the machine to be operated from D.C. mains or a car battery can be obtained from your dealer.

The mains switch is mounted on this panel and will switch power to both deck and amplifiers. Also mounted on the mains adjustment panel is a device known as a " Humdinger." This control is preset at the factory and further information on it may be found in the Glossary.

LOADING THE TAPE

Before loading the tape for the first time, remove the head covers in order to familiarise yourself with the position of the components, the working of the pressure pads and pinch wheel. The upper half of head cover is a pressed fit, and needs only to be lifted from its retaining posts; the lower half is held in position by two screws. To load tape, place full reel on left-hand spindle and thread as shown on the diagram (Fig. 2). With the tape correctly threaded, give the deck a trial run preparatory to making a recording, thus familiarising yourself with the switching operations.

When the right-hand switch on the deck is operated (record/playback) the tape will be transported from left to right across the erase and record/playback heads at a speed dependent on the size of capstan sleeve in use and the setting of the speed switch. The left-hand knob is for rewinding or winding on the tape at high speed, and will only operate if the record/playback switch is in its STOP position.

A1, A2, A3 Tape guides
B Erase head
C Tape contact release pin
D1 Retaining posts for upper half head cover
D2 Retaining posts for lower half head cover
E Record/playback head
F Azimuth adjustment screw
G Capstan shaft
H Capstan sleeve
J Adjustable tape guide
K Pinch wheel
L1, L2 Pressure Pads
M Take-up pin
N Pressure pad operating lever
O Crescent-shaped lever
P Pause control
R Superimpose control
S Pressure pad spring
V $\frac{1}{16}$" free movement
W Supplementary guide pillar

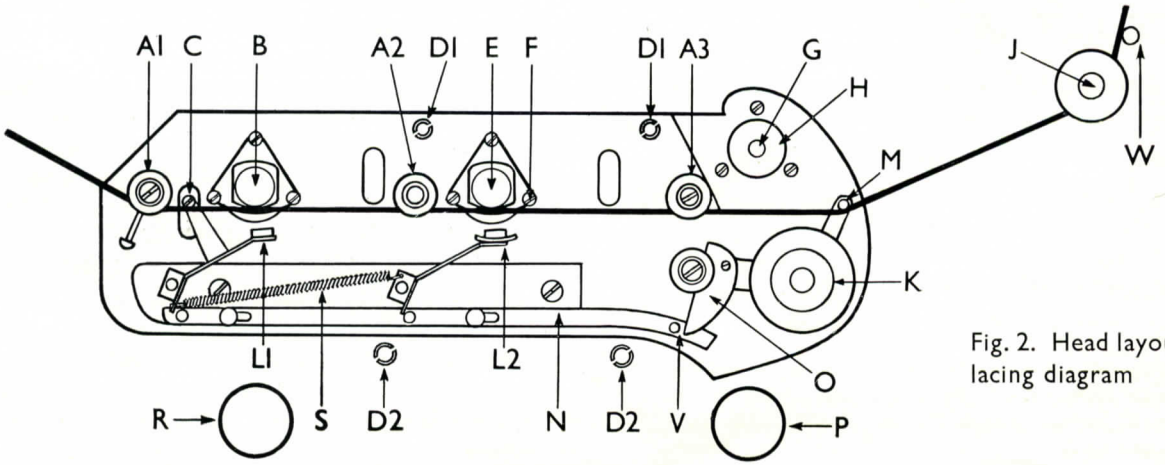


Fig. 2. Head layout and tape lacing diagram

SPOOL RETAINING SCREWS

Screws are supplied for retaining the tape spools on the hubs. Whilst it is not essential to fit these screws when recording, or replaying the tape, they should be used when transporting the machine in order to hold the spools in position.

Should the screws be omitted during fast wind or re-wind, it is inevitable that a certain amount of vibration of the spool will occur.

Adjustable tape guide

In order to enable spools of varied types to be used without the edge of the spool fouling the tape, an adjustable guide is fitted.

Adjust as required by releasing the lower milled circular nut and raising or lowering the guide by rotating the upper portion.

Finally, ensure that the lower locking screw is re-tightened.

Speed-change switch

This three-position switch gives speeds of:

(a) with large diameter capstan sleeve—15, $7\frac{1}{2}$, $3\frac{3}{4}$ i.p.s.

(b) with small diameter capstan sleeve—$7\frac{1}{2}$, $3\frac{3}{4}$, $1\frac{7}{8}$ i.p.s.

This switch does not rotate through 360°. The figures above the switch are for use with the smaller sleeve and the lower with the larger sleeve.

The machine is supplied with the large capstan sleeve in position and the small capstan sleeve fitted to W the supplementary guide pillar.

The sleeves are retained on the capstan shaft with grub screws. Ensure screw is tight, or speed fluctuations will occur. (NOTE: The capstan sleeve should be fixed with the grub screw near the deck plate, allowing $\frac{1}{8}$" clearance between end of sleeve and deck plate.)

RECORDING SEQUENCE

1 After ascertaining that the mains adjustment plug at the rear of the machine is correctly set to suit your mains voltage, connect the machine to the mains supply and switch on (recorder mains switch is on the same panel of the power unit as the mains adjustment plug).

2 Fit reel of tape to left-hand (feed) spoolholder and lace the tape as per diagram (Fig. 2) to the empty take-up spool (right-hand), ensuring that the " sensitive " side of the tape faces the heads. (Most tapes have a " glossy " side and a " dull " side—it is the " dull "-side which is coated with iron oxide and is the sensitive side).

3 Select recording speed and adjust the frequency correction switch (B, Fig. 1) to match. (The faster the tape speed the

better the recording quality. If quality is not so important, then a lower speed may be used to allow longer recording periods per tape.)

4 Insert microphone jack plug into microphone input socket or, if recording from radio, couple the radio to the radio/gram socket. (See special note regarding gramophone pick-ups in " Hints for Improving Recording " section.)

5 Switch amplifier to record and adjust the volume control until the loudest (peak) signal from radio or microphone causes the magic eye bars to just meet or, if a meter is fitted in lieu of eye (see note on zeroing meter in the Glossary—" Modulation Level Indicator ") until the needle rises to " 7 " on the dial (i.e. to the left-hand edge of the red portion of the scale).

6 Note the position of the volume control and then turn it fully anti-clockwise to minimum.

7 Now depress the button near the deck record/playback switch and turn this switch to the " Record " position.

8 Advance the volume control to position noted in 6 and recording will take place.

If the superimpose control is inoperative, i.e. it is set to allow the erase pressure pad to press the tape to the erase head, any signals which have been previously recorded will be erased. (See note on " Superimposing " in the Glossary.)

10 One may hear the signal being recorded on headphones connected to the monitor socket.

11 As the recording proceeds, one may omit certain items, for example, announcements between musical items in a broadcast, by temporarily halting the tape movement by operating the pause control. (Fade out the signal by turning down the volume control—operate pause control and after releasing this control for the continuance of the recording, advance the volume control to its original setting.)

12 To stop the machine, switch the deck record/playback switch to the central " stop " position.

13 When the whole of the tape has passed to the take-up spool, this reel may be inverted and transferred to the feed side in order that a further recording may be made. (See note on " Twin Track " in the Glossary.)

PLAYBACK SEQUENCE

1 Once a recording has been made it may be replayed any number of times until you decide to erase it. (Erasure is automatically accomplished when another recording is made unless superimposing is in operation.)

2 Place the recorded tape on the feed spool (or if you have just finished a recording session, rewind the tape on to the feed spool) and lace it to take-up spool exactly as for recording purposes.

3 Switch amplifier to playback (playback indicator will light). Turn volume control to minimum. Select speed of deck to coincide with recording speed and similarly set frequency correction switch.

4 Turn the deck record/playback switch to playback. Advance volume control and adjust tone control as required. (The frequency correction switch may be adjusted to any position desired but a " flat " response will be obtained when it is set to the position coinciding with the deck speed.)

5 Should playback be required on an external speaker, simply plug the external speaker into the appropriate socket of the amplifier. (Internal speaker will be automatically disconnected.)

6 An external amplifier may be used with the recorder by connecting it to either the (a) monitor socket and adjusting the recorder volume control to the required level, (b) co-axial socket on the amplifier chassis. The signal at this socket is *not* governed by the recorder volume control. (Normally this socket is used with external high fidelity pre-amplifiers and amplifiers and is situated at the rear to enable unobtrusive connection to be made when the recording amplifier is installed in a " permanent " hi-fi installation.)

If it is desired to mute the internal loudspeaker when operating as (a) above, insert a jack-plug which has a 15 ohm resistor wired across it into the external speaker socket.

WARNING—Do not mute with an open-circuited jack-plug or damage will be caused to the amplifier.

STRAIGHT AMPLIFIER

If the function switch is turned to " Amplifier " the amplifier only will be available for reproducing signals from radio tuner, pick-ups and microphones. It should be noted that when a microphone is used in close proximity to a loudspeaker, " acoustic feed-back " (howling) will occur—therefore always ensure that the microphone and speaker are a considerable distance apart.

Hints for improving recordings

MICROPHONES

Seldom is any one type of microphone suitable for every circumstance and we recommend they be used as follows:

Ribbon: For high quality " live " musical recording (indoors).

Dynamic (moving coil)—For indoor and outdoor use: speech, music, etc.

Crystal—Principally for speech recordings.

RECORDING FROM MICROPHONE

Avoid placing the microphone near the motor of the tape recorder. We do not recommend that the microphone be placed on the same table as the tape recorder when recording. Earth the machine if the microphone is used with a longer cable than that supplied. This will avoid excessive A.C. hum. Only use screened extension cables (co-axial cable as used for TV aerial leads is suitable). Always ensure that microphone cable is correctly connected to the jack plug—broken leads or reversed connections will give loud hum. If a low impedance microphone is used a matching transformer will be required.

Do not rub the hand or fingers on the case of a microphone whilst recording otherwise " noise " will be recorded.

Endeavour to persuade people to speak one at a time and not as a group because a microphone records all it " hears " and cannot discriminate as can the human ear.

RECORDING FROM RADIO

The best recordings will be obtained from FM-VHF transmissions. Do not record from a radio receiver by means of a microphone if one of the following methods can be employed:

(a) Record from extension speaker socket of radio receiver.

(b) Record from the diode output of the radio receiver. Your radio may require modification if no diode output socket is fitted. Your local dealer can advise you.

Always use screened cable to couple radio to tape recorder.

Always consult your dealer before using an A.C./D.C. radio or TV receiver which has no extension speaker socket. The recording signal source may require modification to enable the receiver to be used without risk of electric shock.

Always ensure that any plugs or connections are secure otherwise intermittent crackling may be produced.

PAUSE CONTROL

Immediately prior to using the pause control, turn down the volume control. Conversely, revert to normal volume as soon as pause control is released. A little practice will soon enable the user to make recordings of excellent quality at a uniform sound level with all unwanted material omitted.

CARE OF HEADS AND GUIDES

Any accumulation of dirt or oxide particles from the tape will prevent good recordings being made. Periodically, therefore, clean the working surfaces of both heads with methylated spirit applied with a small camel hair brush. Take special care not to scratch the surfaces of the heads. The tape guides and capstan should also be periodically cleaned with methylated spirits to remove oxide deposit. Access to heads and tape guides is available merely by removing the moulded covers.

SELECTING AN EXTENSION LOUDSPEAKER

The choice of a loudspeaker is a very personal thing, and we suggest that the listener should endeavour to hear a variety of makes (within his price range), in use with the tape recorder.

If the speakers can be heard within the listener's own home, so much the better, as room acoustics must be taken into account.

RECORDING FROM GRAMOPHONE PICKUP

It should be borne in mind that modern gramophone discs are deliberately recorded with an attenuated (reduced) bass response and an accentuated treble response compared with the original sound.

Therefore, if satisfactory tape recordings are to be made, suitable frequency compensation must be incorporated between the gramophone pick-up and the tape recording amplifier to reverse the disc's recording characteristics.

Such frequency compensation circuits are incorporated in high fidelity pre-amplifiers and those people possessing such equipment should record from gramophone discs only after the signal has passed through their hi-fi pre-amplifiers.

PICKUPS

Disc recordings from domestic radiograms should be taken from the extension speaker sockets of the radiogram in order to take advantage of any frequency correction circuits incorporated therein. Should your radiogram or record player NOT have extension speaker sockets, do not attempt to use it in conjunction

with your tape recorder before consulting a qualified electrician or dealer. Many record players are dangerous to use unless fitted with isolating transformers to prevent electrical shocks.

Most manufacturers of gramophone pick-ups will supply, on request, details of frequency correction circuits for use with their products—and to avoid any misunderstanding, one should quote the sensitivities and impedances of the amplifier with which a pick-up is to be used when applying for information. In the case of the Brenell Mark 5 Series 2, quote:

" 2 mV into 1 megohm "

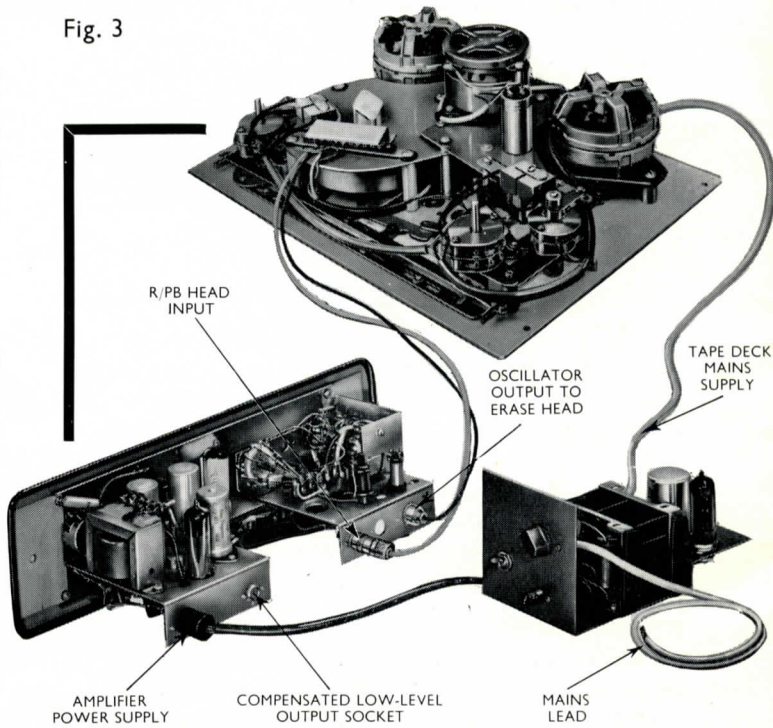
and " 80 mV into 220 k ohms."

Please note that permission must be obtained from the gramophone record manufacturer *before* tape recordings are made from discs. Failure to obtain permission is a breach of copyright.

When stopping the tape, the re-wind switch must be brought **quickly** to the central position in order to allow instantaneous action by both brakes.

(*An alternative method is to switch*—**very quickly indeed**—*from the re-wind to the wind position (or vice versa), thus transferring the power from one motor to the other and achieving a gradual slowing down of the tape, then, just as the tape movement is about to change, turn the switch to the central 'stop' position. This method requires a little practice but is mentioned at the request of a number of people, who, having learned to use it, prefer it to the abrupt arresting of the tape movement.*)

Fig. 3



Incorporating the Mark 5 Series 2 Recorder into a permanent Hi-Fi installation

The Mark 5 Series 2 tape recorder is often sold in the three main units:

tape deck
amplifier
power unit

for use with, and for installation into, a high fidelity console.

As all three units are coupled together by means of non-reversible plugs and sockets (no soldering required) the addition of tape recording facilities to exising equipment is greatly simplified.

DECK MOUNTING (Mask size $15\frac{1}{2}'' \times 12''$)

The tape deck should be mounted HORIZONTALLY for best results.

An aperture of $14'' \times 10\frac{1}{2}''$ in a mounting board will allow the deck to " drop through " until the deck plate rests on the board. Rubber grommets or other rubber cushioning should be fitted between the deck plate and the mounting board.

(Before actually mounting, remove the mask from the deck to gain access to the four holes for fixing purposes.)

The deck should be mounted approximately $\frac{1}{4}''$ clear of the board to facilitate ventilation. Clearance below the deck plate must be at least 5".

$8\frac{1}{4}''$ reels of tape will overlap the deck plate
$1\frac{3}{4}''$ to the rear and
$1\frac{1}{4}''$ on both sides.

AMPLIFIER MOUNTING (Mask size $15\frac{1}{2}'' \times 4\frac{1}{2}''$)

An aperture $12\frac{1}{2}'' \times 4''$ will enable the amplifier to " drop through " a mounting board until the mask rests on the board.

Fixing is by means of two screws through the mask.

The amplifier may be mounted at any angle.

POWER UNIT MOUNTING

The power unit is separate from the amplifier in order that it may be sited to induce the minimum A.C. hum into the heads and the

amplifier. Therefore, after mounting the deck and amplifier, the three units will be coupled together, a loudspeaker attached and the power unit moved around until the position for minimum hum is found. (See note on " Hum.") Fixing is then accomplished by means of screws through the holes provided.

HUM

It should be noted that hum may be introduced from:

a mains transformer

" earth " loops

and therefore certain precautions must be taken and experiments made should excessive hum be encountered.

Hum from mains transformers may be introduced into:

the tape heads

the recording/playback amplifier

the cables from heads to amplifier

the cables carrying the signals to and from the amplifiers.

The Mark 5 Series 2 power unit has a special low A.C. radiation mains transformer. Before screwing the unit into a permanent position the deck, amplifier and power unit should be coupled together (deck and amplifier in permanent positions), and a loudspeaker plugged into the amplifier.

Now connect the equipment to the mains supply, switch the amplifier to playback and set the volume and tone controls to maximum.

Adjust the humdinger on the power unit for minimum hum—if no definite position can be ascertained, set it mid-way. Move the power unit (being careful not to touch any components or a shock may be received) to a position in which the minimum hum is heard from the loudspeaker, then screw the power unit down in this position. (If this position is inconvenient for the operation of the mains switch, put the switch to the " ON " position and instal another switch in a more convenient position, such as on the deck mounting board.)

Now switch on the main amplifying equipment you will be using with the tape recording equipment and listen for hum in the speaker connected to the playback amplifier. Should the hum level rise with the switching on of the main amplifying equipment, it will be necessary to move the unit in which the mains transformer is situated (or move the tape deck and/or amplifier).

COUPLING AMPLIFIER TO HI-FI EQUIPMENT

The co-axial socket on the rear of the Brenell amplifier should be coupled to the appropriate input socket of the hi-fi pre-amplifier using good quality co-axial cable.

It should be noted that the signal from the co-axial socket is frequency corrected and must *not* be fed into a " tape input " socket in the hi-fi pre-amplifier which is designed for direct connection to a *tape head*. If the only socket marked " tape " is unsuitable,

couple to the " extra " or " auxiliary " socket designed to receive a " flat " or compensated signal.

Should the strength of the signal from the Mark 5 amplifier be too high and there is not a preset gain control incorporated in the hi-fi pre-amplifier, the signal must be fed via a screened volume control (value 50 k to 100 k ohms) or attenuator.

(a) **To Record**

Follow the earlier instructions on this subject in this booklet, bearing in mind that a signal for recording purposes may be obtained from either the loudspeaker output of the hi-fi amplifier or from the "record" socket of the hi-fi pre-amplifier (most pre-amplifiers have this provision). Microphones will be plugged directly into the recording amplifier.

(b) **To Replay**

Tape recordings may be replayed via hi-fi amplifying equipment by connecting either (a) the co-axial socket or (b) the monitor socket on the Mark 5 Series 2 amplifier to the hi-fi pre-amplifier, if the output from (a) is insufficient. Output level of (b) will depend upon the adjustment of the playback amplifier's volume control.

EARTH LOOPS

Hum may be introduced into amplifying equipment by having too many earth potential linking cables and it is therefore sometimes necessary to ensure that only one piece of the installation is connected to the earth terminal of the mains supply installation—one must experiment by removing all earth return leads and connecting one at a time to find which gives the condition of minimum hum.

These tests should be carried out with:

all equipment switched on

tape amplifier linked to external amplifier for playback purposes

volume levels set high, but not at maximum.

The cable used for linking the tape amplifier and main amplifier or pre-amplifier should be a good quality co-axial type as used for TV aerial leads.

The signal from the co-axial socket on the Mark 5 Series 2 amplifier is not affected by the volume control setting of this amplifier and therefore this volume control should be set to minimum.

If the Mark 5 Series 2 amplifier is not used with a loudspeaker, it is **essential** to fit a 15 ohm wire wound resistor as a dummy load in lieu of the speaker. This resistor may be permanently fitted across the extension speaker socket of the tape amplifier, or fitted to a jack plug inserted into the extension speaker socket.

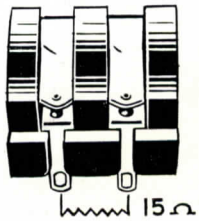


Fig. 4. Socket with resistor fitted

Maintenance

TO CLEAN

For the continued efficient operating of the machine, it is essential to ensure that the heads, pinch wheel and tape guides, are clean and free from tape oxide.

A very thin film of dirt or oxide on the heads will seriously mar the frequency response and reduce the volume level, whilst oxide on the pinch wheel and guides may cause tape slipping—apparent to the listener as a variable change in pitch of the recorded sounds. We recommend the cleaning kit marketed by Messrs. METRO-SOUND M.F.S. Co. Ltd., 19a Buckingham Road, London, N.1, and known as KLENZATAPE. This kit will enable the heads to be quickly and efficiently cleaned.

The tape guides and pinch wheel should be cleaned with methylated spirits, but care should be taken to prevent this spirit being spilt on the plastic head covers. Methylated spirits may also be used on a lightly dampened linen cloth for cleaning the heads.

REMOVAL OF AMPLIFIER

Two domed screws F1-F2 (Fig. 1) are used to hold the amplifier in the cabinet, and the removal of these screws will enable the amplifier to be lifted from the cabinet for examination and, if necessary, operation whilst " live."

Do not disconnect the amplifier from the power unit unless the mains switch is OFF otherwise excessive voltage will build up in the power unit and damage will occur.

REMOVAL OF DECK

The deck is covered by a steel mask which must be removed to gain access to the four bolts which clamp the deck to the mounting brackets.

DO NOT remove the four screws from the sides of the cabinet—these screws retain the deck mounting brackets in position. The mask may be lifted from the deck after removal of the deck knobs, adjustable guide, plastic head covers and the two small screws near the spoolholders. When lifting the deck, care should be taken to avoid damaging the cables coupling amplifier and deck.

REMOVAL OF POWER UNIT

After removal of the amplifier and deck, the power unit will be

readily accessible and may be entirely removed from the cabinet by removing the clamping screws. (Be sure to replace spacers when refitting.)

The power unit must not be operated unless loaded by the amplifier, otherwise high voltages will build up and cause damage.

OILING

The motors, flywheel, idler wheel and pinch wheel are fitted with the " oilite " oil-retaining bearings and therefore will seldom require oiling. Not more than one drop of thin machine oil will be needed to each bearing per 1,000 hours' use.

Oil must not be allowed to contaminate the rubber tyres of the idler and pinch wheels.

Oil on the periphery of the flywheel will cause the tape speeds to become erratic.

BRAKES

Mechanical braking is employed; cork-lined levers act upon the spoolholder drums.

BRAKE ADJUSTMENT

Should tape spillage occur (when using reels of equal size) check adjustment of brakes, which should be as follows:

With rewind and record/playback switches to " STOP," adjust the gap between brake levers and the 4 B.A. adjustable screws in actuating bar, to $\frac{1}{32}$".

Adjustment of these screws can be carried out after releasing the lock-nuts. Always tighten lock-nuts afterwards.

Should spillage occur when the gap is correct, shorten the brake spring by approximately $\frac{1}{4}$".

(NOTE that when using reels of unequal size, centrifugal forces will be unequal and tape spillage may occur.)

STABILISER BRAKE

This is a small brake which operates on the feed-spoolholder drum to stabilise the tape feed on record and playback.

It is essential that this brake should have very light pressure on the feed spoolholder otherwise the wow content will rise as the tape nears the centre of the reel.

The pressure should be just sufficient to prevent a full reel of tape unwinding jerkily during record and playback.

MOTORS

Three motors are employed on the Mark 5 Series 2 deck—hysteresis synchronous type for driving the capstan, 5 watt shaded pole for rewinding, and 3 watt shaded pole for take-up.

MOTOR TEMPERATURE

These motors are designed to operate at high temperatures—50°C plus ambient.

SPEED CHANGE SWITCH

This three-position switch gives speeds of:

(a) with 1" diameter capstan sleeve—15, $7\frac{1}{2}$, $3\frac{3}{4}$ i.p.s.

(b) with $\frac{1}{2}$" diameter capstan sleeve—$7\frac{1}{2}$, $3\frac{3}{4}$, $1\frac{7}{8}$ i.p.s.

(See note on " Capstan sleeves.")

Important: should the user desire to dispense with the 15 i.p.s. and permanently use the small capstan sleeve, giving speeds of $1\frac{7}{8}$, $3\frac{3}{4}$ and $7\frac{1}{2}$ i.p.s., the cable between speed switch and resistor R81 should be removed; this will enable the take-up motor to operate at a lower temperature in the highest speed position.

(NOTE: At 15 i.p.s. full mains power is applied to the take-up motor to give faster initial take-up and prevent tape spillage.)

CAPSTAN SLEEVES

Two sleeves are provided of approximately 1" and $\frac{1}{2}$" diameter. The 1", used in conjunction with speed switch, gives speeds of 15, $7\frac{1}{2}$ and $3\frac{3}{4}$ i.p.s., whilst the $\frac{1}{2}$" is for speeds of $7\frac{1}{2}$, $3\frac{3}{4}$ and $1\frac{7}{8}$ i.p.s.

(See note on " Speed Change Switch ")

The sleeves are retained on the capstan shaft with grub screws. Ensure screw is tight, or speed fluctuations will occur.

(NOTE: The capstan sleeve should be fixed with the grub screw near the deck plate, allowing $\frac{1}{8}$" clearance between end of sleeve and deck plate.)

These illustrations show how simple it is to gain access to all parts of the Brenell Mark 5 Series 2 deck simply by removing the main drive motor plate.

A Take-up motor
C Main drive motor
D 500 ohms 10 watt resistor
F Feed motor
G Suppressor units

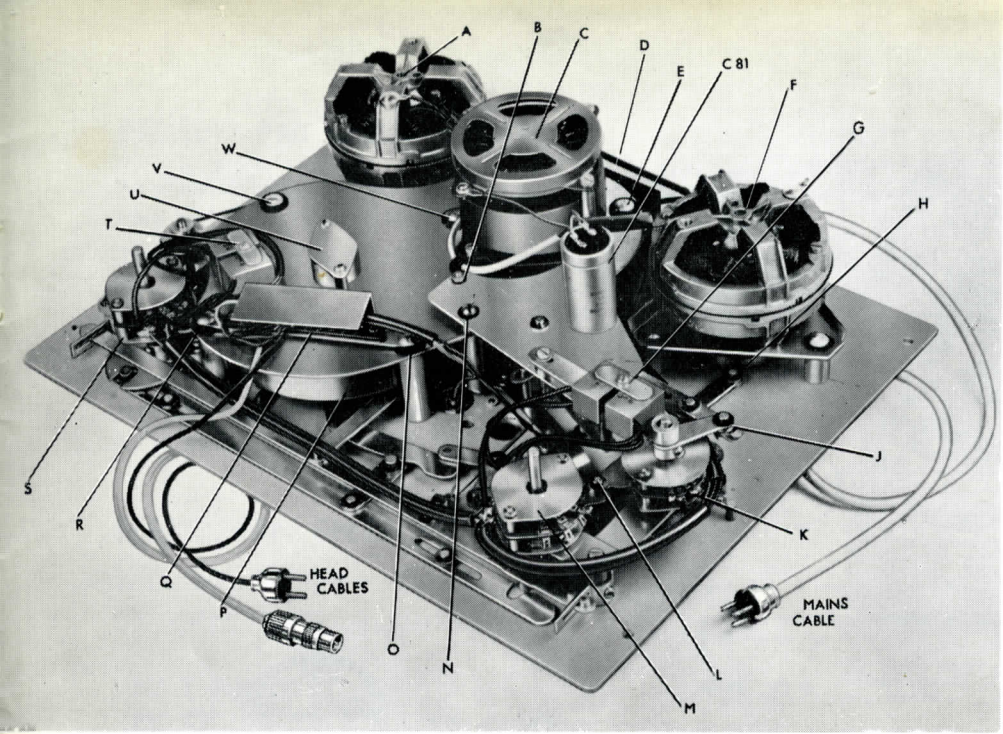


Fig. 5 ▲

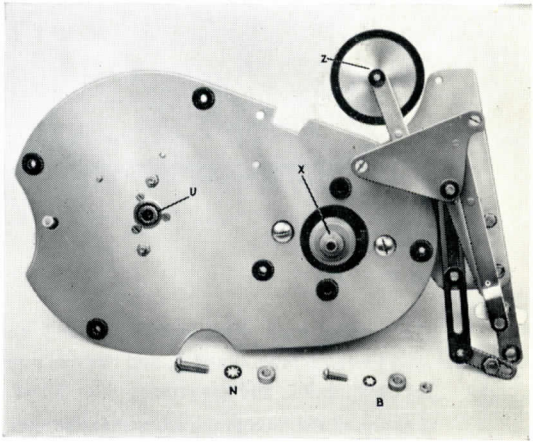
H Mechanical brake
K Speed change switch
M Rewind switch
P Flywheel
Q Head leads, anchoring strip
S Record playback switch
T Suppressor units
U Lower bearing—capstan spindle

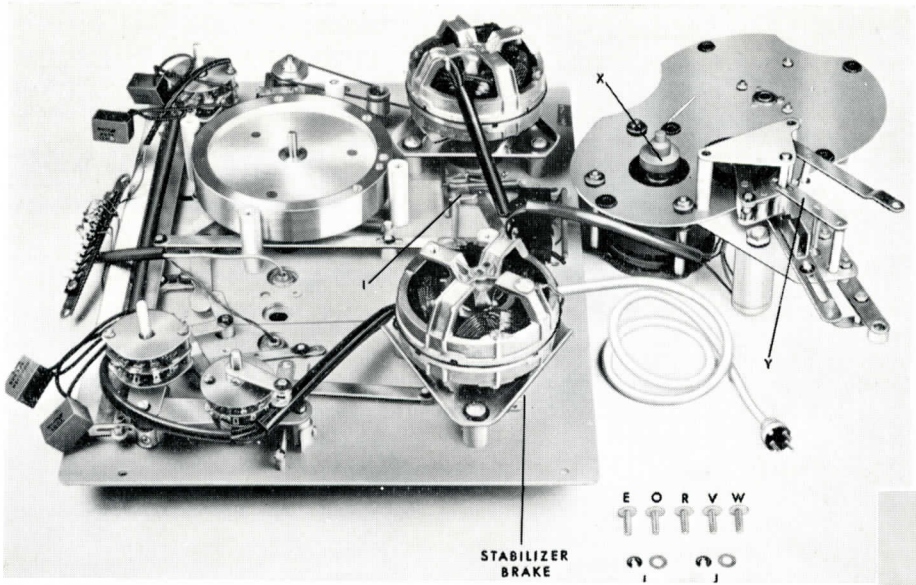
To gain access to idler pulley (Z) remove screws N and B and swing speed-changing mechanism so that idler is clear of motor plate.

X is the stepped pulley.

U is the lower bearing for the capstan spindle.

Fig. 6 ▼

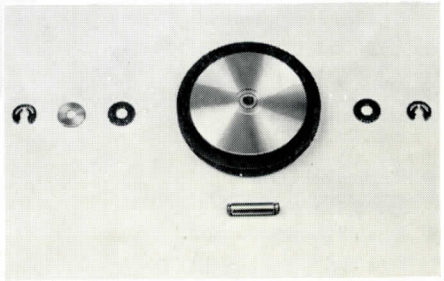




▲ Fig. 7

To extract main drive motor plate and speed-change mechanism (Y), loosen screws G and T, and remove screws E, O, R, V and W, circlips J and L, and suppressor units G and T. See Fig. 5.

I is one of the two brake adjustment screws.



Idler wheel retaining circlips and washer.

▼ Fig. 8

PRESSURE PAD RELEASE MECHANISM

An adjustable crescent-shaped lever (see Fig. 2) controls the movement of the lever releasing the pressure pads (N in Fig. 2).

This is carefully set up before the deck leaves the works, but in case adjustment is required the following setting-up procedure should be adopted:

With 1" diameter capstan sleeve in position, switch to playback and adjust the crescent lever so that when the pressure pads meet the head faces, approximately $\frac{1}{16}$" free movement of the releasing bar is possible (see V on Fig. 2).

ERRATIC TAPE SPEED

Will be caused if OIL is allowed to accumulate on the flywheel, idler or motor pulley.

FAULT FINDING

Loss of top response and/or output from record/playback heads and incomplete erasure:

The above condition can be caused by the tape being unable to make intimate contact with the face of the record/playback head or the erase head owing to a build-up of oxide dust.

REMEDY: Clean head faces with soft, clean cloth dampened with methylated spirits (NOT PETROL). At the same time clean the tape guides, tensioning pins and capstan sleeve.

Check for distortion of pressure pads and/or arms. Check spring tension of arms. The arms should move freely on their posts.

WOW AND FLUTTER

Listed below are some of the possible causes of wow and flutter:

(a) Driving members dirty and/or greasy

(b) Eccentric pinch wheel

(c) Stabiliser brake under too great tension

(d) Idler wheel fouling stepped pulley

(e) Loose capstan sleeve

(f) Tight bearings of flywheel, pinch wheel and/or idler.

REMEDIES FOR WOW AND FLUTTER

(a) Clean with soft cloth dampened with methylated spirits:
the flywheel rim
capstan sleeve
tape guides
head faces
stepped motor pulley.

(b) Change pinch-wheel; avoid contact with oil.

(c) Adjust the pressure of the stabiliser brake to the minimum amount required to prevent the tape spool unwinding in a jerky manner during the record or playback operations. Adjustment is effected by releasing the 4 B.A. fixing nut and resetting the position of the brake lever.

(d) Adjust height of stepped pulley to ensure only one section is operative according to speed in use.

(e) Ensure that fixing screw is tight.

(f) Usually due to dirt—clean and lightly oil the bearings.

Specification

TAPE SPEEDS: $1\frac{7}{8}$, $3\frac{3}{4}$, $7\frac{1}{2}$ and 15 i.p.s.

MOTORS: Three (Synchronous Hysteresis type for driving capstan).

WOW AND FLUTTER:
Less than 0.05% at 15 i.p.s.
0.1% at $7\frac{1}{2}$ i.p.s.
0.15% at $3\frac{3}{4}$ i.p.s.
0.25% at $1\frac{7}{8}$ i.p.s.
Please note, these figures are for Record/Replay and NOT Record only.

RECORD/PLAYBACK FREQUENCY RESPONSE:
15 i.p.s. 40 c/s to over 15 kc/s $\pm$2 dB
$7\frac{1}{2}$ i.p.s. 40 c/s to 14 kc/s $\pm$3 dB
$3\frac{3}{4}$ i.p.s. 40 c/s to 11 kc/s $\pm$3 dB
$1\frac{7}{8}$ i.p.s. 40 c/s to 6 kc/s $\pm$3 dB
Measured at Ext. Amp Socket across 47 k ohm load.

AMPLIFIER RESPONSE: 40 c/s to 20 kc/s $\pm$3 dB.

BASS CONTROL: 9 dB variation at 65 c/s.

SIGNAL/NOISE RATIO: Unweighted—including hum—45 dB.

SENSITIVITIES:
FOR PEAK MODULATION A MINIMUM SIGNAL OF:
MICROPHONE: 2.0 mV (Impedance 1 Megohm).
RADIO: 80 mV (Impedance 220 k ohms).

POWER OUTPUT: 4 watts into 15 ohm loudspeaker.

EXTERNAL AMP OUTPUT: 500 mV across 47 k ohms.

IMPEDANCES:

Input: Microphone, 1 megohm (high).
Radio, 220 k ohms (medium).

Output: Loudspeaker, 15 ohms.
External amp, 47 k ohms.

SOCKETS:

MICROPHONE	Standard Jack Socket.
RADIO	Standard Jack Socket.
MONITOR	Standard Jack Socket.
EXT. SPEAKER	Standard Jack Socket.
EXT. AMPLIFIER	Standard Coaxial Socket.

MONITORING: High Impedance Headphones (2000 to 4000 ohms) may be used for monitoring the recording amplifier.

Note: On playback a voltage of up to 2V (according to setting of volume control) is developed across a 100 k ohm load. This output is suitable for:

(*a*) providing a driving signal to some types of external amplifier.

(*b*) providing a signal for copying purposes on a second recorder.

RECORDING MEDIUM: Standard $\frac{1}{4}$ in. plastic coated tape on reels up to $8\frac{1}{4}$ in. in diameter.

TRACK WIDTH: 0.095 in. displaced to one edge.

TRACK SENSE: To International Standards. (Upper track operative. Tape movement L to R across heads).

NUMBER OF TRACKS: Two.

PLAYING TIMES per reel:

	$1\frac{7}{8}$ i.p.s.	$3\frac{3}{4}$ i.p.s.	$7\frac{1}{2}$ i.p.s.	15 i.p.s.
2,400 ft 7 in D.P. Tape	8 hr	4 hr	2 hr	1 hr
1,800 ft 7 in L.P. Tape	6 hr	3 hr	$1\frac{1}{2}$ hr	45 min
1,200 ft 7 in Std. Play Tape	4 hr	2 hr	1 hr	30 min

(Add 50% to above times for $8\frac{1}{4}$ in reels of tape.)

REWIND TIMES: Approx. 45 seconds per 1,200 ft of tape.

WORKING VOLTAGE: 200-250V 50 c/s
(or to order 100-125V 60 c/s).

POWER CONSUMPTION: 100 watts.

VALVE COMPLEMENT:
1—EF86, 1—EL84, 1—ECC83, 1—EM87, 1—EZ80.

LOUDSPEAKER: 9 in × 5 in High Flux, Elliptical.

CABINET: A specially designed wooden cabinet with excellent acoustic properties giving high quality from the internal elliptical speaker. Deck and amplifier protected by tastefully designed masks.

FINISH: Grey with chromed fittings.

OVERALL DIMENSIONS: 18 in × 17 in × 9 in.

NETT WEIGHT: 39 lb.

Glossary

AMPLIFIER That section of the tape recorder which is concerned with the amplification of sound. When the function switch is turned to the " Amplifier " position the Brenell tape recorder amplifier can be used quite independently to amplify signals from a microphone, gramophone pick-up or radio tuner.

ERASE All material previously recorded on a tape is automatically removed (or " erased ") magnetically when new material is being recorded. Should a portion of tape require erasing without further recording taking place, simply operate the instrument in the " Record " position with the volume control set at minimum.

FEED SPOOL The spool from which tape is removed as the recording or playback proceeds.

FREQUENCY CORRECTION Compensation (electronic) within the amplifier to enable tapes to be recorded to an international standard so that they can be played back on machines of different makes without loss of quality.

FUNCTION SWITCH This performs the multiple switching required when the amplifier is used for:

recording

playback

" straight " amplification.

HUMDINGER A device, mounted on the mains adjustment panel, for minimising hum level. Simply adjust for the minimum hum level with volume and bass controls advanced to maximum (amplifier and deck switched to playback.)

Should there be no perceptible change in the hum level, set the control to approximately midway position.

JACK PLUG The special type of plug, usually screened, to enable firm, positive contact at the various input and output JACK SOCKETS.

JACK SOCKET Two input sockets are used for microphone and radio. Two similar output sockets are used for extension speaker and monitoring.

MAGIC EYE The miniature cathode ray tube indicator used for indicating the peak modulation level when recording.

MODULATION When applying a signal to the tape when recording, it is termed " modulating " the tape.

Too great a signal (over-modulation) results in distortion whilst too weak a signal (under-modulation) may be responsible for a noisy background and low volume on playback.

MODULATION LEVEL INDICATOR To assist the recordist, some form of visual indication of peak modulation is necessary. The Brenell Mark 5 Series 2 incorporates the latest cathode ray type of indicator which has been especially developed for this purpose. When recording, adjust volume control until bars meet on PEAK signals. On some models a meter is used in lieu of the magic eye. This meter should be adjusted by means of the " Meter Zero " control to

read " 0 " in the record position of the amplifier (volume control to minimum) before recording commences. Peak recording level will be indicated when the needle rises to " 7 " on the scale.

MONITORING Listening (usually by headphones) to the speech or music during the process of recording.

PAUSE CONTROL A device for arresting the tape movement during recording or playback. By holding button " P " (Fig. 2) forward it will effect a temporary stoppage so that any unwanted material such as announcements may be omitted from a recording taken from the radio. (See notes on " Recording "—11, Page 6.)

PRESSURE PADS The small felt pads used for maintaining the tapes in close contact with the sound heads.

REVOLUTION COUNTER The numbered digital counter enables the easy identification and " logging " of recording items. It is the " re-set " type, the large wheel enabling the counter to be quickly returned to its starting (" 0000 ") position. Recordings can be easily located on the tape by noting the figure indicated on the rev. counter at the time of recording.

SOCKETS

Input sockets: Microphone (sensitivity, 2 millivolts—impedance, 1 megohm)
Radio/gram (sensitivity, 80 millivolts—impedance, 220 k ohms)

Output sockets: External loudspeaker (15 ohms)
Monitor (for headphones 2000/4000 ohms or external amplifier)
Low-level output (from coaxial socket on rear of amplifier for use with external amplifier)

SUPERIMPOSING A switch has been incorporated to enable the tape to be removed from the erase head in order to record a second time without completely erasing the original recording, i.e. to add speech to music, so that a musical background is available. This method is preferable to switching off the erase head supply.

It must, however, be remembered that, in common with all tape recorders fitted with superimposing facilities, the bias for the second recording will act as partial erasure for the first recording and therefore the recording which may be reduced in level should be recorded first, i.e. record the music before the speech.

One should, however, make a habit of returning this switch to normal, immediately after use or recordings which must be erased may be inadvertently retained.

TAKE-UP SPOOL The spool on which the tape is collected after it has passed the sound heads.

TAPE SPEEDS The speed measured in inches per second at which the tape passes the sound heads during recording or replay.

TWIN TRACK The system whereby only half the tape (from centre to upper edge) is used at one time. When the full length of tape has passed before the recording head, the spools should be turned over then reversed from left to right so that the remaining half of the tape can be used.

Brenell

BRENELL ENGINEERING CO., LTD.

1a Doughty Street, London, W.C.1

Telephone: HOLborn 7356 (3 lines)

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