

1592.



For Service Manuals Contact
MAURITRON TECHNICAL SERVICES
8 Cherry Tree Rd, Chinnor
Oxon OX9 4QY
Tel: 01844-351694 Fax: 01844-352554
Email: enquiries@mauritron.co.uk

MARK 5 TAPE DECK

INSTALLATION, OPERATING AND SERVICING INSTRUCTIONS

IMPORTANT

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

VOLTAGE.

This 3-motor, 4-speed Tape Deck is for use on A.C. Mains only—200-250 v. 50 c/s unless otherwise specified.

To operate on D.C. supplies a convertor is necessary.

SIZE.

15" × 11½".

Allow clearance of 1¾" to the rear and 1¼" on both sides to enable 8¼" reels to be accommodated.

Clearance space below main deck plate—approx. 5".

Clearance space above main deck plate—approx. 1¼".

Weight—16 lbs.

MOUNTING.

To be mounted in horizontal position.

An aperture 14" × 10½" will be required ; rubber buffers or grommets should be inserted between the Deck plate and mounting board. These should allow the Deck to be approx. ¼" above board to facilitate ventilation.

MAINS CONNECTIONS.

The 3-core cable (Green Earth) is for connection to the Mains Supply, either direct or via the auxiliary outlet which is usually provided on main amplifying equipment.

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.

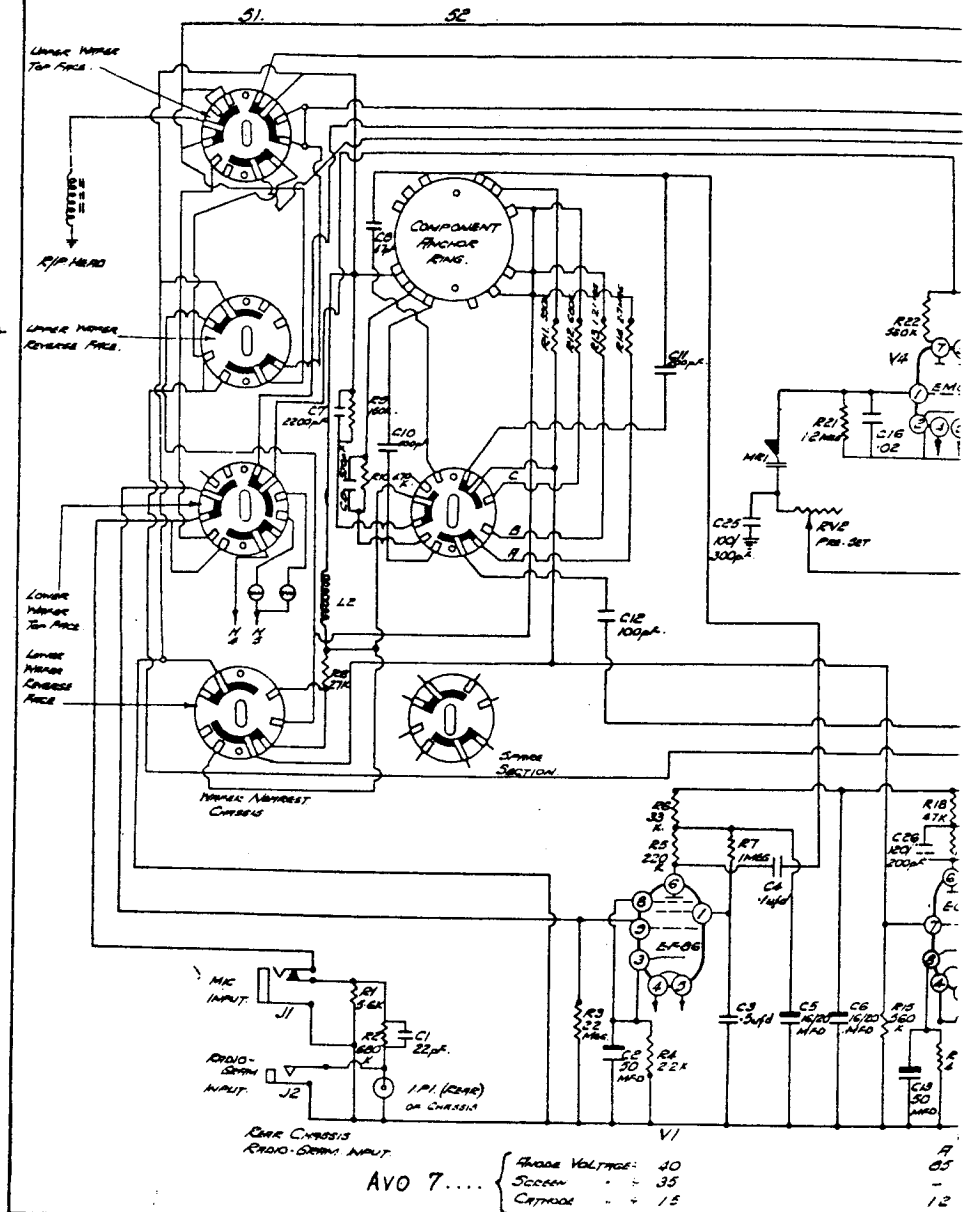
To load Tape, place full reel on left-hand spindle and thread as shown on the diagram (Fig. 1). With the Tape correctly threaded, give the Deck a trial run preparatory to making a recording, thus familiarising yourself with the switching operations.

When the right-hand switch 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

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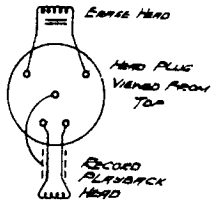
BRENELL RECORD/PLAYBACK AMPLIFIER Mk 5

PLEASE NOTE
 ON SOME MODELS
 R2 MAY BE 150 K Ω

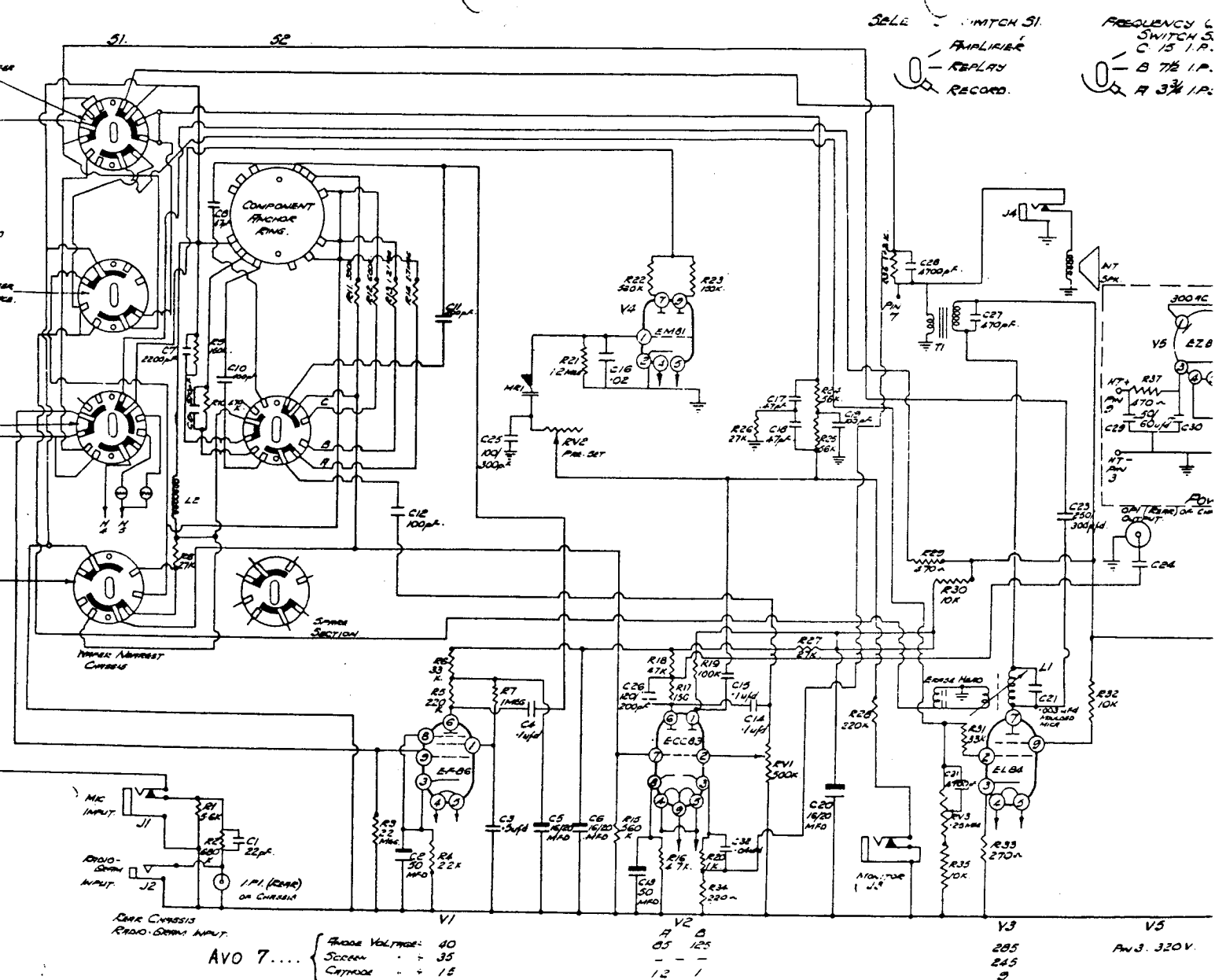


AVO 7.... { Anode Voltage: 40
 Screen: 35
 Cathode: 15

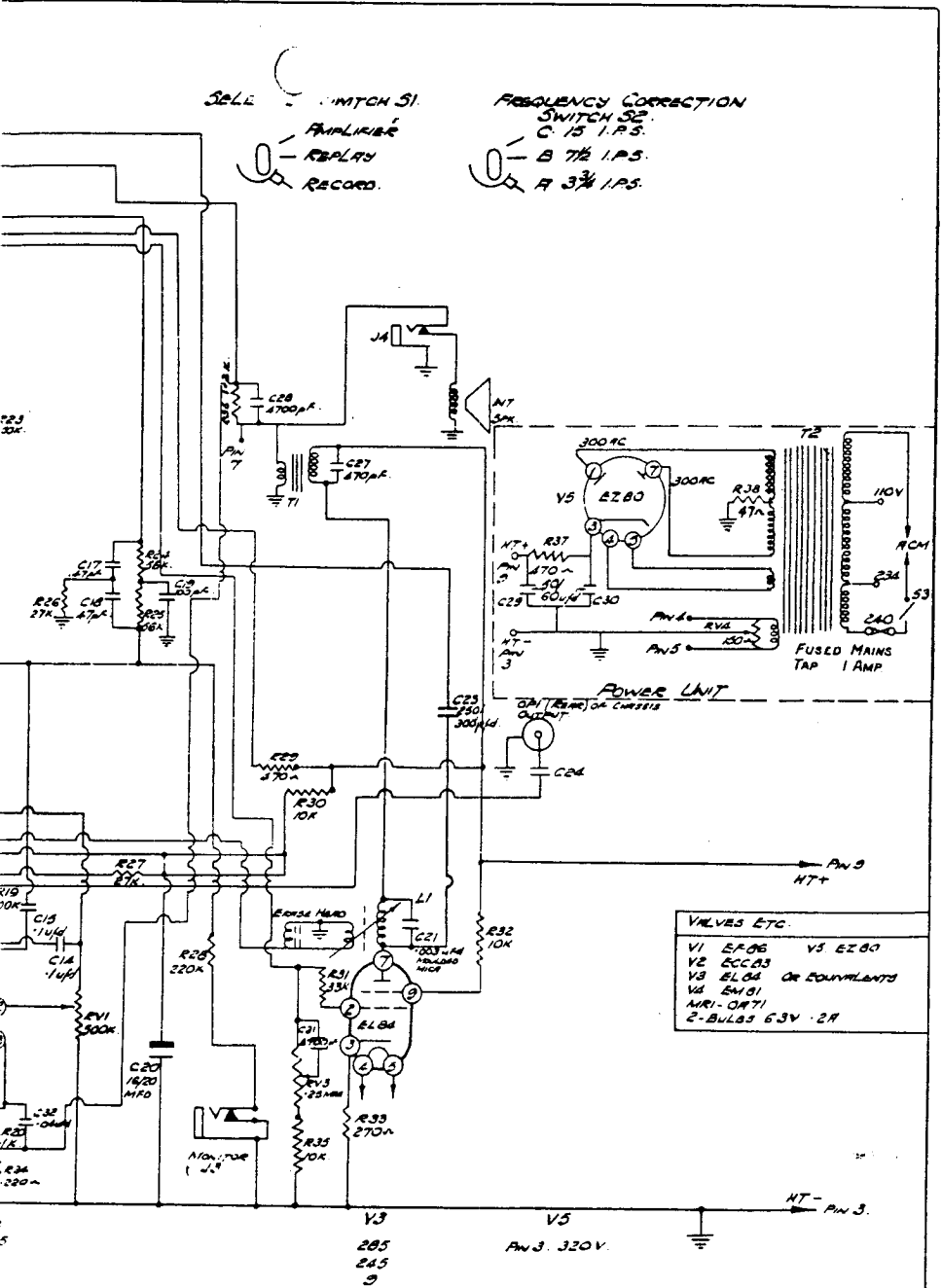
RESISTORS $\pm 10\%$ 1/2 WATT			RESISTORS 1/2 AND 1 WATT		TELETYPE CONDENS.
R1 56K	R16 47K	R28 220K	R4 22K HS/2W	C3 .5 μ F	3.50/500
R2 600K	R7 150K	R9 570 Ω	R5 220K HS/2W+5-10%	C4 .1 μ F	
R3 2.2M Ω	R8 47K	R10 10K	R6 1M Ω HS	C5 .1 μ F	
R4 53K	R9 100K	R11 33K	R7 270 Ω 1 WATT $\pm 10\%$	C6 .1 μ F	
R5 27K	R10 1K	R12 10K	R8 470 Ω	C7 .02	
R6 120K	R11 1.2M Ω	R13 220 Ω		C8 .1 μ F	
R7 470K	R12 500K	R14 10K		C9 .001 μ F/pfd	
R8 300K	R13 150K	R15 12K		C10 .003 MFD/50V	
R9 600K	R14 56K	R16 47 Ω		C11 250/300 pfd	
R10 1.2M Ω	R15 25 27K				
R11 2.7M Ω					
R12 500K					



BRENNEL RECORD/PLAYBACK AMPLIFIER Mk 5



RESISTORS ±10% 1/2 WATT	RESISTORS 1/2 AND 1 WATT	TUBULAR CONDENSERS 350/500 VOLT	SILVER MICR OR CERAMICS 5%	SILVER MICR OR CERAMICS 10%	ELECTROLYTIC	OTHER COMPONENTS
R1 5.6K R2 600K R3 2.2M R4 10K R5 22K R6 10K R7 1M R8 47K R9 10K R10 560K R11 150K R12 56K R13 1.2M R14 2.7M R15 56K	R16 47K R17 150K R18 47K R19 10K R20 560K R21 1K R22 1.2M R23 560K R24 150K R25 56K R26 27K R27 47K	R28 330K R29 570K R30 10K R31 33K R32 33K R33 270K R34 470K	R35 22K HS 1/2W R36 220K HS 1/2W ±10% R37 1M HS R38 270K 1 WATT ±10% R39 470K	C1 22pF C2 47pF C3 570pF C4 47pF C5 200pF C6 100pF C7 100pF C8 1uF C9 1uF C10 1uF C11 1uF C12 1uF C13 1uF C14 1uF C15 1uF C16 1uF C17 1uF C18 1uF C19 1uF C20 1uF C21 1uF C22 1uF C23 1uF C24 1uF C25 1uF C26 1uF C27 1uF C28 1uF	C29 50nF 25VWK C30 160K 250 C31 160K 350 C32 50 12 C33 160K 350 C34 50 350 C35 50 350 C36 50 350	L1 250 OHM L2 250 OHM L3 250 OHM L4 250 OHM L5 250 OHM L6 250 OHM L7 250 OHM L8 250 OHM L9 250 OHM L10 250 OHM L11 250 OHM L12 250 OHM L13 250 OHM L14 250 OHM L15 250 OHM L16 250 OHM L17 250 OHM L18 250 OHM L19 250 OHM L20 250 OHM L21 250 OHM L22 250 OHM L23 250 OHM L24 250 OHM L25 250 OHM L26 250 OHM L27 250 OHM L28 250 OHM L29 250 OHM L30 250 OHM L31 250 OHM L32 250 OHM L33 250 OHM L34 250 OHM L35 250 OHM L36 250 OHM L37 250 OHM L38 250 OHM L39 250 OHM L40 250 OHM L41 250 OHM L42 250 OHM L43 250 OHM L44 250 OHM L45 250 OHM L46 250 OHM L47 250 OHM L48 250 OHM L49 250 OHM L50 250 OHM



SELECT - SWITCH S1
 AMPLIFIER
 REPLAY
 RECORD

FREQUENCY CORRECTION
 SWITCH S2
 C 15 I.P.S.
 B 7 1/2 I.P.S.
 A 3 3/4 I.P.S.

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VALVES ETC.	
V1	6F06
V2	ECC83
V3	6X4 OR EQUIVALENT
V4	6W6
V5	E280
6AR5-OR71 2-BULBS 6.3V - 2A	

SILVER MICA OR CERAMICS 5%	10%	ELECTROLYTIC	OTHER COMPONENTS	HEATERS
C7 2200pF	C1 22nF	C2 50MFD x 25VWK	L1 02C COIL	NT - 3 3/4" SPEAKER PLUS VIEWED FROM UNDERNEATH (PINS)
C8 47pF	C17 47pF	C3 1620 x 350	L2 SPECIAL ADJUSTOR	
C9 5.70pF	C18 47pF	C4 1620 x 350	S1.3 ADJ TON/DUAL SELECTOR	
C10 400pF	C19 1000pF	C5 50 x 12	S2 " 5 - FREQUENCY CORRECTOR	
C11 200pF	C20 100(300pF)	C6 1620 x 350	S3 SINGLE POLE OR DP SWITCH	
C12 100pF	C21 470pF	C7 50 x 25	S4 2.314JACK SOCKETS	
C13 10000pF	C22 4700pF	C8 50 x 25	S5 2.314JACK SOCKETS	
	C23 4700pF		S6 2.314JACK SOCKETS	
	C24 4700pF		S7 2.314JACK SOCKETS	

1592

Bredell ENGINEERING CO LTD
 17, DOUGLAS STREET,
 LONDON W.C.1, ENGLAND

TAPE LACING CHART

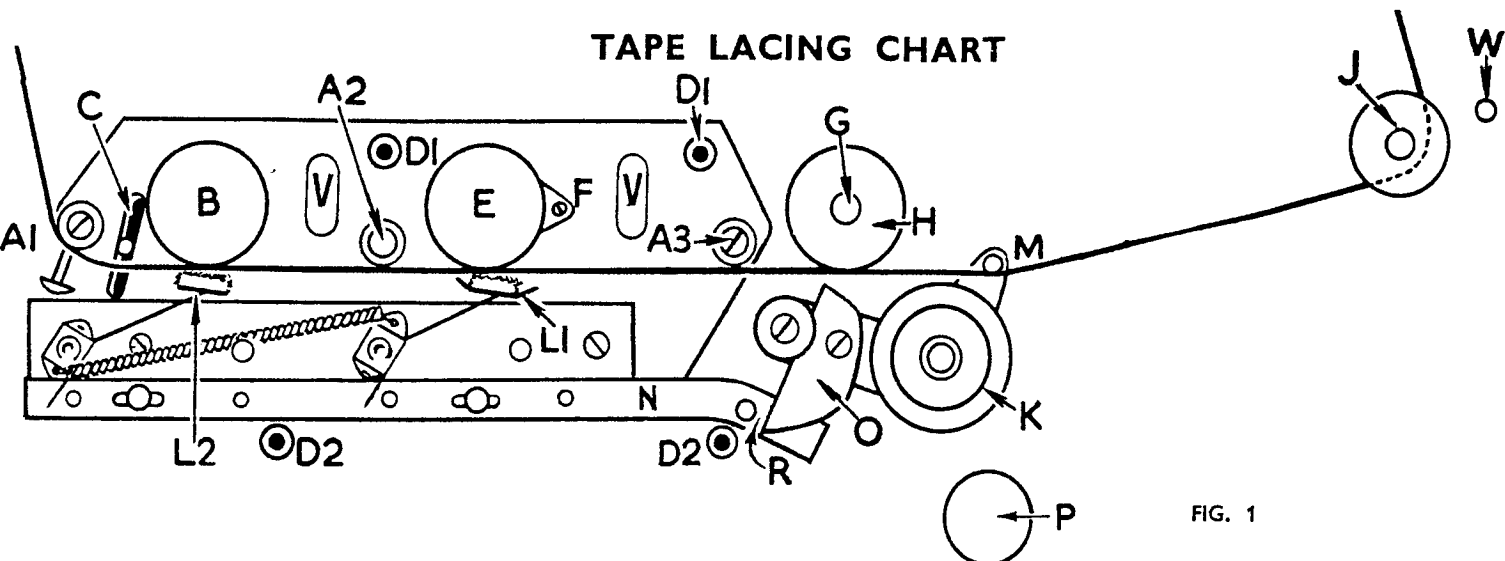
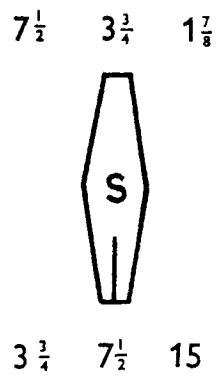


FIG. 1



- | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>A1, A2, A3. Tape Guides.</p> <p>B. Erase Head.</p> <p>C. Tape Contact Release Pin.</p> <p>D1. Retaining Post for upper half Head Cover.</p> <p>D2. Retaining Post for lower half Head Cover.</p> <p>E. Record/Playback Head.</p> <p>F. Azimuth adjustment Screw.</p> <p>G. Capstan shaft Sleeve.</p> <p>H. Sleeve.</p> <p>J. Adjustable Tape Guide.</p> | <p>K. Rubber Pinch Wheel.</p> <p>L1, L2. Pressure Pads.</p> <p>M. Take-up Pin.</p> <p>N. Pressure Pad operating lever.</p> <p>O. Crescent-shaped lever.</p> <p>P. Pause Control.</p> <p>R. $\frac{1}{8}$" free movement.</p> <p>S. Speed Change.</p> <p>V. Mounting slots for extra heads.</p> <p>W. Supplementary Guide Pillar.</p> |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Fig. 1

size of Capstan Sleeve in use and the setting of the speed switch. The left-hand knob is for re-winding or winding on the tape at high speed, and will only operate if the Record/Playback switch is in its STOP position.

MOTORS.

Three motors are used, and as these are fitted with oil-impregnated bearings, oiling is unnecessary before 1,000 hours use. Thin machine oil is the type recommended when oiling is undertaken.

MOTOR TEMPERATURE.

These motors are designed to operate at high temperatures—50°C. plus ambient—but it is advisable to provide adequate ventilation by : (a) raising Deck above mounting board by $\frac{1}{4}$ " , and (b) providing air intake vents at base and rear of cabinet.

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.

PLEASE 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.

RECORD/PLAYBACK SWITCH.

(Fitted with Suppressors)
Transfers mains supply to main drive and take-up motors, moves pressure pads and pinch wheel into position and releases the brakes.

Before switch can be operated in "Record" position it is necessary to press the small release button situated to the left of the knob. An additional wafer can be added to this switch.

REWIND SWITCH.

(Fitted with Suppressors)

Transfers mains supply to either the feed or take-up motors for rapid winding in either direction. Also releases brakes from spoolholder drums and operates lever to move tape away from heads to eliminate head wear during rapid winding.

SPOOLHOLDERS.

The die-cast spoolholders are retained on the motor spindles by means of 4 B.A. screws. The height of the spoolholders is maintained by means of 2 B.A. grub screws, which are inserted down the centre shafts until contact is made with the ends of the motor spindles. Shellac can be used for resealing the screws. Care should be taken not to damage the drums, otherwise the efficiency of the braking system will be impaired.

On the take-up spool a pulley is incorporated for driving the Revolution Counter.

REVOLUTION COUNTER.

A digital Revolution Counter is fitted to enable the rapid location of recordings. It is coupled to the driving pulley of the take-up spoolholder by means of plastic or rubber belts.

SPEED CHANGE SWITCH.

This 3-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 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.)

PAUSE CONTROL.

Provided to enable instant temporary stoppage of tape transport during recording or replay. It removes pinch wheel pressure and applies brake to feed spool.

HEADS.

Provision is made for the accommodation of four heads, mono or stereo, although for normal use, only two heads, upper track erase and upper track record playback, are required. Details of special heads are available on request.

HEAD ASSEMBLIES

Showing details of springs and pressure pads.

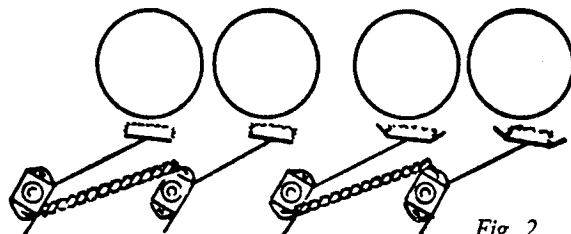


Fig. 2

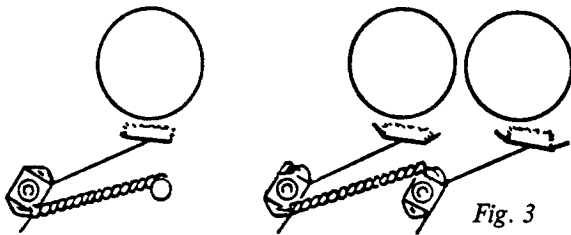


Fig. 3

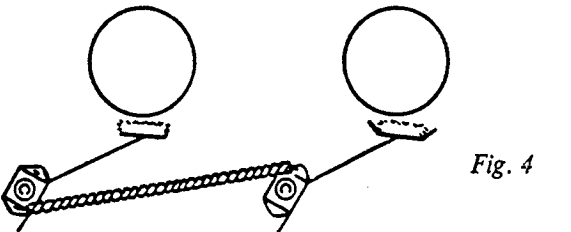


Fig. 4

These illustrations show how simple it is to gain access to all parts of the Brenell Mark 5 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 ; 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.

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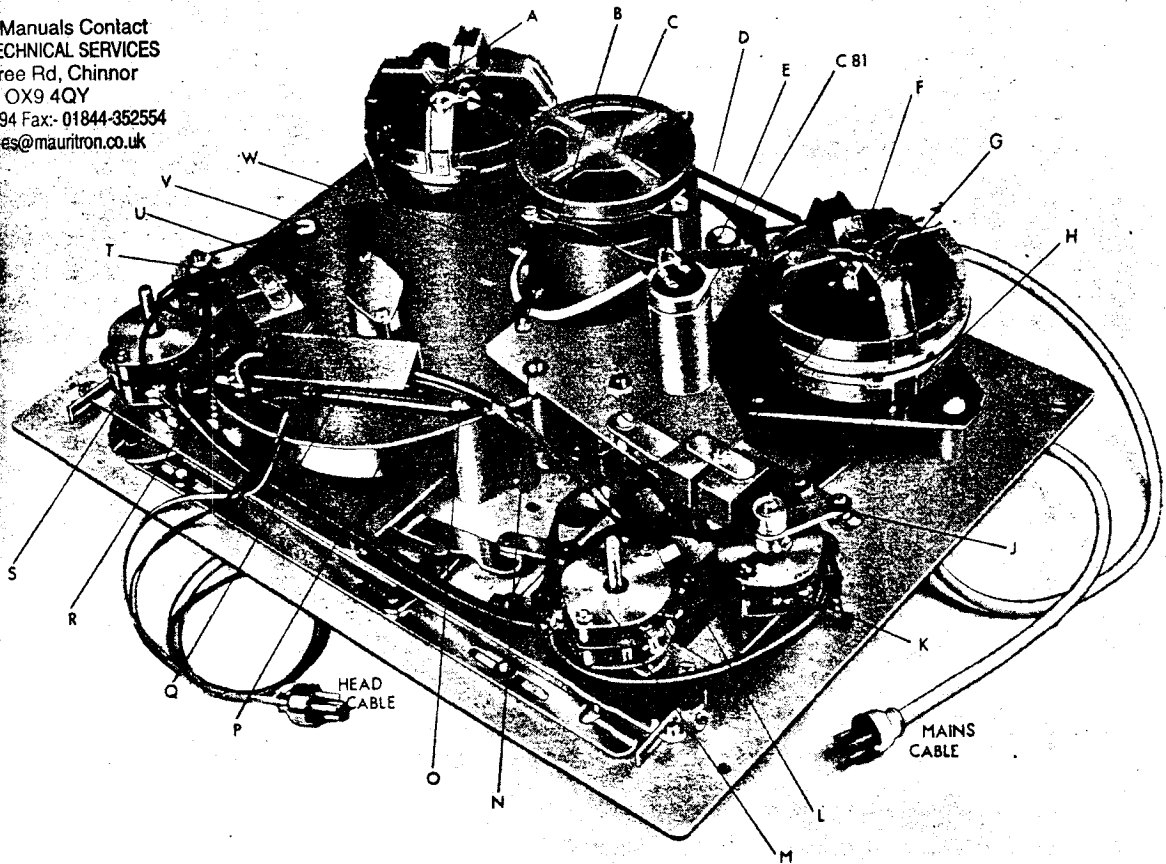
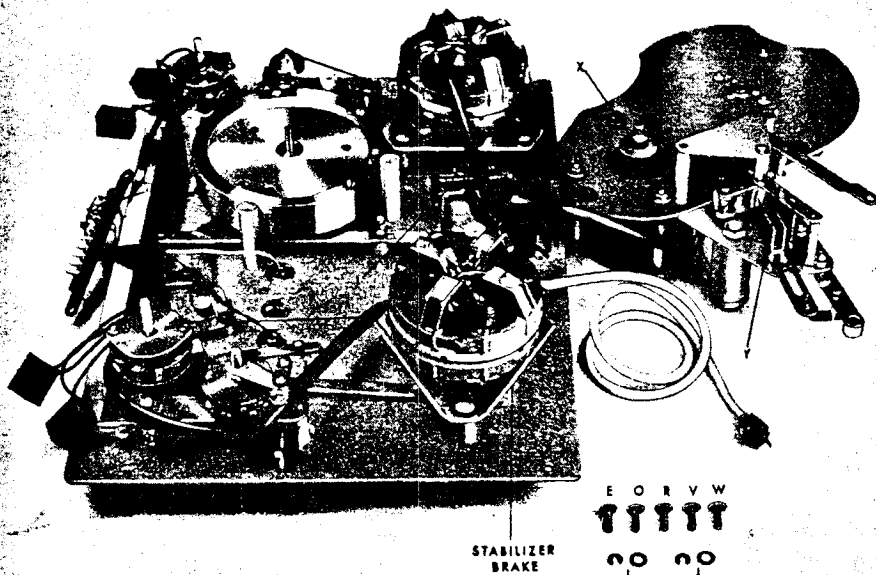


Fig. 5



▲ 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. I is one of the two brake adjustment screws.

Fig. 6

Fig. 7

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.

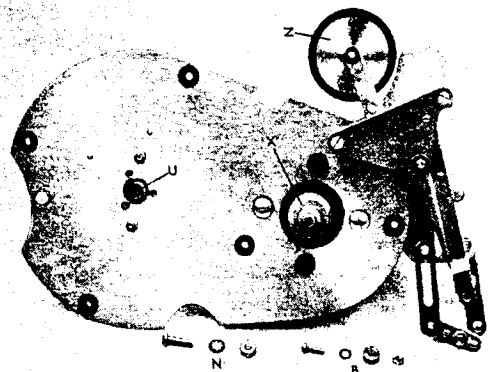
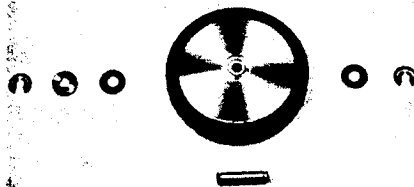


Fig. 8

Idler wheel retaining circlips and washer.



Specifications of Standard $\frac{1}{2}$ track heads :—

ERASE HEAD.

Inductance 1.5 mH.
Low Impedance.
D.C. Resistance 0.5 ohm.
Impedance 45 Kc/s, 350 ohms.
Erase Power required 2—2.5 watts.
Erase Voltage—approx. 30 volts.
Erase Gap 0.005".

RECORD/PLAYBACK HEAD.

Inductance 300 mH.
High Impedance.
D.C. Resistance 60 ohms.
Impedance at 45 Kc/s : 50,000 ohms.
" " 10 Kc/s : 16,000 ohms.
" " 1 Kc/s : 1,800 ohms.
Bias Current 1 milli amp.
Bias Voltage 50 v.
Recording Current 100 micro amps.
R/PB Gap 0.00025".

Specifications of other heads available on request.

HEADS—AZIMUTH ADJUSTMENT.

Maximum output and especially top response can only be obtained if the R/P head is correctly aligned. The vertical or azimuth alignment on the standard R/PB head is adjustable by the 6 B.A. screw which will allow the head to be tilted slightly until the gap is vertical.

To ascertain accurately when the azimuth is correct, a test tape with 8 Kc/s signal at $7\frac{1}{2}$ i.p.s. must be played back, the head being tilted for maximum output : this output should be observed on a suitable meter.

HEAD REMOVAL OR ADDITION.

Should it be necessary to remove heads, or if it is desired to add further heads, it should be noted that the heads are clamped to an easily detachable head mounting plate. This plate is held in position on the deck by six screws (two in the pressure pad assembly, the two posts which take the clip on section of head cover, and the two screws which also retain the tape guides) (see Fig. 1).

The Standard Erase and R/PB head leads terminate at a tag board and it should be noted that the Erase head has two unscreened leads whilst the R/PB cable is 'twin' screened. The screened lead is not earthed within the head and is not intended to be earthed until it connects with the earthing system of the Tape Record/Playback amplifier—or Tape Pre-amplifier.

The twin cables are likewise not earthed, so should a co-axial cable be used to extend these cables, it is permissible to couple either internal lead with the screening of this cable.

(NOTE :—Lowest hum will be experienced if these cables are extended in TWIN SCREENED LEAD. To prevent accidental erasure, the Erase head is short circuited in the STOP and Playback positions.)

PRESSURE PAD RELEASE MECHANISM.

An adjustable crescent-shaped lever (see diagram Fig. 1) controls the movement of the lever releasing the pressure pads—(N in diagram).

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 $\frac{1}{8}$ " free movement of the releasing bar is possible (see R on Fig. 1).

FAULT FINDING.

Loss of top response and/or output from Record/Playback heads and incomplete erasure :

(a) The above condition can be caused by the tape being unable to make intimate contact with the face of the R/PB 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.

(b) Check for distortion of pressure pads and/or arms. Check spring tension of arms. The arms should move freely on their posts and the pads should enter the slots in the head covers without fouling the edges.

The lubricant most suitable for pressure pads is a quick drying colloidal graphite.

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 :—

- (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 to be operative according to speed in use.
- (e) Ensure that fixing screw is tight.
- (f) Usually due to dirt—clean and lightly oil the bearings.

SPECIAL NOTE.

When the Mark 5 Deck is used with the Brenell Mark 5 amplifier and power unit, connection is made via a 5-pin plug (head connections) and a 3-pin plug (mains). For stereo use, two Mark 5 amplifiers and power units will be required.

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**Deck
 Wiring
 Diagram.**

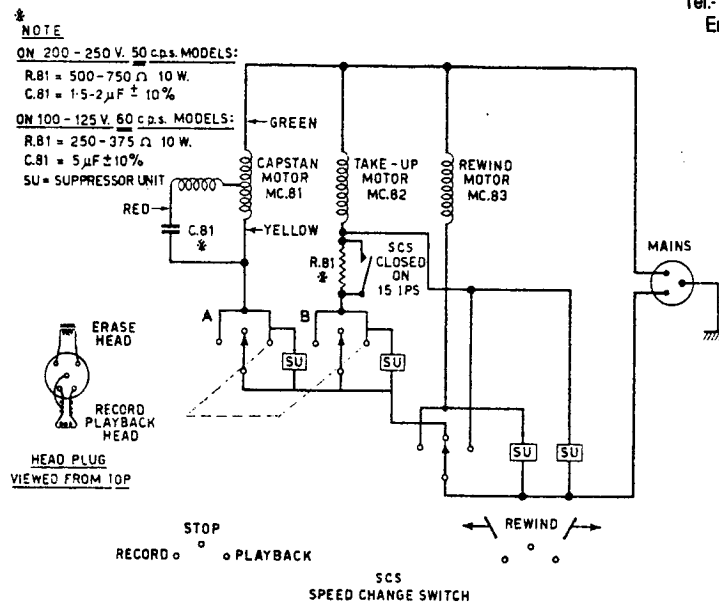


Fig. 9

Sole Manufacturers

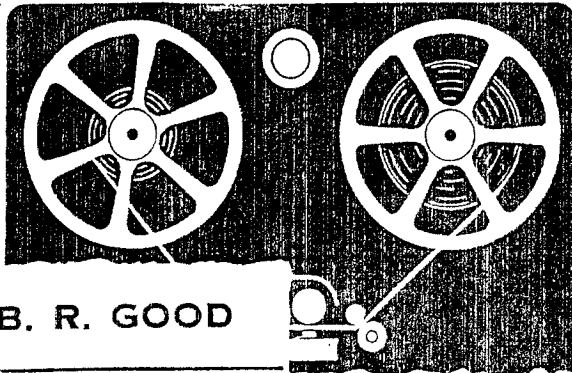
Brenell Engineering Co. Ltd.

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

Telephone : HOLborn 7356 (3 lines)

Servicing the MODERN TAPE RECORDER

PART SIX OF A NEW SERIES BY B. R. GOOD



IN a series of this nature it is impossible not to be selective. There is a host of machines on the market, many by makers that no longer produce, others that have been superseded, some new models by makers that change their style as often as the auto designers. Nothing is constant—and space precludes our noticing them all. We are forced to spotlight particular models.

These have been chosen, in previous articles, because they are either representative of the general run of a manufacturer's line, or because they illustrate a particular feature of design.

This time we pick on a group of machines that earned the acclaim both of the "popular" critics and the more discerning enthusiasts. Machines that are a little more complicated than some previously discussed, a little closer as to tolerance, a little more exact as to specification—perhaps a little harder to service—with the compensating factor that they are less often in need of it.

BRENELL MODELS

The Brenell 3-Star and Mark 5 Tape Recorders are similar in many respects, but have some important differences. Whereas the former is a general-purpose instrument, three-speed, push-button operated, with a single motor, the latter has a top speed of 15 i/s in addition to the standard three speeds (7½, 3¾ and 1½ i/s), uses a different mechanical system, operated by individual knobs, has three motors, and incorporates the Unit Assembly system, which certainly facilitates servicing.

It should be noted that the Mark 5 deck has been incorporated in a number of other instruments, and has been the basis of several ambitious audio rigs.

The Three-Star

The rather complicated sketch shown at Fig. 1 is an attempt to outline the salient points of the deck, including only those mechanical features relevant to our service problems. In practice, the lever system of this deck is very straight-

forward; the diagram is intended merely to show the drive system and principal moving parts.

Both motor and flywheel are mounted on a separate, palette-shaped sub-plate, and in consequence are drawn chain-dotted. The view is from below the main deck.

A stepped pulley, A, on the motor spindle drives the take-up spool B, via a plastic belt. This pulley has a brake drum as its lower section, held by a grub screw. Faulty take-up can be caused by this grub screw working loose.

The clue is that the rev. counter, C, will still be operating, being driven by the same pulley, via a thin rubber belt.

Faulty take-up with the rev. counter also erratic may be the result of the swivel bracket, D, being loose.

This is held in tension by spring E, shown end view, and provides clutch action. Excessive tension of spring E will cause the clutch action to become too stiff when the pause control is operated.

The flywheel F is driven by idler wheel G, which is held in engagement with A and F by spring H. The idler is mounted on the speed change bracket and raised or lowered by the rotary action of cam or pulley J. A set of cogged drive levers lie beneath this assembly (nearer the deck plate).

Rewind is obtained by engagement of idler K with the motor pulley. Note the spring k, at the outer end of the swivel arm, which transmits the movement of the main bar to the idler wheel. A belt drives the reservoir spool drum, L, from the idler wheel pulley.

(Continued overleaf)

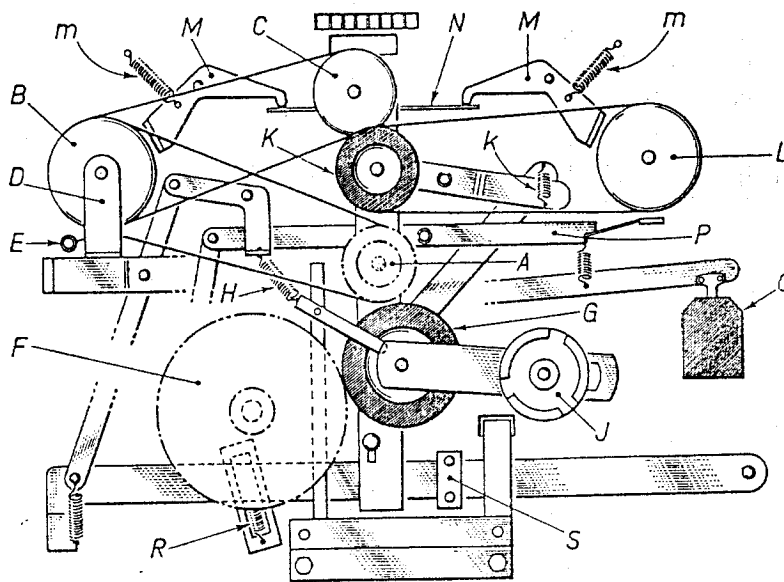


Fig. 1: An outline of the salient points of the Brenell Three Star tape deck.

MODERN TAPE RECORDERS

—continued

Braking

Braking operation is straightforward, and the arrangement of brake levers M-M, the assisting springs, m-m, and the operating bar N is such that they are basically self-adjusting. In the "off" position there should be a clearance of $\frac{1}{2}$ -in. between the brake levers and the operating bar.

A further, auxiliary brake is operated by the pause control. The cross lever, P, of the pause brake, is sprung against the movement of the arm which operates the main motor switch, Q.

At the same time, the lower end of this pause lever assembly draws the pinch wheel assembly, R, out of engagement with the flywheel spindle, and here again there is a spring to assist the return motion.

These springs should be checked if reports of erratic action are made, as should the adjustment, S, on the main operating cross lever, which determines the pinch wheel pressure.

A point to note on this deck, especially when replacing belts, is the avoidance of grease. This can be troublesome at the cap of bracket D. The takeup belt has to be threaded between this cap and the spool drum to be replaced. It is advisable to clean the cap free of grease first, replace the belt, then grease the cap again after assembly.

The Amplifier

Electronically, the 3-Star presents few problems. The amplifier is easily removed for servicing, and if a jumper lead, 8-way, with octal plug and socket connections is made up, it is possible to remove the amplifier panel, reconnect it to the power unit panel and carry out any functional test required.

The main lever connecting the function switch with the deck assembly should be treated with care during these dismantling operations, as it tends to swing across and get hooked up, and can be bent if handled hastily.

Frequency compensation on this model is at the disposal of the operator. The electrical arrangement is conventional; a T-network of capacitors and resistors is switched between the output of the pre-amplifier EF86 and the input of the second triode of the ECC83, thus forming a feedback loop over the first triode.

The selection of network components is made by the compensator switch brought out to the lower right of the deckplate. This only operates on "Record". On "Playback" there are treble and bass controls in an alternative network, selected by two sections of the function switch wafers.

There are one or two points of interest: the heater feed from the transformer has a pair of 100 ohm resistors to chassis, on the printed circuit panel side of the

connecting plug. For playback hum, check that these match.

Also, ensure that the screening can of the EL84, (Playback output, Record oscillator valve), has not accidentally become shorted to chassis. This effectively earths one side of the heater line, as the can is at heater potential for screening purposes.

The Mark V

Much more ambitious is the Mark 5 Tape Deck, which was first shown at the London Audio Fair, in April 1958, and has since proved very popular with kit-makers who required a semi-professional standard around which to build.

Although the basic operation is essentially simple, the construction is such that functional movement is difficult to analyse. But removal of the main drive motor plate allows access to the main parts, and servicing is remarkably simple.

From the wiring diagram of Fig. 2 it can be seen that the three-motor system takes advantage of electro-mechanical switching to achieve economy of construction. For example: the Rewind switch B is mechanically prevented from operating unless the Record/Play switch A is in the "Stop" position.

Under those conditions, full mains input is placed across either takeup or rewind motor as required. Notice that the 500 ohm series resistor of the takeup motor, selected by the speed switch (shorted out at 15 i/s), is bypassed in the wiring to the rewind switch.

On Record or Playback both capstan and takeup motors are fully energised. The suppressor units, shown dotted across switch contacts in Fig. 2, seldom give trouble, but the symptoms caused by a short-circuit in one of these should be obvious.

Unfortunately, damage to the flyleads of these "block" suppressors can be caused during dismantling; they have to be removed to facilitate the unshipping of the main drive motor plate.

Brake adjustment is simple, the brakes being cork-lined, drum-bearing types, and should be carried out with switches A and B at "stop" position. The gap between the actuating levers and the 4BA stop screws should then be $\frac{1}{2}$ in. Remember to tighten the locknuts on the 4BA screws after adjustment.

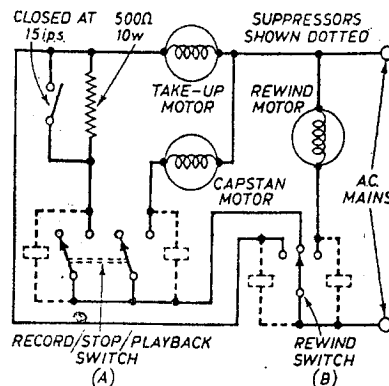


Fig. 2: Wiring diagram of the motor system used in the Brenell Mark V tape deck.

Stabiliser Brake

A stabiliser brake acts on the spindle of the reservoir drum, and should be checked if erratic running is noted. An easy check on this is to unspool a few feet of tape, make a large loop and allow the drive to feed the tape through without the influence of the stabiliser's contrary tension.

This applies in most machines with conventional capstan and pinch wheel propulsion of the tape, but not to those which use gravity clutches, etc.

Prime culprit however, is the pinch wheel itself, its collar or sleeve, or even its bearing bracket, and in machines such as this the capstan sleeve is a possible cause of speed variation.

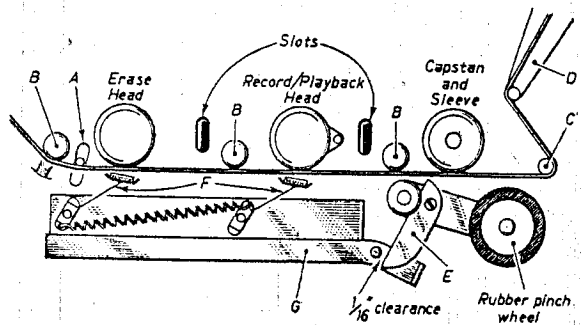
Two capstan sleeves are in use, one of 1 in. diameter, giving 15, 7½ and 3¾ i/s, and the other, $\frac{1}{2}$ in., for 7½, 3¾ and 1½ only. For quality work, the larger sleeve is desirable, and if the recorder is to be run on the "standard" speeds of 7½ and 3¾ it is wise to use the 1 in. sleeve.

Also, if 15 i/s is not intended to be used the extra power fed to the takeup motor to prevent tape spillage is less likely to be needed and the 500 ohm resistor can be left in circuit by removing the switch lead.

Head Assembly

An attractive feature of this deck is the ease with which the head assembly can be serviced. A plate, held by six screws, supports the heads, and it will

Fig. 3: Sketch showing the main features of the head assembly as used in the Brenell Mark V tape deck.



SERVICE ENGINEER

be noted that there are slots ready for the addition of duplicate heads for stereo or monitoring purposes (see Fig. 3).

Azimuth alignment is by means of a single 6BA screw, the makers recommending adjustment at $7\frac{1}{2}$ i/s with a standard 8 kc/s input.

When making electrical tests it is necessary to bear in mind that the erase head is short-circuited in the "Playback" and "Stop" positions of the function switch.

Another precaution is the holding of the tape from contact with the heads during "Rewind". This is done by the pin A in its slot. The tape normally runs along the surfaces of tape guides B, takeup pin C on the pinch-wheel bracket and the pin D in the tape-tensioner bracket.

Pressure Pads

The pressure pads, F, are mounted on a bracket with a release bar G which is regulated by the adjustment of the curved lever E. Correct setting is for one-sixteenth of an inch clearance between the leading edge of the crescent lever and the stop pin, when the 1-in. sleeve is in use.

The height of the spoolholders is adjustable, by 4 BA screws to the motor spindles.

It will be noted that the makers have left adequate deck space to enable users to employ tapes of varying spools; in fact, up to 8½ in. diameter spool can be accommodated.

The deck is a self-contained assembly, and connections to it are made via two plugs (5-pin for head and 3-pin for mains connections) if the deck is used in conjunction with the Brenell Pre-amplifier and the matched Mark 5 amplifier. A point to note if the arrangement is not so simple, is that the earthing of the erase head (unscreened leads) and the screened Rec/PB twin lead is intended to be made at the amplifier and is not made off to the deck chassis.

Therefore, if an alternative arrangement has been made, always check earthing, to ensure that the chassis line has not been crossed. A simple fault, but one that can be very misleading!

Extending these leads for alternative construction, as when the deck is incorporated in a gramophone unit or hi-fi cabinet, may be done with coaxial cable, and the screened outer can be connected to either of the twin inners, the screening being separately earthed. But for minimum hum, it is advisable to carry the wiring through in twin screened.

For a general purpose machine, this Mark 5 has impressive performance and very few service problems. More complicated, but again very trustworthy, is the "professional" equipment, an example of which will be analysed in the final article of this series, next month.

New Books

★ SERVICE ENGINEER REVIEWS OF THE LATEST TECHNICAL LITERATURE

Television and Radio Repairing, by J. Markus. Published by the McGraw-Hill Publishing Company Ltd., 95 Farringdon Street, London, E.C.4. 568 pages. Size 6 x 9½ in. Price 69s. 6d.

FROM time to time complaints have appeared in these columns that books for the radio serviceman are few and far between. Those that purport to serve the purpose too often fall between the stools of erudition and technical baby-talk.

Even more rare is the book that is aimed at the enthusiastic layman, commencing from basic data, which succeeds in putting over, without boring or bogging down the reader, the fascinating subject of radio and television repair techniques.

Which is why I am tempted to cry "Eureka!" when I read through this substantial offering from the house of McGraw-Hill.

Here is a volume that treats the subject from a strictly practical point of view. John Markus assumes that the reader wants to know *how* to mend the set on his bench, then to progress to the reasons *why* it went wrong, to investigate further associated faults and their remedies, and to go on logically to organise himself—to use his new-found knowledge profitably. Hence the advice covers not only technical aspects of radio repair, but includes much valuable information on making a service call, setting up a workshop, ordering stock, and generally expanding a business. I cannot go all the way with the blurb on the jacket: "Before you've even gotten halfway through this book you can go out and fix half the television and radio receivers that come your way". But, before I had gotten halfway through the 23 chapters I was well aware that the intelligent layman would have learned enough to be able to handle basic repairs. By the time the book was through I had formed the conclusion that here, at last, was the sort of plain guidance that the radio shop improver could use.

The first chapter is by way of whetting the reader's appetite. In it, Mr. Markus discusses some methods of running service departments—or setting up a one-man shop. His advice covers ordering replacements, making out charges, checking accounts, building up a data library, even the design of letterheads and business cards. The whole tone of the chapter implies that radio service is a job worth doing—and that what is worth doing is worth doing well.

After such an unusual, but salutary, opening, we get down to the bedrock of servicing. Tools are described and illustrated in the second chapter, including

not only hand tools, but benches, bench wiring, cheater leads and the larger, "permanent fixture" tools. Chapter 3 is a "plain man's guide" to the theory of radio and TV reception.

Normally, this is the pitfall chapter, where the average volume devotes too much time to theoretical information and not enough to practical description. So that the unknowledgeable reader may well absorb a good deal about the way a radio set works without being able to recognise a capacitor if it came up and bit him, or to distinguish a choke from a transformer. The author has avoided this trap very nicely. He illustrates amply, and contents himself with description of purpose and function of the various parts, leaving deeper explanations to a later chapter. Significantly, his sub-headings read "Getting acquainted with—"

The next thirty pages deal with a subject that seldom enters even the most "practical" books on radio service: "Making a Service Call". This includes many hints on the small points of service, from removing knobs to replacing C-R tubes, and some guidance on dealing with customers.

The balance of this book is interesting. After this dissertation on customer-relations we find ourselves going back to the rudiments, studying magnetism and electricity, using multimeters, testing and replacing valves and picture tubes (three chapters that cover a lot of ground, teaching function and fault symptoms, storage systems, etc.), soldering generally and working on printed circuits.

Chapter 13 is headed "Transistors and Crystal Diodes", and is perhaps the best in the book. An especial delight is the section dealing with trouble symptoms. First, a typical 6-transistor circuit is given, then a 4-page table of symptoms, causes and remedies, with particular reference to the given circuit. This should be of great benefit to learner and old-hand alike.

There are chapters on resistors, capacitors, switches, coils, transformers, tuning devices, remote controls and speakers, all in great detail and amply illustrated.

Perhaps the greatest recommendation I can give this book is that at no time did I have to perform those mental "quick-changes" that are the usual drawback of American reading. The assimilation of information is painless.

This book, the eighth of Mr. Markus, volumes that McGraw-Hill have published, amply demonstrates he has not grown stale. Recommended to all practical men, learners and laymen. —H.W.H.

ERT SERVICE BULLETIN

DEALING WITH DECKS 1

a new series by
WILLIAM HENRY

BRENELL THREE STAR AND MARK FIVE

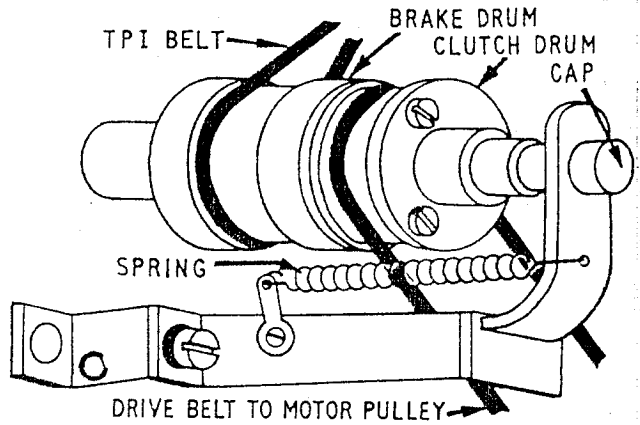


Fig. 1. Arrangement of brake drum, clutch bracket and pulleys on the Brenell machines. loose clutch bracket can cause erratic running, but may be adjusted by altering tension on the spring

THIS is, we are often told, the age of the specialist. But radio servicing remains a job requiring versatility as well as skill. The engineer is expected to tackle all manner of equipment, from irons and kettles and motorised gear to closed-circuit television installations.

Probably the part of service that arouses most reluctance in the average engineer is the purely mechanical—in particular, tape decks and gramophone mechanisms.

Variations in design are wide, and adjustments often finicky. Hit-or-miss troubleshooting can be disastrous. The jobs can be time-consuming, even when full data are available.

The aim of this series of articles is to reduce troubleshooting time by spotlighting special features and principal adjustments and picking out prevalent faults.

It is not intended to provide full service data or to discuss basic principles. The series is to be regarded as a serviceman's quick guide.

Equipment will be dealt with alphabetically by manufacturer's name. Details of drive systems, clutches, brakes, speed change, function switching, spools, pads and pinchwheels, head adjustment, tape position indicators, inputs and outputs and special features will be briefly listed and illustrations given of points that need stressing. Adjustment procedure will be as laid down by manufacturers. Fault-finding hints will be the outcome of the author's practical experience.

The writer will welcome discussion of practical problems and will be happy to hear of any valid short cuts to good service on particular models. Knowledge shared is goodwill gained in our trade.

BRENELL ENGINEERING CO.

1a Doughty Street, London: WCI (Tel.: CHAncery 5809, and HOLborn 7338).

THREE STAR TAPE DECK.

Speeds: 7½, 3¼, 1½ ips.

Tracks: Twin, to international standards.

Spool size: Up to 7in. diameter.

Rewind time: 55 sec. approx. for 1,200 ft. tape.

Wow and flutter: Less than 0.2 per cent. at 7½ ips.

Record playback head gap: 0.00025in.

Record playback head impedance: At 45kc/s, 50,000 ohms; at 10kc/s, 16,000 ohms.

Bias voltage: 100mV ± 15mV RMS across 100 ohms.

Erase head gap: 0.005in.

Erase head impedance: At 45kc/s, 450 ohms.

Erase voltage: 27V RMS.

Bias and erase frequency: 50-53kc/s.

Special features: Visual indicator for record (red), playback (green) and amplifier (white) consists of pilot light fronted by coloured slides operated by the function switch.

Provision is made for additional heads and pressure pads on top plate (see Fig. 2).

Digital rev. counter and pause control are incorporated.

Adjustments.

AZIMUTH—single screw (see Fig. 2). Replay 8kc/s signal from test tape while adjusting head.

PINCH WHEEL PRESSURE—beneath deck, at lower of two screws in bracket across the main operating lever (crossbar near motor plate retaining screw). Note there should be 1/16th in. clearance, with pads engaged, at point indicated in Fig. 2. Adjust "P."

BRAKES. Self-adjusting, spring-compensated. Check 1/32nd in. clearance between inner ends of elbow levers and transverse bar.

CLUTCH. Swivel bracket, illustrated in Fig. 1, applying to base of take-up spool. See later servicing notes.

SPEED CHANGE. Roller in cam, secured by locking nut, regulating level of large idler, which engages steps of motor pulley. Adjust for correct level at appropriate speed.

Service notes. Erratic running can be caused by looseness of clutch bracket shown in Fig. 1. Check spring and ensure that cap is filled with thick grease. Some adjustment is provided by alteration of angle of tag to which spring is attached. Other possibilities are (a) weakness of spring at end of idler wheel

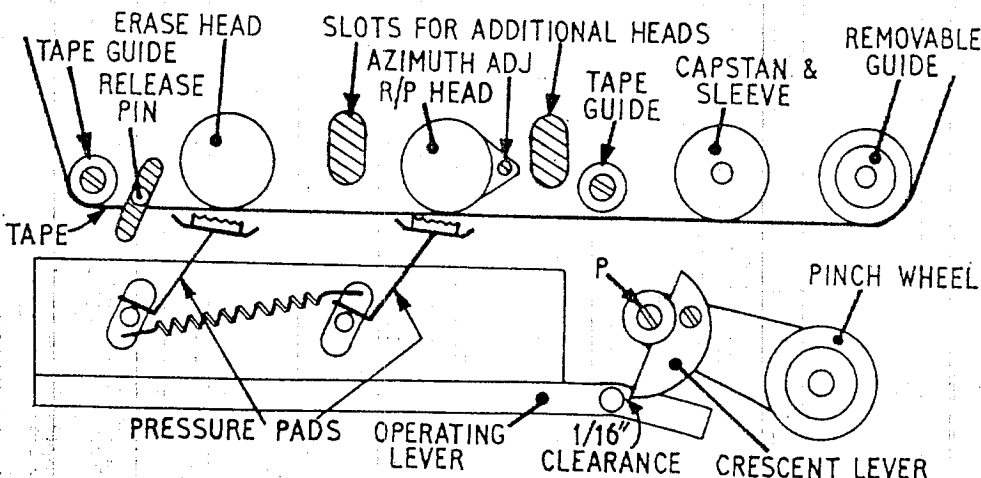


Fig. 2. Layout of heads, tape guides, pressure pads, capstan and pinch wheel. A single screw adjustment is used for azimuth alignment of the record/replay head. Screw P should be set to give 1/16 in. clearance at point indicated when pads are engaged

For Service Manuals Contact
MAURITRON TECHNICAL SERVICES
8 Cherry Tree Rd, Chinnor
Oxon OX9 4QY
Tel: 01844-351694 Fax: 01844-352554
Email: enquiries@mauritron.co.uk

bracket, (b) loose capstan sleeve (grub-screw fixing) and (c) auxiliary "pause" brake spring fouling or adrift.

The last mentioned can also cause tape spillage, due to restriction of the reservoir spool on fast rewind. The opposite fault—inoperative "pause"—may be caused by excessive tension of the aforementioned take-up spring. When checking these adjustments, see that the return action of the pressure and pinch plate is positive when the pause control is released; check spring assisting tension at base of pause control lever assembly.

When removing the deck for service, take care not to damage the EM84, modulation indicator, as the interlocking lever is lifted from the function knob spindle. It is also necessary to avoid bending this lever, which protrudes from the otherwise compact assembly.

Measurement of erase voltage should be across the head, as the oscillator coil is centre-tapped. Normal reading 27V RMS (valve voltmeter) or 80V peak-to-peak (oscilloscope). When checking bias or erase voltages see that Start button is engaged, removing short-circuit of R/P head.

BRENELL MARK FIVE

Speeds: 15, 7½, 3½, 1½ ips (see notes).

Tracks: Twin, operative gap at top, British Standard.

Spool size: Up to 3¼ in. in diameter.

Rewind time: 45 sec. for 1,200 ft.

Wow and flutter: Less than 0.15 per cent. at 7½ ips.

Record/playback gap: 0.00025 in.

Record/playback head impedance: At 45kc/s, 50,000ohms; at 10kc/s, 16,000ohms.

Bias voltage: 50V at 1mA.

Recording current: 100 microamps.

Erase head gap: 0.005in.

Erase head impedance: At 45kc/s 450ohms.

Erase voltage: 30 volts, approx. (Power 2-2.5 watts).

Bias and erase frequency: 50kc/s.

Special features: Selected frequency compensation to CCIR standards by separate switch. Visual indication, as on 3-Star, but with indicators on control panel, as is modulation indicator. Provision for up to four heads (Fig. 2).

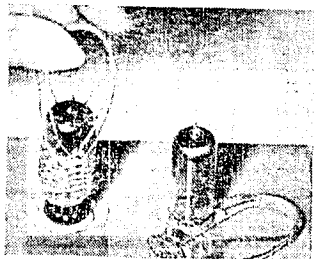
Three BTH shaded-pole motors, with suppressors. In later models, two BTH and one Papst motor. Digital rev. counter, belt-driven from take-up motor pulley. Stabiliser brake on reservoir drum for constant pressure tape feed.

EQUIPMENT FOR THE ENGINEER

VALVE PULLERS

SIMPLE but highly effective devices for extracting standard 7- and 9-pin valves from their sockets are made available by Termination Equipment Co. Ltd., Noel Works, Elson Street, New Basford, Nottingham. These valve pullers are designed to avoid bending and possible fracture of pins and bases, and are particularly useful where hot valves have to be replaced and/or when they are surrounded by other components, making a firm pull by fingers impossible.

A stainless steel grip is pressed over the valve and grips the tube firmly as soon as extraction pressure is applied by the hand. The grip contracts on to the valve in a manner similar to the type of children's toy in which a finger is inserted in a rafter tube and then cannot be withdrawn.



Novel type valve extractor uses a flexible stainless steel grip which tightens around the tube when pulled

POS-TEM RESISTORS

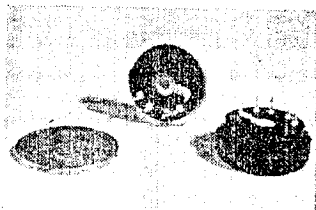
A RANGE of resistors with a positive temperature coefficient designed to provide thermal compensation in transistor circuits, instruments, etc., is available from Alma Components Ltd., 551 Holloway Road, N19.

Designated type K, these are available in values from 5 ohms to 2.5K, with toler-

ances down to 0.1 per cent. at 20 degrees C. Average coefficient is + 0.45 per cent. per degree C, achieved by using a precision copper wire-wound technique, arranged to produce minimum inductance.

ARDENTE RELEASE

A SWITCHED potentiometer type VC2760, suitable for use in transistor radios, and having an overall diameter of only 0.72in., is released by Arden Acoustic Laboratories Ltd., 8-12 Minerva Road, North Acton, NW10. Initially designed to Post Office specifications, it is particularly suited for use on printed circuits.



Potentiometer with switch by Arden is less than ¾ in. diameter and is for use in transistor radios

10-AMP RELAYS

A COMPLETE new range of system relays, type 8501 "GO," is now available from Square D Ltd., Cheney Manor, Swindon, Wilts. There are two basic relays plus two attachments, designed to meet all control applications. The units butt together, are available in 2, 3, 4, 6 and 8 pole construction, and are rated at 277V, 10A.

Contacts are convertible from normally closed to open, and vice versa, at the touch of a screwdriver. Attachments are latching and timing devices. Manufacturer's bulletin SM307 gives full details.

LOW-COST DIPLEXER

A DIPLEXER for masthead mounting and claimed to be weatherproof, unaffected by climatic changes, efficient, easy to install and, finally, not expensive, is being made by Olympic Diplexer Co., Markham Road, Winton, Bourne-mouth.

The diplexer is in a polythene box approximately 3½ x 2 x 1½ in. The lid springs on by hand pressure, simplifying installation.

Adjustments

AZIMUTH. As for 3-Star.

PINCH PRESSURE. As for 3-Star.

BRAKES. With Rewind and R/P switches at Stop, adjust gap between brake levers and 4BA screws in bar to 1/32nd in. Screws are secured by locknuts—always re-tighten.

SPEED CHANGE. A replaceable sleeve on the capstan spindle allows a doubling of the basic speed obtained by engagement of an idler with the drive motor pulley. Rotation of the speed selector switch swivels a lever system along a stepped bracket to the appropriate level. The prime lever is attached to the speed selector spindle by a bush and two locking screws.

The capstan sleeve for the 15, 7½ and 3½ ips speed is one inch in diameter, and the makers advise its use for the intermediate speeds, reserving the ½ in. sleeve for 1½ ips only. Mount sleeve with grub screw near deck plate, allowing ¼ in. clearance.

Service notes. A 500 ohm 10W resistor, mounted on a tag strip between take-up and reservoir motors, is in series with the take-up motor at all speeds except 1½ ips. This component is a principal suspect if take-up fails—check that rewind (Forward) still operates (the rewind switch bypasses the series connection). Disconnection of the shorting lead to the switch is advised if the 15 ips speed is not going to be used—but note maker's advice above.

Wow can be caused by over-tensioning of the stabiliser brake, which operates on the feed spool drum. Rubbing of the drums may be eradicated by adjustment of height of spoolholders, held by 4BA screws. Care should be taken to avoid damage to brake drums and the insulated insert and pulley on the take-up spool, used for driving the digital rev. counter.

Other causes of wow may be an insecure grub screw in the capstan sleeve or fouling of the idler wheel with the next largest step of the motor pulley. Adjustment for height of idler should be made at bush on link at end of idler support lever. Remember to allow for slight play in lever. Grub screws (2BA) inserted from top of holders enables fine adjustments to height of spool holders to be made.

Where this deck has been incorporated in a rig, a check should be made on the mounting. The makers advise mounting on rubber grommets, allowing at least a ¼ in. clearance for adequate ventilation.

Screening of the head cables is not earthed at the tag strip on the deck. When extending for test or installation, take care not to earth the erase twin lead, and ensure that the R/P head is extended with twin screened cable for elimination of hum.

Erase head is shorted on stop and playback.