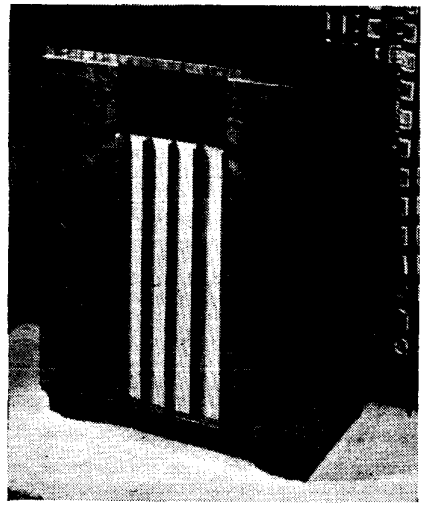
# GRUNDIG TAPE RECORDER 700C



*Self-contained two-speed magnetic tape recorder and reproducer. Sockets for inputs from condenser microphone, radio receiver, pick-up, telephone adaptor, and remote control and outputs to extension speaker and monitor headphones. Housed in figured walnut console cabinet, with microphone and tape spool stowage compartments. Consumption 80W, and suitable for 105-130V, 210-250V 50c/s AC. Manufactured by Grundig (Gt. Britain) Ltd., Kidbrooke Park Road, London, SE3.*

MODEL 700C is a console type magnetic tape recorder designed to provide particularly comprehensive facilities. The needs of the amateur, business man, and the professional, have all been catered for. Used in the home, favourite radio programmes can be recorded direct from the receiver, or entertainment for parties compiled by use of a gramophone pick-up and microphone. At the office an adaptor enables the businessman to record two-way telephone conversations, while interviews, conferences and board meetings can be recorded and stored for indefinite periods. Singers, elocutionists and medical men will also find it an aid to their work.

Housed in a solidly constructed walnut console cabinet of modern styling (height 32⅝in., width 26in., depth 13¾in.), special features of the machine, which make it simple to operate and ensure first-class results, include : full push-button control on both recording and reproducing (see Switch sequence below) ; remote control facilities for starting and stopping the tape (hand and foot operated remote switches are available as extras) ; twin-track recording with simple spool loading and tape threading ; fast tape rewind ; a programme level indicator (Magic Eye) to ensure against overloading and distortion while recording, and a thumb-operated tone control for tonal balance when reproducing.

The tape can be run at 7½in./sec. or 3¾in./sec. according to requirements. For higher quality work, such as the recording of music, the faster speed should be used, while for dictation, and so on, 3¾in./sec. is suitable. A total of 60 minutes' recording can be made on each track of the 1,200 ft. spool at the slower speed ; at 7½in./ sec. 30 minutes' recording on each track is available.

For rewinding a fast speed is provided, the 1,200 ft. of tape being run back in approximately two minutes. Fast forward operation at the same rate is also available.

Recording is always made on the lower half of tape, the spools being changed over by the user at the end of the 1,200 ft. run. A scale calibrated in minutes for both tape speeds is provided to help the user to locate individual recordings.

Threading of the tape on the recording-reproducing head is achieved by merely passing it over the two chrome-plated guide posts, making sure that the glossy side is facing outward towards the user.

## THE MECHANICAL SIDE

The recording-reproducing mechanism is assembled on a chassis covered by a removable cream moulded plastic escutcheon situated under cabinet lid. The volume control knob takes the form of a rosette in cream plastic, which surrounds the Magic Eye. Tone control is situated on the top back of escutcheon between the tape spools and is thumb-operated. The eight push-buttons are also moulded in cream plastic as are two Stop push-bars.

A heavily constructed, split-phase induction motor, with self-lubricating bearings, provides the motive power. A novel feature is that the " rotor " is fixed and the outer squirrel cage rotates. This arrangement is of distinct advantage, since the cage has considerable mass and therefore constitutes an effective flywheel.

The tape spools have three-point location centres and are carried on the top halves of two moulded-plastic, electro-magnetically operated friction clutches, the lower halves being driven from the motor pulley by an endless plastic belt.

Clutch action is achieved between the pulley surface and a felt ring. The speed of the take-up pulley is approximately eight times that of the capstan carrying the tape and exerts a slipping action. On an empty spool only a small torque is needed since the diameter of the tape on the spool is small. Therefore, as the amount of tape on the spool increases, the torque is proportionately increased by its weight.

The thin plastic tape is friction-driven between the motor spindle and a magnetically-controlled rubber pressure roller, and held against the recording-reproducing and erasing heads by felt pads on a spring-loaded arm mounted on the pressure roller platform.

A small lever on the righthand side of tape deck selects the tape speed.

## THE ELECTRONIC SIDE

The electronic part of the instrument consists of a four-stage recording and reproducing amplifier, an oscillator for supplying HF bias and erasing current, and a recording level meter (Magic Eye). All types of input and output connections are made via jack sockets. A condenser microphone is provided.

The amplifier is incorporated on the main chassis which carries the recording-reproducing mechanism, but a separate chassis is employed for an additional power supply unit, on which the speaker output transformer is also mounted.

The 10in. PM speaker has a speech coil impedance of 3 ohms.

**Connection Panel.** Six panel-mounted jack sockets are positioned at cabinet back ; five of them being, as listed below, for various kinds of input and output, while the sixth affords remote control for starting and stopping the tape.

Socket marked **Micro** is for Grundig condenser microphone (input 2mV). **Input 1** allows for connection of 1 megohm impedance input (at approximately 400mV) from radio receiver or gramophone pickup ; **Input 2** is of 50,000 ohms impedance (2mV) intended for use where high sensitivity is required, and provides connection for a high-impedance microphone, diode output from radio receiver, or the employment of a telephone adaptor for recording conversation.

**Output 1** is a 3-ohm impedance socket for extension speaker or headphones ; **Output 2** has an impedance of 5,000 ohms and affords a point for headphone monitoring while recording. Where more than 4.5W output is needed, an external amplifier can be connected to this socket.

**Recording and Reproducing Amplifier.** Input to V1 is selected by the push-button switches, Recording Micro, Recording Tele or Reprod. Tape, and fed to grid via C1. R2 is the leak resistor, R5 the anode load, R6 C3 provide screen feed and decoupling. Heater operates at 5.6V to minimise hum, with hum-dinger R7 introduced as a further precaution. Cathode is returned direct to chassis.

**Condenser microphone** obtains its polarising voltage from a potential divider made up of R4 R38, series fed through R3 with C2 as decoupling.

Output from V1 goes to grid of triode V2A via C7, **Volume Control** R12, and C8 ; R14 being the load resistor. On all recording positions negative feed-back from V2B anode is applied to cathode through R17; on Reprod. Tape it comes via R23 C12 to give a bass lift response of 22-25dBs at 50c/s, R23 affording variable adjustment for treble lift.

Automatic bias is derived from R15 shunted by C9 C28. C9 is not in circuit on Reprod. Gram., since no top lift is required, while C28 is out of circuit on 7½in./sec. tape speed. R16 is the anode load resistor.

Control grid of V2A also has input fed via Input 1 socket when Recording Radio-Gram. or Reprod. Gram. switches are operated.

Amplified output from V2A goes to grid of triode V2B via C11 R19. Automatic bias is built up on R20, which is shunted by C18. Anode load R21 is coupled to a potential divider R18 R22. The output across R18 is fed to Output 2 socket by a screened lead for monitoring purposes or further amplification by an external amplifier.

Signal voltage at V2B anode is also fed to **control** grid of output pentode V3 via capacitor C13, selector switches S21, S51, R29, **Tone control** network R43 C41, and grid stopper R25. Automatic bias is provided by R10 R11, bypassed by C15. Top cut is effected by C14, while negative feedback is derived from secondary of OP1 and applied through R41—which is part of the tone control circuit—to grid. R34 is a load resistor to safeguard V3 when Output 1 jack socket contacts are opened and the internal 10in. PM speaker automatically becomes disconnected.

**Recording-Reproducing head** is L3. For recording purposes the output at V2B anode is fed to the head via C13 R9 R8 C6 and L2, hum-bucking coil ; while HF bias for the tape, derived from oscillator V4, is applied via C25.

For play-back the push-button selector switches connect head between grid of V1 via C1, and chassis. On the 3¾in./sec. tape speed, C4 is brought into circuit.

**Oscillator** V4 is employed to provide current for the **Erasing Head** L1 and HF bias for the tape while recording.

Oscillator frequency of approximately 50kc/s results from anode to grid back-coupling via L4B, tuned by C26, and L4C of OT1 ; winding L4A, tuned by C39, supplies about 55V to L1. HF bias of approximately 60V is fed from the anode to recording-reproducing head L3 via C25.

**Programme level indicator** V5 is operated by output from V2B in a circuit made up of pre-set variable resistor R31 and a metal rectifier MR2, with C21 C22 for smoothing and R32 as load resistor. Anode HT is obtained through R39, while R33 supplies target anode. R31 should be adjusted so that the Magic Eye closes fully for a 3rd harmonic distortion (on play-back) at Output 2 of 4-5 per cent.

**HT** originates from two separate sources on mains transformers MT1 and MT2.

Main HT from winding on MT1 is full-wave rectified by MR1 and choke-capacity smoothed by C17 L11 C16. Reservoir smoothing capacitor C17 should have a ripple current rating of 100mA. This source supplies HT to anode and screen of oscillator V4, the **upper solenoids** L6 L8 and, after voltage has been dropped and smoothed by R40 C40, the anodes of V2A V2B. Further voltage reduction and smoothing by R13 C10 are necessary before V1 anode and screen are served, and the condenser microphone polarised via potential divider R4 R38. **Lower solenoids** L7 L9 of **capstans** A and B also derive current from this HT line through R35. Current for energising tape roller and pressure pads solenoid L10 is obtained via R36, smoothed by C23.

HT for anode and screen of V3 comes from winding on MT1, full-wave rectified by MR3 and choke-capacity smoothed by C31 L13 C30. Reservoir capacitor C31 should be rated to handle 50mA ripple current.

The two HT supply circuits are independently fused by F1 and F3 (special surge-resisting type); each being rated to carry 120mA.

**Heaters.** V1 is fed from 5.6V secondary L12C of MT1. V2 V4 V5 and pilot lamp DI obtain current from secondary L12D of MT1. V3 is supplied from secondary L14C of MT2 on some models.

**Mains input.** Primaries of mains transformers MT1 and MT2 are tapped for 105-115V ; 120-130V; 210-230V ; 230-250V 50c/s AC mains. **On-off switch** S60 is ganged to volume control R12. Fuse

...should be rated at 2A for 105-130V supplies, while for 210-250V, the rating should be 1A.

**Motor** is a split-phase, induction type, with external rotating cage and switched field windings for 7½in./sec. and 3¾in./sec. tape speeds. It is designed to operate on 50c/s AC mains. For recording and reproducing the motor is fed from the 160V tapping on mains transformer MT1 ; for Fast Rewind and Fast Forward speeds, it is fed direct from 240V tapping on MT1.

## SWITCH SEQUENCE

The following information relates to the operation of push-buttons when depressed.

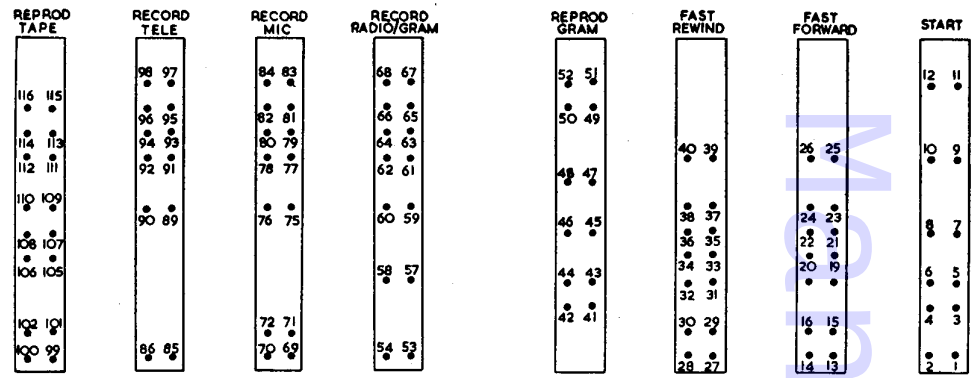
**Reprod. Tape.** S47 S49 S51 S52 S54 S57 close and S48 S50 S53 open. This results in L3, recording-reproducing head, being connected between V1 grid and chassis ; negative feedback, via R23 C12 is switched to cathode V2A for reproducing characteristic ; output from V2B fed to grid V3 ; HT applied to L7 L9 lower solenoids of capstans.

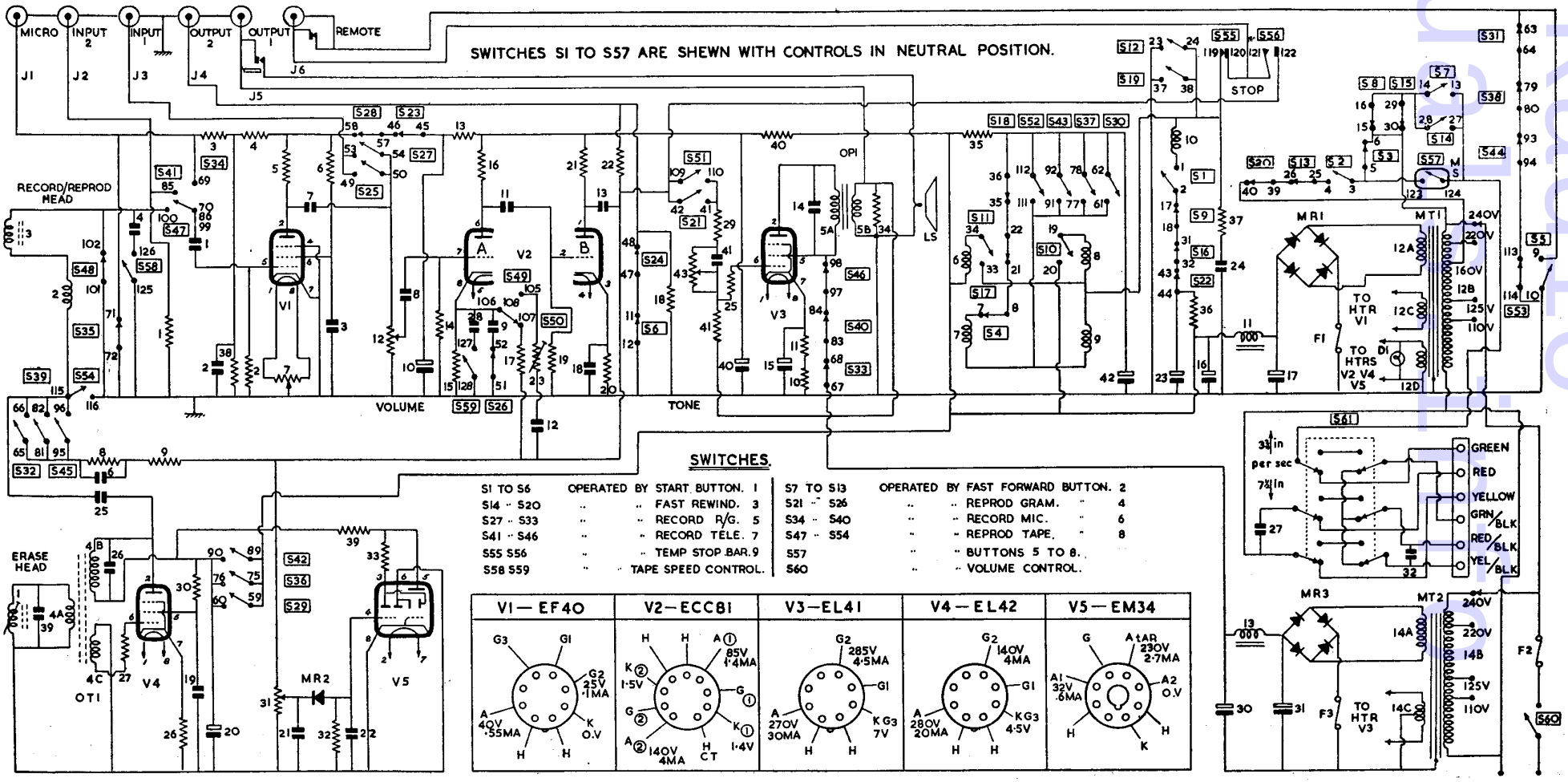
**Recording Tele.** S41 S42 S43 S45 S57 close and S44 S46 open. Input 2 sockets connects to grid V1 ; HT switched to oscillator V4 ; HT to L7 L9, lower solenoids of capstans ; L3 recording-reproducing head coupled between V2B anode and chassis ; HT removed from V3.

**Recording Micro.** S34 S36 S37 S39 S57 close and S35 S38 S40 open. Micro socket switched to V1 grid ; HT applied to oscillator V4 ; L7 L9, lower solenoids of capstans, connected to HT ; L3 coupled between V2B anode and chassis ; HT to V3 removed.

**Recording Radio/Gram.** S27 S29 S30 S32 S57 close and S28 S31 S33 open. Input 1 socket connected via volume control R12 to grid V2A ; HT switched to oscillator V4 ; HT fed to L7 L9, lower solenoids of capstans ; recording-reproducing head L3 connected between V2B anode and chassis ; HT removed from V1 ; HT disconnected from V3.

**Reprod. Gram.** S21 S25 close and S22 S23 S24 S26 open. Input 1 socket connected via volume control R12 to V2A grid ; output from V2B fed




## SWITCHES.

| | | | | | |
|---|---|---|---|---|---|
| SI TO S6 | OPERATED BY START BUTTON. | 1 | S7 TO S13 | OPERATED BY FAST FORWARD BUTTON. | 2 |
| S14 - S20 | " " FAST REWIND. | 3 | S21 - S26 | " " REPROD GRAM. | 4 |
| S27 - S33 | " " RECORD R/G. | 5 | S34 - S40 | " " RECORD MIC. | 6 |
| S41 - S46 | " " RECORD TELE. | 7 | S47 - S54 | " " REPROD TAPE. | 8 |
| S55 S56 | " " TEMP STOP BAR. | 9 | S57 | " " BUTTONS 5 TO 8. | |
| S58 S59 | " " TAPE SPEED CONTROL. | | S60 | " " VOLUME CONTROL. | |

## RESISTORS

| R | Ohms | Watts |
|---|---|---|
| 1 | 50K | ½ |
| 2 | 10M | 1/10 |
| 3 | 200K | ½ |
| 4 | 3M up to 5.6M | ½ |
| 5 | 200K | ½ |
| 6 | 1.25M | ½ |
| 7 | 100 Potr. | |
| 8 | 60K | ½ |
| 9 | 60K | ½ |
| 10 | 100 | ½ |
| 11 | 100 | ½ |
| 12 | 1M Potr. | |
| 13 | 50K | 1 |
| 14 | 1M | 1/10 |
| 15 | 1K | ½ |
| 16 | 100K | ½ |
| 17 | 150K | ½ |
| 18 | 2K | ½ |
| 19 | 1M | 1/10 |
| 20 | 400 | ½ |
| 21 | 30K | 1 |
| 22 | 100K | ½ |
| 23 | 20K Potr. | |
| 24 | No Component | |
| 25 | 4.7K | ½ |
| 26 | 200 | ½ |
| 27 | 100K | ½ |
| 28 | No Component | |
| 29 | 47K | ½ |
| 30 | 30K | 1 |
| 31 | 1M Potr. | |
| 32 | 3M | ½ |
| 33 | 300K | ½ |
| 34 | 47 | 1 |
| 35 | 18K | 4 |
| 36 | 10K | 8 |
| 37 | 100 | 1 |
| 38 | 3M | ½ |
| 39 | 15K | ½ |
| 40 | 5K | 1 |
| 41 | 33K | ½ |
| 42 | No Component | |
| 43 | 1M Potr. Special | |

## CAPACITORS

| C | Capacity | Type |
|---|---|---|
| 1 | .025 Tubular 500V | |
| 2 | .1 Tubular 250V | |
| 3 | .5 Tubular 250V | |
| 4 | 800pF Tubular 125V | |
| 5 | No Component | |
| 6 | 200pF Tubular 250V | |
| 7 | .025 Tubular 500V | |
| 8 | .1 Tubular 125V | |
| 9 | .05 Tubular 125V | |
| 10 | 16 Electrolytic 385V | |
| 11 | .025 Tubular 500V | |
| 12 | 5000pF Tubular 250V | |
| 13 | .1 Tubular 500V | |
| 14 | 500pF Tubular 800V-AC | |
| 15 | 50 Electrolytic 18V | |
| 16 | 50 Electrolytic } 385V | |
| 17 | 50 Electrolytic } | |
| 18 | .05 Tubular 125V | |
| 19 | .01 Tubular 500V | |
| 20 | 4 Electrolytic 385 | |
| 21 | 500pF Tubular 125V | |
| 22 | .05 Tubular 125V | |
| 23 | 16 Electrolytic 385V | |
| 24 | .2 Tubular 2000V | |
| 25 | 60pF Tubular 500V | |
| 26 | 3000pF Tubular 500V | |
| 27 | 3 Tubular 750V | |
| 28 | .05 Tubular 125V | |
| 29 | No Component | |

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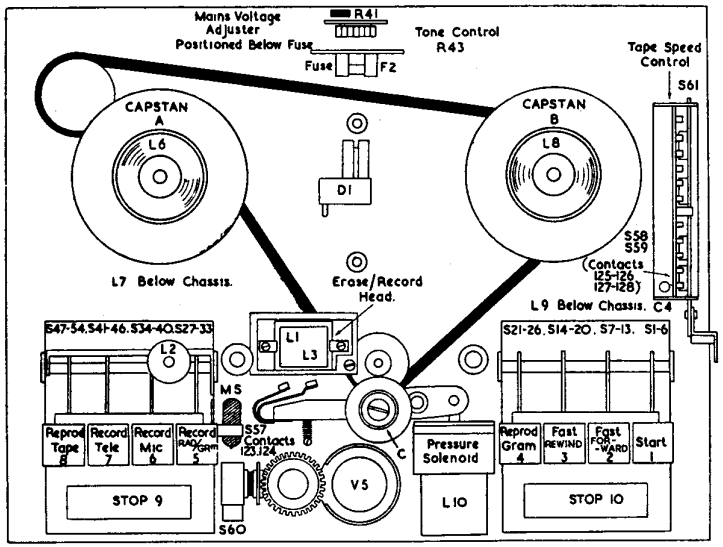
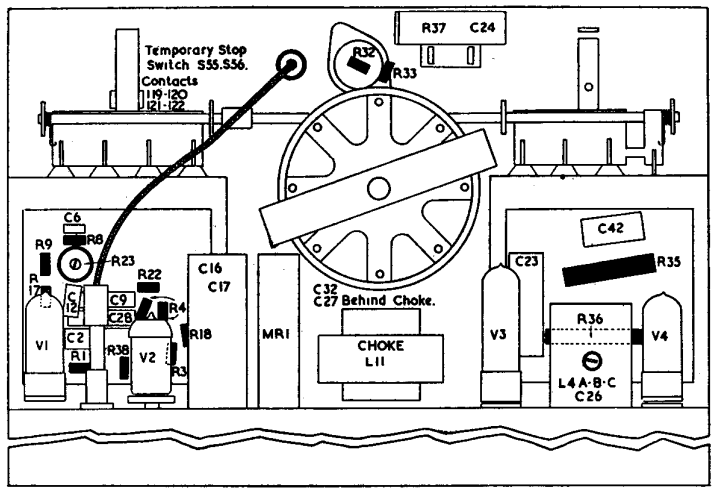
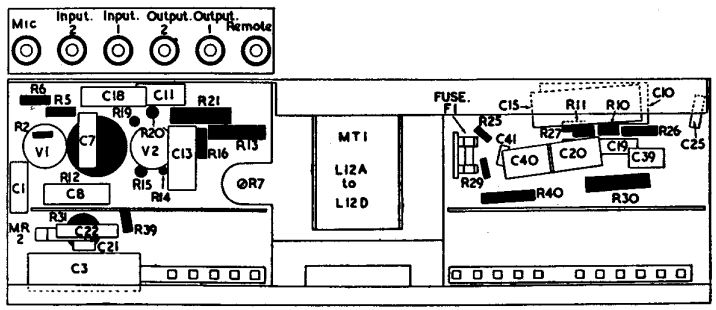



to grid V3 ; HT removed from V1 ; output 2 socket brought into circuit for monitoring or connection to external amplifier ; V2A cathode capacitor C9 taken out of circuit.

**Fast Rewind.** S14 S17 S19 close and S15 S16 S18 S20 open. Motor fed from 240V tapping of MT1 ; upper solenoid L6 of capstan A is energised ; HT line to pressure pad solenoid L10 open-circuited ; HT to lower solenoid L7 of capstan A disconnected.

**Fast Forward.** S7 S10 S12 close and S8 S9 S11 S13 open. Motor fed from 240V tapping of MT1 ; upper solenoid L8 of capstan B energised ; HT line to pressure pad solenoid L10 open-circuited ; HT to lower solenoid L7 of capstan A disconnected.

**Start.** S1 S2 S5 close and S3 S4 S6 open. Tape pressure pad solenoid L10 energised ; motor fed from 160V tapping of MT1 ; Remote and Output 2 sockets brought into circuit.

**Stop.** Operation of lefthand stop bar controls change-over switches, opening S55 and closing S56. Earth return of capstan solenoids L6-L9 and tape pressure solenoid L10 open-circuited ; output of V2B returned to chassis.

Operation of righthand stop bar—which is purely mechanical—returns all press-button switches to neutral.

**Remote control** socket is fitted with self-shorting contacts and connected in series with the earth return lead from S55-S56 of lefthand stop bar. Socket enables an external stop switch to be employed where required.

**Mercury tilt switch** S57 is mechanically operated by lefthand press-buttons, and is incorporated in 160V mains supply circuit to motor.

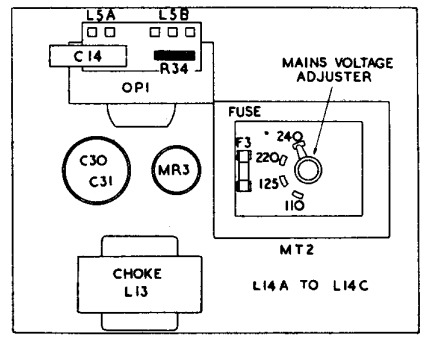
## CAPACITORS

*Continued.*

| C | Capacity | Type |
|---|---|---|
| 30 | 32 } | Electrolytic 350V |
| 31 | 32 } | |
| 32 | 1 | Tubular 750V |
| 33 to 38 | | No Component |
| 39 | 3000pF | Tubular 500V |
| 40 | 8 | Electrolytic 385V |
| 41 | 5000pF | Tubular 125V |
| 42 | 4 | Electrolytic 385V |

## INDUCTORS

| L | Ohms |
|---|---|
| 1 | 12 |
| 2 | 20 |
| 3 | 550 |
| 4a | 20 |
| 4b | 11 |
| 4c | 3.5 |
| 5a | 550 |
| 5b | .5 |
| 6 | 10K |
| 7 | 8K |
| 8 | 10K |
| 9 | 8K |
| 10 | 5.3K |
| 11 | 260 |
| 12a | 140 |
| 12b | 26 |
| 12c | Very Low |
| 12d | Very Low |
| 13 | 185 |
| 14a | 280 |
| 14b | 50 |
| 14c | Very Low |




## MAINTENANCE

**Removal of chassis.** To remove chassis from cabinet, lift out the rosette-shaped moulding surrounding Magic Eye ; remove the two brass screws between capstans. The moulded panel can now be lifted off (it is secured at the four corners by self-locking press studs) taking care not to exert sudden or undue force.

Next undo the eight small nuts (grouped in pairs at chassis corners) securing the four rubber suspension buffers to cabinet. Uncleat leads to output transformer on power unit chassis ; unsolder leads on speaker. Remove the six screws securing power unit chassis to cabinet. With a second person's assistance, both chassis may now be lifted out through top of cabinet. Do not lift main chassis by the capstans or switch banks, since damage may result.

Once chassis is clear of cabinet, all valves are readily accessible. By removal of the two switch screen covers and the main back screen (self-tapping screws) all components can be easily reached.

**Removal of speaker.** Unsolder the leads to speech coil tags and withdraw the four fixing screws.

**Motor.** After about 500 hours' use the motor should be lubricated with 10 drops of Shell Vitrea Oil No. 21. Oiling hole is close to motor pulley. If necessary motor shaft can be cleaned and polished with crocus paper.

When servicing, remember that the external cage of motor rotates ; make sure that it is well clear of the cabinet and any obstructions before switching on.

**Belt.** Plastic belt is 5mm in diameter and 690mm long. If it becomes slightly stretched or stiff, it should be held near an electric light bulb or fire for a few minutes. Before removing the belt it will be necessary to unscrew idler pulley to avoid damage to the lefthand clutch assembly.

**Clutches.** If capstans are removed, ensure that neither of the two washers on top part of shaft are lost, as they are most essential for the proper functioning of the clutch mechanism. After approximately 1,000 hours' use, clutch shaft should be lubricated with one drop of Shell Vitrea Oil No. 21.

**Clutch facings.** An uneven pull from right-hand clutch may be due to accumulation of dirt on felt ring in the capstan. Felt should be cleaned with a brush and methylated spirit.

**Felt pads.** When it becomes necessary to replace tape pressure pads, the new felts must be coated with graphite (Aquadag, thinned with water) in order to provide a path for static discharge. Pads should only be just big enough to cover front faces of the tape pressure springs.

**Pilot lamp.** To replace the pilot lamp first unsolder the two leads for easy removal. If a 10V .2A bulb is unobtainable, it should be replaced with one of 12V .2A rating.

**Suspension brackets.** Check that the suspension brackets (one at each corner) are not damaged or bent. They should only allow unit to drop in sufficiently to line up the input socket panel with the slot in back of cabinet.

**Fixing screws.** When units are reassembled, seal all fixing screws with lacquer or varnish in order to prevent loosening during operation.

**Cleaning of head assemblies.** After recorder has been in use for 1,000 hours the screening hood of the head assemblies should be removed and the recording-reproducing and erase heads cleaned. Remove any dirt which may have accumulated from inside of screen. Methylated spirit is recommended for cleaning purposes but on no account should

**carbon** tetrachloride or any acetone fluid be used, since these will damage the casing of the head assemblies. After cleaning the heads must be realigned.

**Condenser microphone.** When the Grundig microphone is in need of repair, it should be returned to the company for servicing or replacement. The complete machine should be returned only in cases of difficulty. All spares are available.

**Metal rectifier** MR2 may be replaced by a Germanium diode (Mullard type OA60) in the event of a breakdown.

**Oscillator.** The simplest method of checking oscillator output is with a valve voltmeter of 1 megohm input impedance. With no audio input, HF voltages across the recording head L3 and the erasing head L1 should be 60V and 55V respectively.

Adjustment of oscillator coil unit may be made by means of the dust-core, which should afterwards be resealed. Oscillator frequency is approximately 50kc/s.

Alternatively, current measurements may be made by inserting resistors of 100ohms (L3) and 10ohms (L1), in series with the heads; the voltage drop should be 85mV ±10 per cent. and 400mV ±10 per cent.

**Hum level.** Plug a valve voltmeter into output 2 socket (100mV range), and with the volume control set fully clockwise, press Reproducing Tape and Start buttons and measure hum level, which should not exceed 10mV (40dBs below zero level output).

Adjust humbucking coil L2 and hum-dinger R7 for minimum hum. This is nearly always necessary after changing the EF40, ECC81, recording-reproducing head L3, the motor or the mains transformers.

When adjusting R7, C1 in grid of V1 should be disconnected in order to avoid any influence of the recording head.

**Distortion, output level and dynamic range.** Feed a 1000c/s from an audio signal generator to Micro. socket at a level of about 2mV, set volume control to between 7 and 8 and record for 10 seconds (Recording Micro., and Start buttons pressed) with Magic Eye just closed.

Play back the recording and examine waveform from Output 2 socket. If a distortion factor meter is available, measure 3rd harmonic distortion, which should be between 4 and 5 per cent. ; alternatively an oscilloscope may be used, when the distortion should produce a just discernible flattening of the peaks and troughs. If distortion is above or below these limits, input to Magic Eye should be increased or decreased by R31, and further recordings at maximum level should be made until distortion lies within the limits on play-back.

Finally plug a valve voltmeter into Output 2 and measure the level of 1000c/s recording made at maximum level. This must be at least 100 times the hum level.

**Head adjustment.** The positioning of head assembly is very critical for perfect reproduction of recordings made on other machines. Adjustment should always be carried out with a standard test tape at 10kc/s. Hood clamps should be slackened, screening hood moved to left or right for coarse setting, and the rubber cushioned mountings adjusted for maximum response. Make sure that bottom edge of tape lines up with bottom edges of pole pieces on the recording-reproducing head, and also that the pole pieces on erasing head overlap .1mm below edge of tape. Adjust all three screws at the same time to avoid head assemblies leaning backward or forward.

**Test tape.** In order to carry out tests and repairs in the most efficient manner, the use of a standard test tape is strongly recommended. Test tape should carry recordings of a series of audio frequencies, and the recommended values are: 10,000c/s, (for alignment), 6000c/s, 1000c/s, 500c/s and 60c/s. It is essential that the instrument on which a test tape is recorded is in perfect condition and that its head assembly has been previously aligned with Grundig test tape TB53.

**Recording frequency response.** Connect an audio oscillator to the Micro. socket (via a blocking condenser) and a valve voltmeter to Output 2 socket. Press Recording Micro. button, set volume control at maximum. Adjust output from audio oscillator to show full recording level on Magic Eye. Reduce recording level to one-fifth by means of the volume control or, alternatively, if audio oscillator is fitted with an attenuator, by setting it back 15dB.

Press Start button and record frequencies of 1000c/s, 60, 500, 1000, 4000, 7000, and 10,000c/s. Rewind and reproduce. The variations of level over all frequencies should be ±3dB with reference to the reading obtained at 1000c/s.

**Reproducing frequency response.** Connect valve voltmeter (calibrated in dB's) to Output 2 socket. Set R23 at mid-way position and play back the part of the test tape which has 1000c/s. Note deflection on meter and then play back 10,000c/s, when the reading should be within ±3dB of the first. Check lower frequencies correspondingly, always taking 1000c/s as reference level. If a flat response curve is not obtained, R23 should be turned clock-wise to increase gain at the higher end of the scale and anti-clockwise to increase level of frequencies below 4000c/s. All tests should then be repeated until a uniform response is obtained over the whole frequency band.

## Service Casebook

### BUSH TUG12A

AFTER 15 minutes' use, picture would collapse to 4ins. height and consist of white lines forming a sort of honeycomb winding and an elongated sine wave.

The frame circuit was examined, C8 and C9 (maker's diagram) were replaced, and all was well again.—W. T. CLEMENTS, Harrow.

### PHILCO 581

A PHILCO 581 gave low signal on strong station only. Oscillator section was out of action.

The FC valve, oscillator coils, trimming and tracking condensers and anode resistance and condenser were tested and found OK. The oscillator switch was found to be faulty, the two small plates at each side of centre had become disconnected from each other.

I scraped them clean around the rivets and soldered them. The radio was re-aligned and worked well.—WILF LEAVER.

### RADIO SERVICE TOOLS

HAVE often wondered if any British tool maker produces a flexible screw fixer. I have a rigid tool of this type ex-USA Army which is the envy of my friends.

Also I recently obtained a rusty ex-WD, allegedly flexible, instrument of this kind. I regret to say it only flexes in the middle whereas radio and TV chassis require something even more pliable at times.

If such a tool could be made with interchangeable screw gripper and BA nut sockets, it would be extremely useful.—E. C.

## REGENTONE P21

*Continued from page 34*

**AERIAL.** An internal plate aerial consisting of metal foil, affords reception of local stations and can be connected by a fly-lead. Sockets, isolated by C1 C2 with R1 as static drain resistor, are also provided for an external aerial and earth system. L1 forms a low impedance path to mains frequency voltages induced in the aerial, and thereby eliminates modulation hum.

On short waves the input signal is auto-transformer coupled to V1 grid by L2 L3, but medium and long wave coils L4 L5 are bottom end capacitive coupled. Switching is by S1/A, while VC1 is the grid tuning capacitor. AVC voltage, IF filtered by R2 C12, is fed to grid of V1 via L5 L4 L3. Screen (g2 g4) voltage is obtained through R6 and de-coupled by C13. Suppressor is internally strapped to cathode, which is earthed. Tuned primary L6 C5 of first IF transformer IFT1 is in the heptode anode circuit.

**Oscillator** section of V1 employs a tuned grid, shunt-fed circuit, and operates at 470kc/s above the signal on all wavebands. Grid coils L8 (SW) L10 (MW) L12 (LW) are trimmed by T6 T7 T8-C7 respectively, with C8 C10 C9 as padders to maintain accurate tracking on all wavebands. The coils are switched to oscillator tuning capacitor VC2 by S1/B.

Anode reaction voltages are obtained inductively from L9 (SW) L11 (MW) L13 (LW) and switched by S1/C through C11 to oscillator anode, of which R4 is the load resistor.

**IF amplifier.** The signal at heptode anode of V1 is fed to grid of IF amplifier V2 via transformer IFT1, which is tuned to 470kc/s; L7, the secondary, is damped by R5 to increase pass band. AVC voltage, decoupled by C12, is applied to V2 grid through L7. Suppressor grid and cathode are connected to chassis, while screen (g2) voltage comes via R6, which like V1 screen, is decoupled by C13.

**Demodulator** diode of V3 obtains signal from V2 anode through IFT2, made up of L14 L15; rectified audio signal appears across volume control R18; R7 is the diode load.

**AVC** is developed by signal diode of V3. When no signal is applied to the second diode anode, a small amount of current flows and a voltage drop occurs across R11, making the anode about 1.5V negative with respect to cathode. This negative voltage together with the AVC voltage, is IF decoupled by R11 C12 R2 and fed to V1 and V2 control grids.

**AF amplifier** consists of triode section of V3, which amplifies the audio signal voltage appearing across R18. Automatic grid bias is built up on C18, with R9 as leak. R10 forms the anode load.

**Output stage.** Audio signal voltage across R10 goes to grid of beam tetrode V4 via C19, R12 being the grid load resistor. A certain amount of negative feedback is obtained by not decoupling cathode bias resistor R13, and C20 is employed to provide some top cut. Screen (g2) voltage comes from the HT line that supplies V3 anode and the screens of V1 and V2, while anode voltage is derived from line also feeding anodes of V1, V2. Amplified signal at V4 anode is transformer coupled by OP1 to a 6½in. PM speaker.

**HT.** On AC mains HT is provided from a half-wave rectifier V5, protected by surge limiter R17. Resistance-capacity smoothing is effected by C23 R15. C24, the reservoir capacitor, should have a ripple current rating of 125mA.

**Heaters** of valves are wired in series and obtain their current through R16A—R16C, a resistor tapped to suit supply voltages. R16D across pilot lamps prevents damage by switching surges and also ensures that should the bulbs fail, the mains supply to receiver will not be open-circuited. S2, on/off switch, is ganged to R18 volume control.

### TRIMMING INSTRUCTIONS

| Apply signal as stated below | Tune Receiver to | Trim in Order stated for Max. Output |
|---|---|---|
| (1) 470 kc/s to g1 of V1 via .05 capacitor | MW band —with gang at max. capacity and volume at max. setting. | Cores L15, L14, L7, L6 |
| (2) With gang set at maximum capacity adjust dial cursor to coincide with index points on scale facsimile at right-hand end. | | |
| (3) 300 kc/s to aerial socket via. dummy aerial | LW Band 1000 metres | T8, T3 |
| (4) 1.5 mc/s as above | MW band 200 metres | T7, T2 |
| (5) 15 mc/s as above | SW band 15 mc/s | T6 for second signal from "tight" setting. While rocking gang capacitor slightly adjust T1 for optimum |

## Service Casebook

### REGENTONE U22

VERY weak signal, with distortion, was the complaint. Fitting a new 25A6 output valve brought no improvement.

A voltage check at the reservoir and smoothing condensers gave almost indentical readings.

With no voltage drop across the smoothing resistor, there was obviously no output valve current. Checking the cathode bias resistor I found that it had risen from its value of 620ohms to well over 5,000ohms. This is the second time I have encountered this particular fault.

### FERGUSON 321AC

ONE of these receivers, straight from stock, came in with the complaint, "dead on all wavebands." Twiddling the wavechange switch, I noticed a click on "gram" position only. Obviously the set was partly OK from AF grid onwards. This section, by the way, comprised an EBF80, combined AVC, detector diode and IF amplifier followed by an EF41, functioning as AF amplifier.

Checking volts around the EBF80 I discovered screen volts were rising. Suspecting the .1mF decoupler to the screen, I replaced it and the set became normal. Although the condenser checked normal on the meter, it had obviously broken down on load.—K. UNDERWOOD, Rowlands Gill.