

equipment reviews



GRUNDIG TK2200

MANUFACTURER'S SPECIFICATION (9.5 cm/s). Battery powered 1/2-track tape recorder. **Frequency range:** 40 Hz-15 kHz. **Signal-to-noise ratio:** 47 dB. **Wow and flutter:** $\pm 0.25\%$. **Power supply:** Six U2 cells or equivalent, or TN12 mains power pack. **Tape speeds:** 9.5 and 4.75 cm/s. **Spool capacity:** 13 cm. **Weight:** 12.5 lb. **Dimensions:** 35 x 21 x 10.5 cm (l x w x h). **Price:** £96 12s. including purchase tax. **Manufacturer:** Grundig Werke GmbH, 851 Furth, Kurgartenstrasse 37, West Germany. **Distributor:** Grundig (Great Britain) Ltd., London S.E.26.

FIG. 2 GRUNDIG TK2200 RECORD/PLAY WOW AND FLUTTER

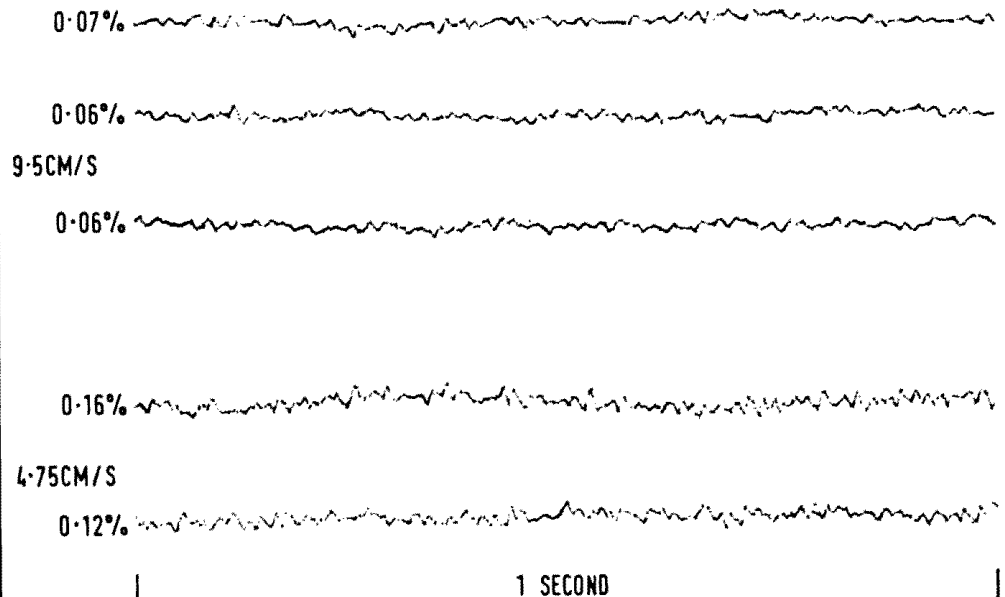
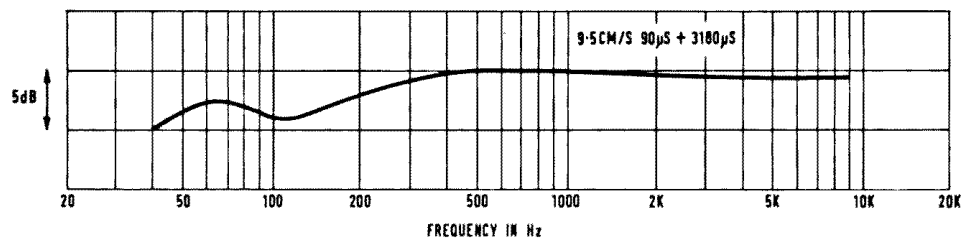


FIG. 3 GRUNDIG TK2200 PLAY ONLY RESPONSE (TEST TAPE TO LINE OUTPUT)



treble cut on anticlockwise rotation from a central level-response position.

Full wind or rewind of a 13 cm reel of LP tape (900 ft) took a fraction over two minutes in either direction, but wind or rewind on to a nearly full reel was rather sluggish and sometimes needed a helping hand to get things moving.

Long term tape speed was constant from beginning to end of reel but the mean speed at 9.5 cm/s was nearly 2% fast and is therefore

near the top limit at this speed. At 4.75 cm/s the speed was 1.4% fast. This is one of the few recorders where the speeds *can* be adjusted by pre-sets in the motor control electronics, but I will leave Mr. Hellyer to sort out the exact procedure in his excellent service notes.

Short term speed fluctuations were extremely small as will be seen by the fluttergrams of fig. 2. The meter readings were very steady and it was not possible to phase the record and play cyclical speed variations to build up a steady high value. This shows that the speed fluctuations are fairly random in nature so that cumulative record-play adding is unlikely. A low wow and flutter test tape also read 0.06% RMS at 9.5 cm/s. At the lower speed, a 1.5 Hz wow can just be seen on the top trace, giving a cumulative reading of 1.6% RMS. This is much lower than the capstan rotation frequency and is probably due to a slightly eccentric pressure roller.

The contra-rotating flywheels seem to be effective in maintaining a constant tape speed despite severe agitation of the recorder. Shaking the recorder with a twisting motion in the plane of the flywheels, so that the take-up

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FIG. 4 GRUNDIG TK2200 RECORD/PLAY RESPONSE (LINE IN TO LINE OUTPUT)

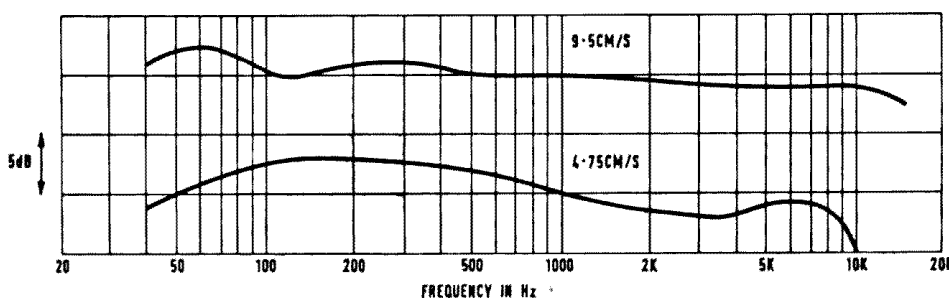
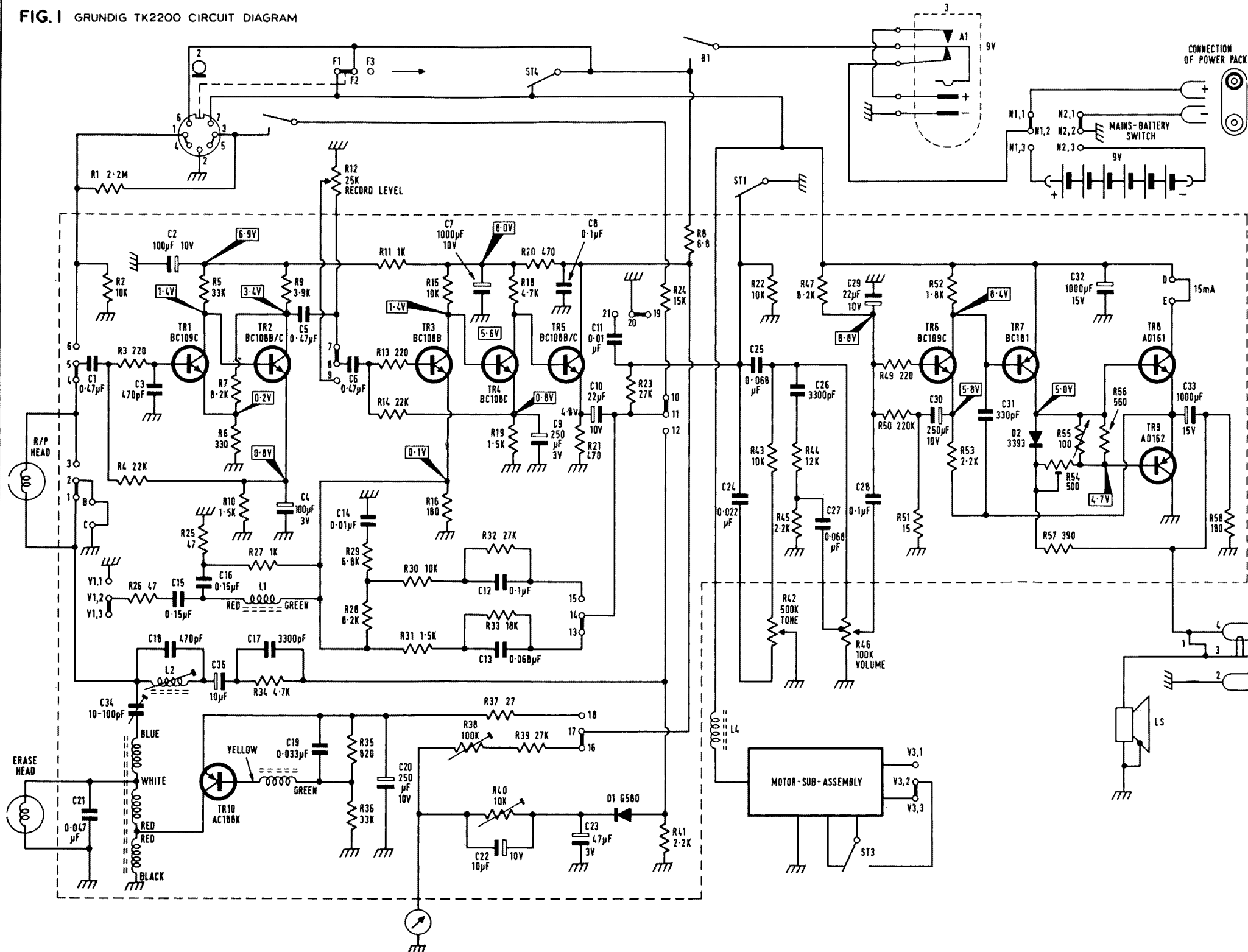


FIG. 1 GRUNDIG TK2200 CIRCUIT DIAGRAM

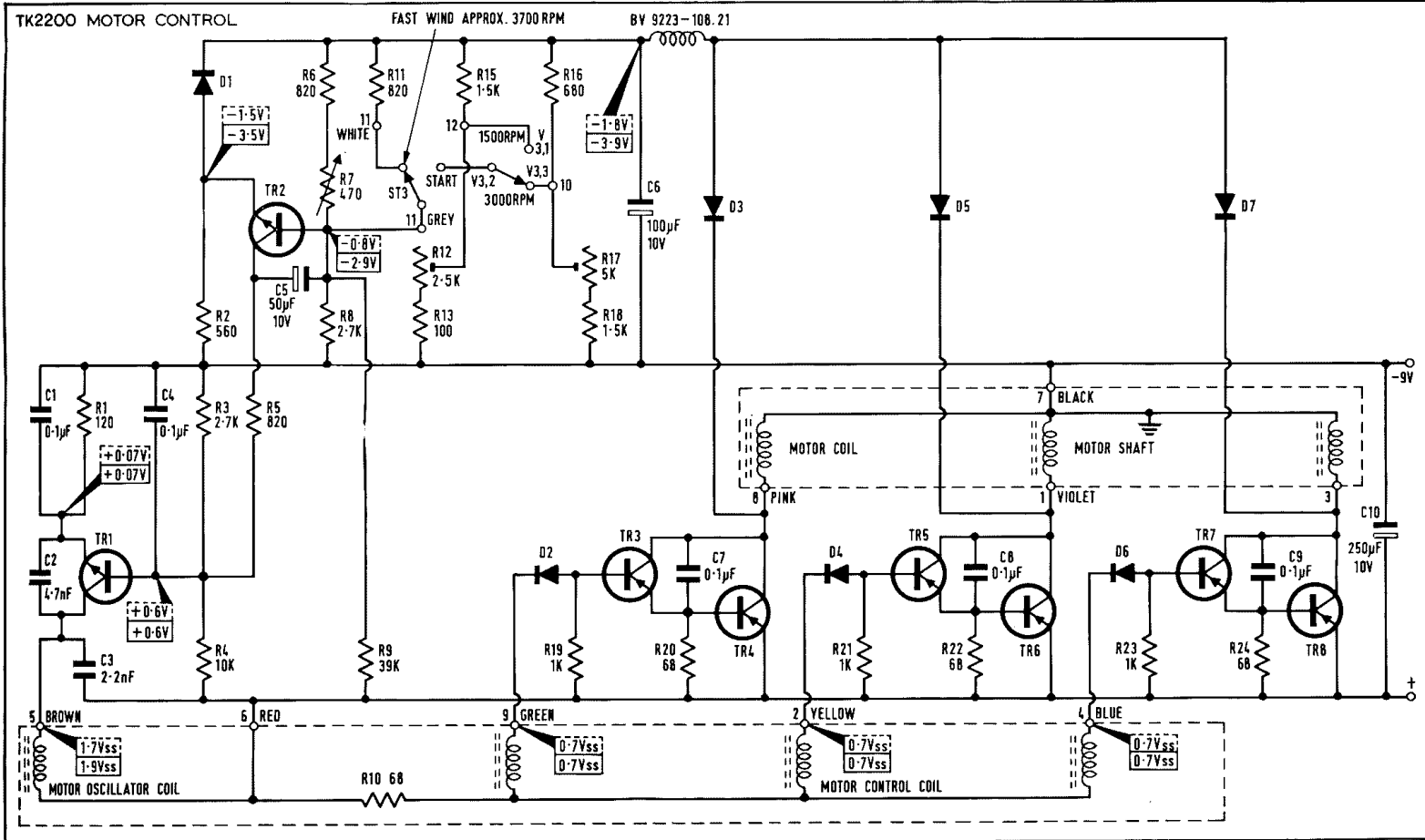
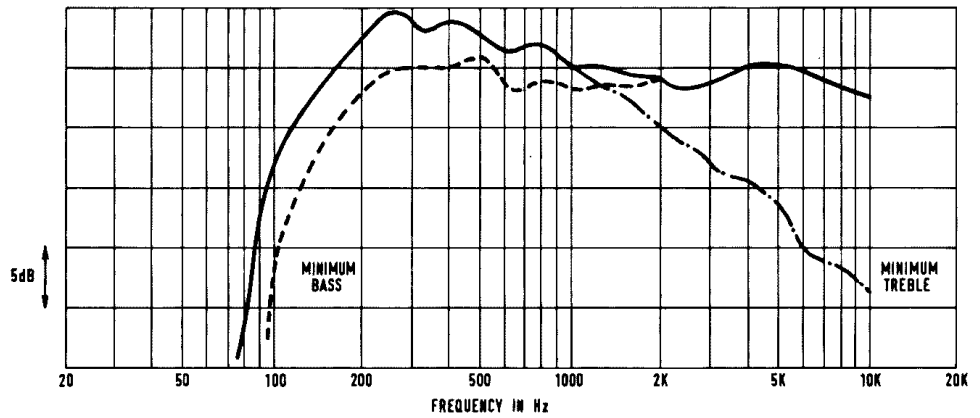


reel was momentarily stopped with a slight spillage of tape, produced no wow, in fact the only audible effect was a slight chirp as the take up reel took up the slack and jerked the tape slightly.

Fig. 3 shows the playback response to line output while playing a 9.5 cm/s test tape recorded to the new 90 μ S characteristic with bass pre-emphasis of 3180 μ S. It will be seen that, despite the bass rise on the tape, the playback response falls slightly at low frequencies.

Fig. 4 shows that extra bass pre-emphasis is used in the recording process to give a more even response and that the high frequency

FIG. 5 GRUNDIG TK2200 ACOUSTIC RESPONSE (WHITE NOISE TO SPEAKER SOUND OUTPUT)



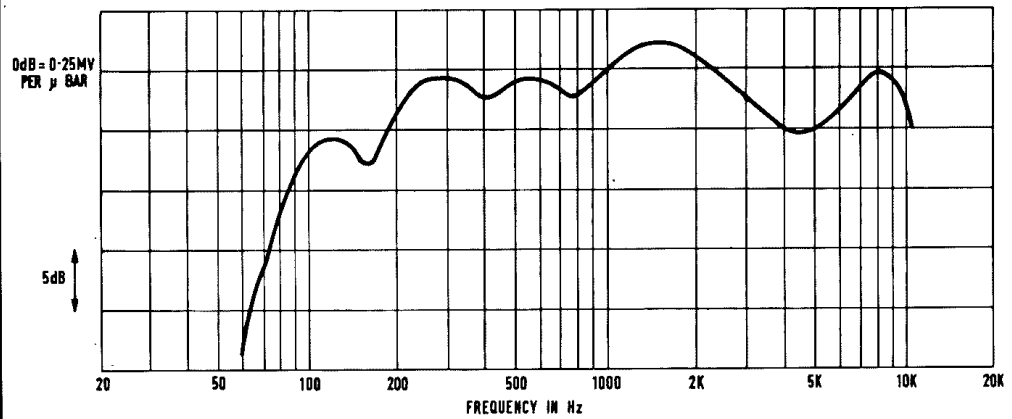
recording characteristic is close to the desired 90 μ S response. At 4.75 cm/s, the response is not quite so level, but is within ± 3 dB limits over the range 40 Hz to 9 kHz range.

System noise, with no tape passing the heads, was at the extremely low level of 47 dB below test tape level or 59 dB below peak recording level.

Recording distortion measurements at 1 kHz using BASF LGS35 tape showed 3.5% third harmonic distortion with the record level meter pointer just entering the red sector of the scale. Unweighted noise after erasing peak recording was 55 dB below peak recording level.

The acoustic response of fig. 5 was obtained by recording 25 one-third octave bands of

FIG. 6 GRUNDIG GDM 305 MOVING COIL MICROPHONE (1K)



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filtered white noise and then measuring the sound output on the speaker axis during replay. The 'level' response position of the tone control gives a slightly bass heavy sound quality and the clockwise bass cut setting gave a response level within 3 dB limits from 200 Hz to 10 kHz.

The microphone response of fig. 6 was also measured using the white noise technique. The dip in the mid HF range from 3 to 6 kHz makes some voices sound slightly dull on this recorder.

The circuit diagram reproduced with this review shows that direct coupling of groups of transistors with DC feedback over as many as three stages is used for high thermal stability. The 'brushless' motor control is worth

attention as the current to each coil of the motor is switched in sequence through pairs of transistors which are biased 'on' by rectified high frequency signals derived from a rotating coil high frequency commutator. The back-EMF from the unswitched coils, which is directly proportional to the motor speed, feed a control transistor which alters the HF current to the 'commutator' so that the mean speed is governed to a high degree of accuracy.

A big feature of this recorder is the excellent signal-to-noise ratio. The system noise, at -60 dB level is a quiet, smooth, white noise, hiss with no vestige of governed motor noise or annoying high frequency spikes.

Wow and flutter remain low under the most extreme handling conditions, in fact I think the term "Easy G" should be borrowed from the advertising of other Grundig recorders and

used for this one in a different way!

The only mild criticisms I can make on this machine are the slightly 'lazy' wind and rewind, which may be a fault in this particular review model, and the location of the tone control. I feel that the proper place for this is for it to be paired with the playback volume control and not with the recording gain control. I also found during my tests that the azimuth of the head was wildly out and nearly two turns of the sealed adjusting screw were needed to bring it into correct azimuth as indicated by the official DIN 45513 test tape.

Nearly £100 is a lot to pay for a portable recorder, but for the true enthusiast, who wants something better than the £25-£35 fixed speed machines and can not afford to rise to the Uher or Nagra, this machine is well worth considering.

A. Tutchings.