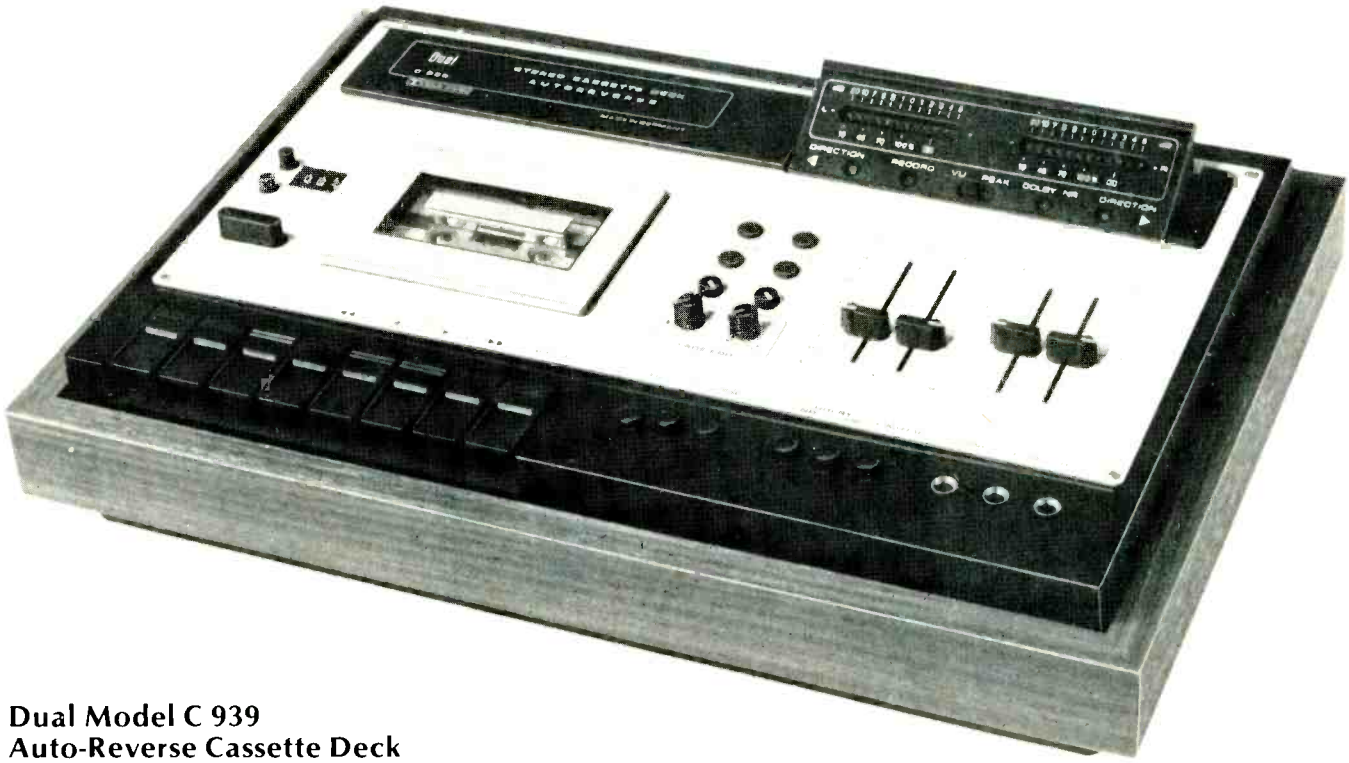
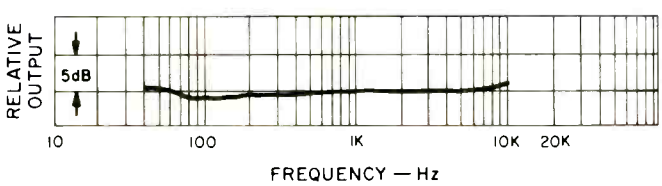


Dual Model C 939
Auto-Reverse Cassette Deck

MANUFACTURER'S SPECIFICATIONS
Speed: 1 7/8 ips, ±1 per cent.
Wow & Flutter: 0.1 per cent in record/replay (DIN).
S/N: 53 to 58 dB without Dolby; 63 to 65 with Dolby.
Erasure: 65 to 70 dB.
Frequency Response: 20 Hz to 17 kHz with FeCr, 20 Hz to 14 kHz with $Fe0_2$ tape (DIN).
Distortion @ 1kHz: 1 per cent with FeCr tape, 1.8 per cent with $Cr0_2$, and 1.2 per cent with $Fe0_2$ tape.
Line Input for 0 VU: 70 mV.
Output: 0-700 mV.
Headphone Output: 4 to 2000 mV, adjustable.
Dimensions: 17¼ in. (43.8 cm) W x 11¾ in. (30 cm) Dx 5¾ in. (14.6 cm) H.
Weight: 15¼ lbs. (6.9 kg).
Price: $550.00.

European audio designs, especially those hailing from the Scandinavian countries and West Germany, tend to be rather different from their American and Japanese counterparts, and this new Dual cassette deck is no exception. First of all, it is not the "usual" front-loading type, and instead of offering variable bias, a monitor head, and provision for a timer like most decks in this price range, it has an auto-reverse tape function, a special "fade edit" circuit, and two groups of LEDs in place of VU meters. Each channel has seven green LEDs calibrated from 0 VU to −20 dB, plus five red ones for +1 up to +5 dB. These LEDs are mounted on a neat hinged bracket at the rear on the right-hand side along with illuminated indicators showing tape direction, record function, and Dolby with a two-position switch for peak/average indication of the LEDs. Two pairs of sliders, each 2½ inches long, are on the main panel in front and control the level of the line and microphone inputs. To the left is a group of six adjustable controls for *Output, Dolby Calibration,* and *Headphone Level,* while just in front of these is another pair marked *Fade-Edit,* about which more later. There are eight control keys on the front, two of which are not usually found on other cassette decks. One of the additional keys is marked *Cont,* and as the name suggests, depressing it enables the machine to play continuously until the key is released. The second added key puts the cassette into the reverse mode for playback. The illuminated tape compartment is just behind it, and next are the large *Eject* button, the digital counter, and the *Memory* switch. On the right of the tape keys are two groups of three pushbuttons; the first three are for tape selection marked *Fe, Cr,* and *FeCr,* then there is a pair for the Dolby functions (*Tape* and *FM*), while the last switches in a "limiter" to prevent overloading when recording. On the extreme right there are three standard quarter-inch phone jacks for microphones and headphones. All the other input and output sockets, including a DIN connection, are at the rear.

Fig. 1—Playback response from a standard test tape.



Now for an explanation of the *Fade-Edit* controls . . . the left control is a safety interlock, and the control on the right introduces the variable erase oscillator so that you can partially or completely erase a recording. In order to prevent accidental erasure, the oscillator switch is spring loaded so it has to be held down during the editing process. In operation, the deck is put into the playback mode so you can hear the recording to be edited, either via the amplifier or the headphones. The instruction manual suggests that you can use the *Fade-Edit* facility to remove the noise made by record scratches, but you will have to work very quickly to accomplish this, otherwise you will remove a chunk of music as well. The control does have its uses, especially since the actual amount of erasure is controllable.

The drive motor is the synchronous type with separate belts for the take-up torque and capstan, while the fast-wind mode is gear driven, an interesting idea. A photo transistor

Table I—Signal-to-noise ratios of the Dual 939 using various types of tape, all referred to 3-per cent distortion.

Brand, type	S/N, dB	S/N, dB, with Dolby
Meriton FeCr	58	66
Maxell UD	60	69
TDK SA	60	67
BASF Super Chrome	59	66

continuously monitors the tape movement and prevents the formation of tape loops, while at the same time providing the signals for auto-stop and reverse control.

The deck is somewhat larger than usual, measuring 17¼ inches, by 11 ¾ inches, by 5 ¾ inches high. Feet are provided for either vertical or angled mounting, and a plastic cover is available. Styling is the conventional black and silver combination with a wooden base.

Measurements

Playback response with a standard test tape is shown in Fig. 1. As a Maxell UD cassette came with the deck, this was used to measure the *Record/Replay* response, and the results are shown in Fig. 2. The −3-dB point was at 15.5 kHz with some fringing in evidence at the low end. Next, this cassette was replaced by a TDK SA, and the selector switch was set to *Cr*. Now the high frequency response extended to 16.5 kHz, which is very good. As a sample of the new BASF Super Chrome tape had just arrived, I was anxious to see how it compared with the other tapes, and Fig. 4 tells the story. At 0 VU the saturation was relatively low, but the −20 dB response had an appreciable rise from around 3 kHz to a maximum of +4 dB at 15 kHz, confirming the manufacturer's claim that this new tape is more efficient with a "hot" high frequency response. The last tape checked was the Meriton Ferri-Chrome, and here the upper −3-dB point was 16.6 kHz . . . approximately the same as the TDK SA. (However, the output was lower, but I'll come to that shortly.)

Next, all four tapes were tested for distortion at 1 kHz (see Fig. 6), and it will be seen that the Ferri-Chrome starts off with the lowest distortion, but above +2 dB, the UD is slightly the better here.

Distortion versus frequency was the next test, and these particular measurements were made at 0 VU to indicate what headroom is available at mid and lower frequencies. This is admittedly a severe test but, obviously, a lot more meaningful than one made at −10 dB or so. The procedure is to begin with a 1-kHz signal which results in a 0-VU indication on the LEDs (in this case), and this input level is kept constant throughout the frequency range. Usually the meters will indicate a constant level, but in some cases the input to them is frequency "tailored" in an effort to prevent overloading. Then again, the meters could be connected to either equalized or unequalized circuits—there's no absolute standard for home recorders. In the case of the Dual C-939, the response of the indicator is "tailored" at *both* ends of the scale, as shown in Fig. 7. It will be seen that the relationship is linear between 150 Hz and 2 kHz, the LEDs gradually lighting up above and below this midrange band. The UD and FeCr show good headroom (or low distortion) down to 30 Hz, while the SA and Super Chrome tapes cannot accept quite such high signals below 100 Hz. So, the LEDs give a better indicator of overloading in this range, although this overloading is not likely to happen except, possibly, with organ music or electronic compositions. The signal-to-noise figures for a 1-kHz signal, referred to 3-per cent distortion, are shown in Table I; the actual output varied from 400 to 800 mV, according to the kind of tape.

The *Record-Replay* response of the Dolby circuitry was checked down to −40 dB, and the deviations were found to

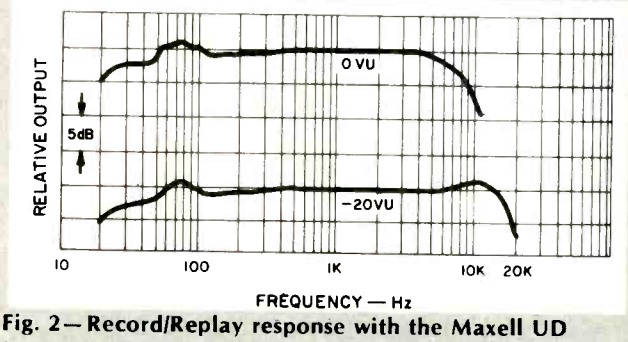


Fig. 2—Record/Replay response with the Maxell UD tape.

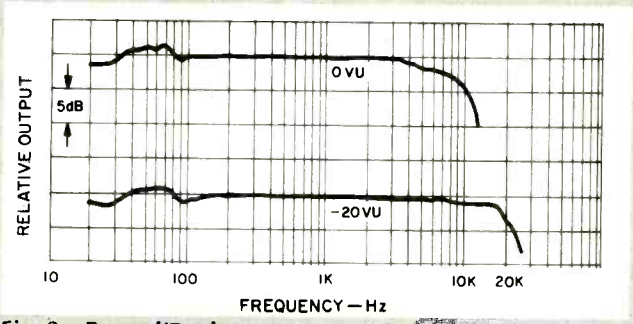


Fig. 3—Record/Replay response with the TDK SA tape.

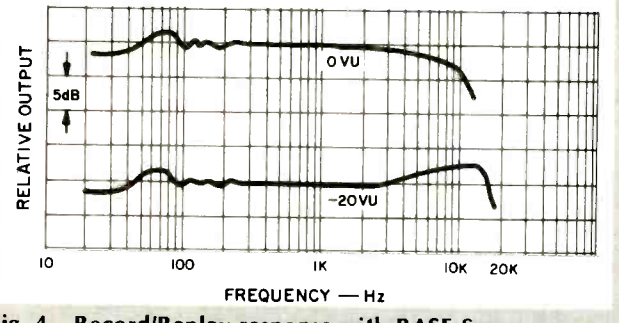


Fig. 4—Record/Replay response with BASF Super Chrome tape.

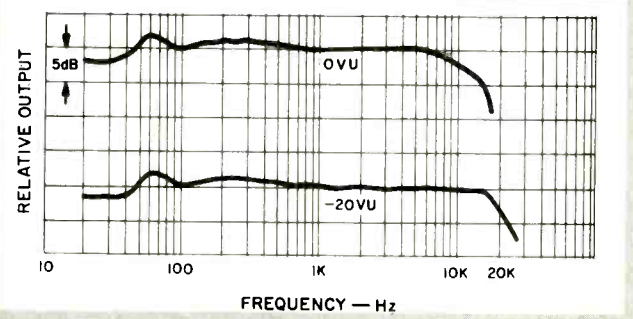


Fig. 5—Record/Replay response with Merriton Ferrichrome.

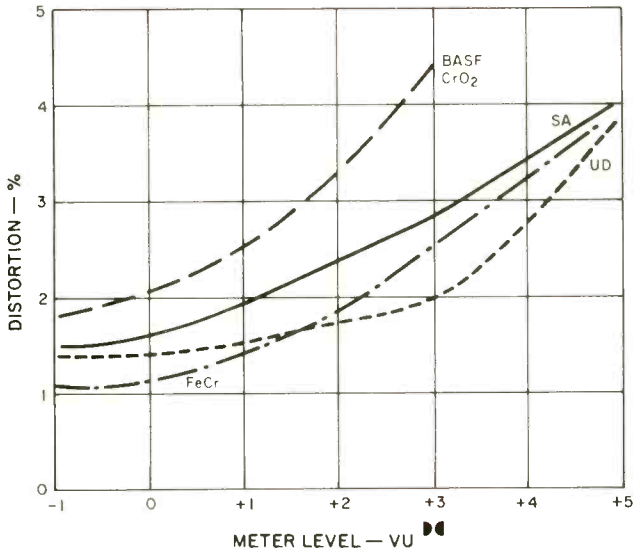


Fig. 6—Distortion at 1 kHz.

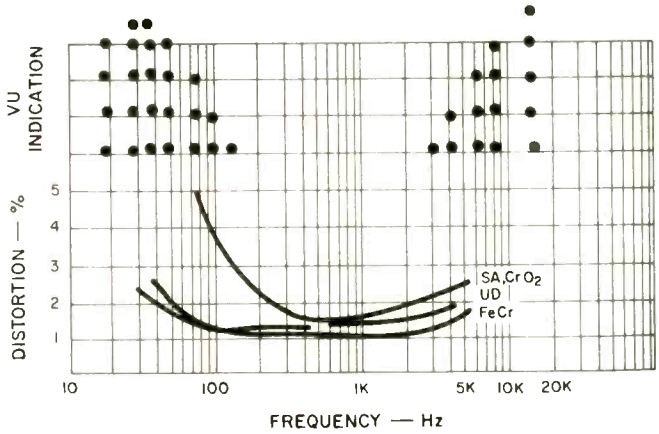


Fig. 7—Distortion vs. frequency for constant input giving 0 VU at 1 kHz.

be less than 2 dB. Input required for 0 VU was 70 mV line and 0.03 mV at the microphone socket. Switching to microphone decreased the signal-to-noise by 9 dB with the input control at maximum. Erase efficiency was better than 65 dB with CrO_2 tape. The wow and flutter was commendably low at 0.06 per cent, while the speed was almost "on the nose" at 0.03 per cent slow. Rewind time for a C-90 cassette was 65 seconds.

Listening and Use Tests

I used the 939 cassette deck for a period of several weeks, and the unit gave me no trouble whatsoever. I must admit, though, that it did take a little time to get used to the electronics being totally controlled by the tape keys. The LED indicators work very nicely, and in many circumstances might be preferred to VU meters, particularly because of their fast action in the peak-reading mode.

In terms of general performance, Dual's 939 cassette deck is fully up to the extremely high standards we have come to expect from cassette decks in this price range. The auto-reverse facility will, undoubtedly, appeal to those of us who have a large collection of pre-recorded tapes. However, I am sure that many enthusiasts, especially those who've had experience with reel-to-reel tape decks, will say that the most useful feature of the Dual 939 cassette deck is the *Fade/Edit* switch.

George W. Tillett

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