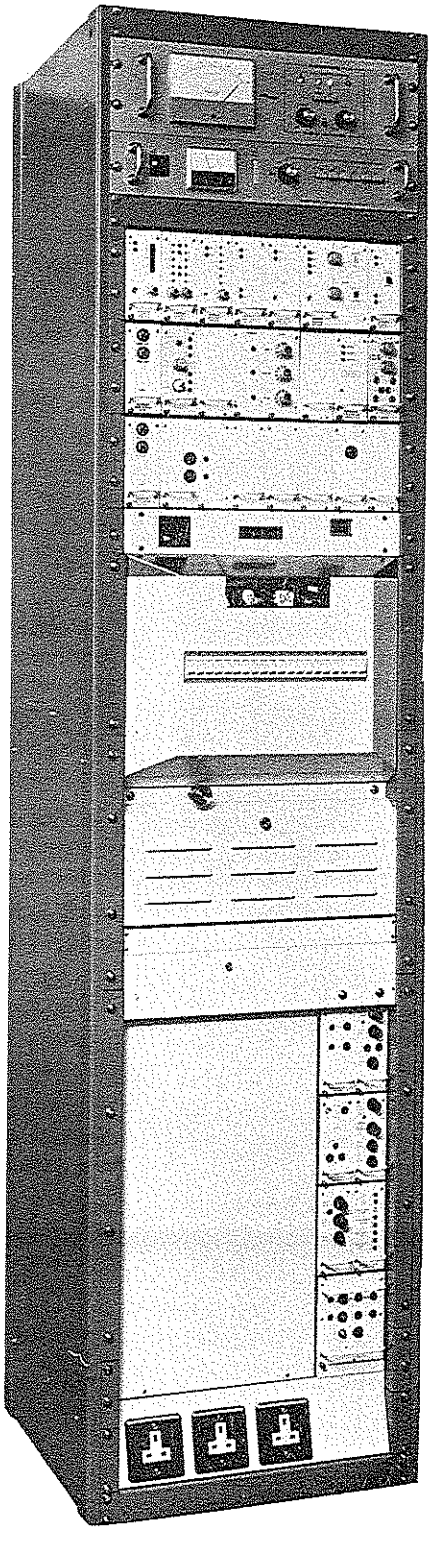
BBC Engineering Design Information

DESIGNS DEPARTMENT LIAISON UNIT BBC LONDON W1A 1AA 01-580 4468 EXT. 4345

Colour Transparency Scanner BA10/501



1. General Description

This is a flying-spot transparency-scanner, giving red, green and blue colour-component output-signals for application to separate coding equipment. In addition to all the normal features of a high-quality transparency-scanner, this equipment offers a number of special facilities, of which the following are especially noteworthy:-

Accommodation for 20 slides, which can be changed while the scanner is on the air.

Rapid selection of slides (usually in about one second). Slides can be selected either in the order of their position in the rotating slide-carrier, or in unrestricted random sequence.

Rapid C.R.T.-changing capability. The flying-spot tube is mounted in a fixed mechanical cradle which, in conjunction with an electrical alignment system, enables a new tube to be set-up in a matter of minutes.

Automatic gain-control. This ensures a constant output-signal level, notwithstanding a wide variation of slide-density.

Flexibility of control. In addition to the controls on the equipment, electrically-extended slide-selection, "lift", and gain controls can be provided at a remote point, if desired.

Compactness of design. The entire equipment is within the confines of a standard apparatus bay.

The slide-carrying, scanning and optical and electronic arrangements of the equipment are described in more detail on Sheets Nos. 10099, 10098 and 10100 of this series, respectively.

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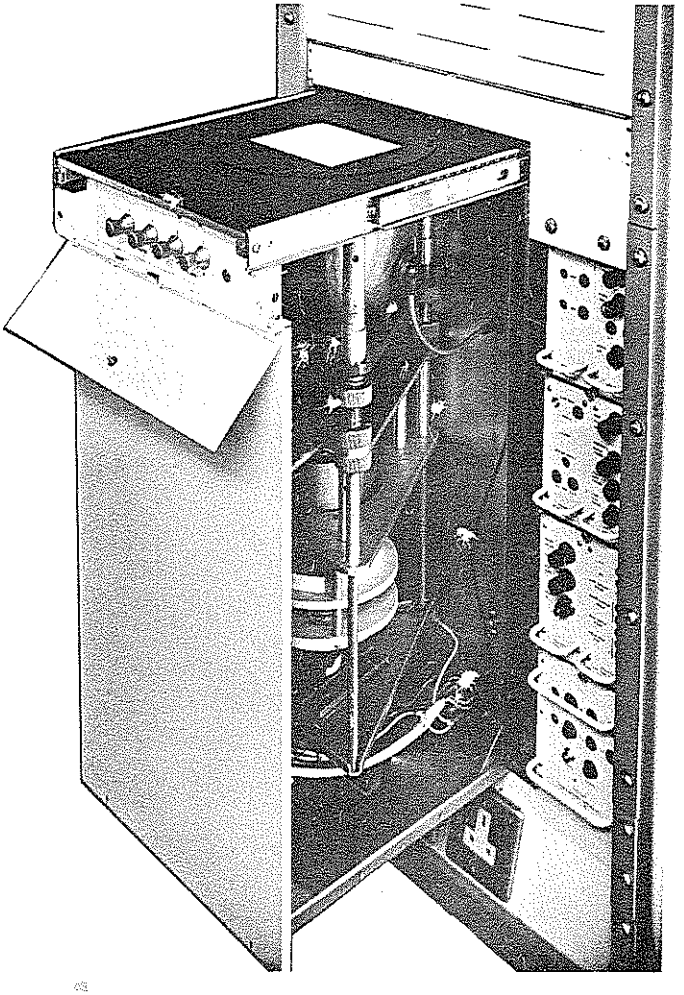

The tube carriage drawn forward for tube removal. A top plate and base-end clamp support the tube. No mechanical adjustments are necessary as tube alignment, with normal scans ON, is entirely electrical using the four control-knobs shown at the front of the tube carriage. An interlock arrangement breaks the e.h.t. supply when the tube carriage is withdrawn.

2. CRT Assembly

The cathode-ray tube assembly occupies the lower half of the bay. It consists of the tube itself together with the scan and focus coils, beam alignment coils and pin-cushion magnets mounted in a rigid framework, with the various generators and power supplies for the tube and its coils mounted alongside. The e.h.t. supply is at the top of the bay.

A standard high-quality scanning tube is used. The supplies to the tube and its coils are highly stable and include circuitry to maintain a constant beam current. No adjustments are normally required after switching on the scanner. Should any of the supplies fail, an interlock system prevents any possible damage to the tube.

The construction is such that no mechanical adjustments are necessary when a new tube is fitted. The accurately-machined focus coil reduces astigmatism to a minimum and only four electrical adjustments are required to align the new tube. A novel method of alignment allows these adjustments to be made without collapsing the scans. The entire operation of fitting and aligning a new tube can be carried out in a matter of a few minutes.

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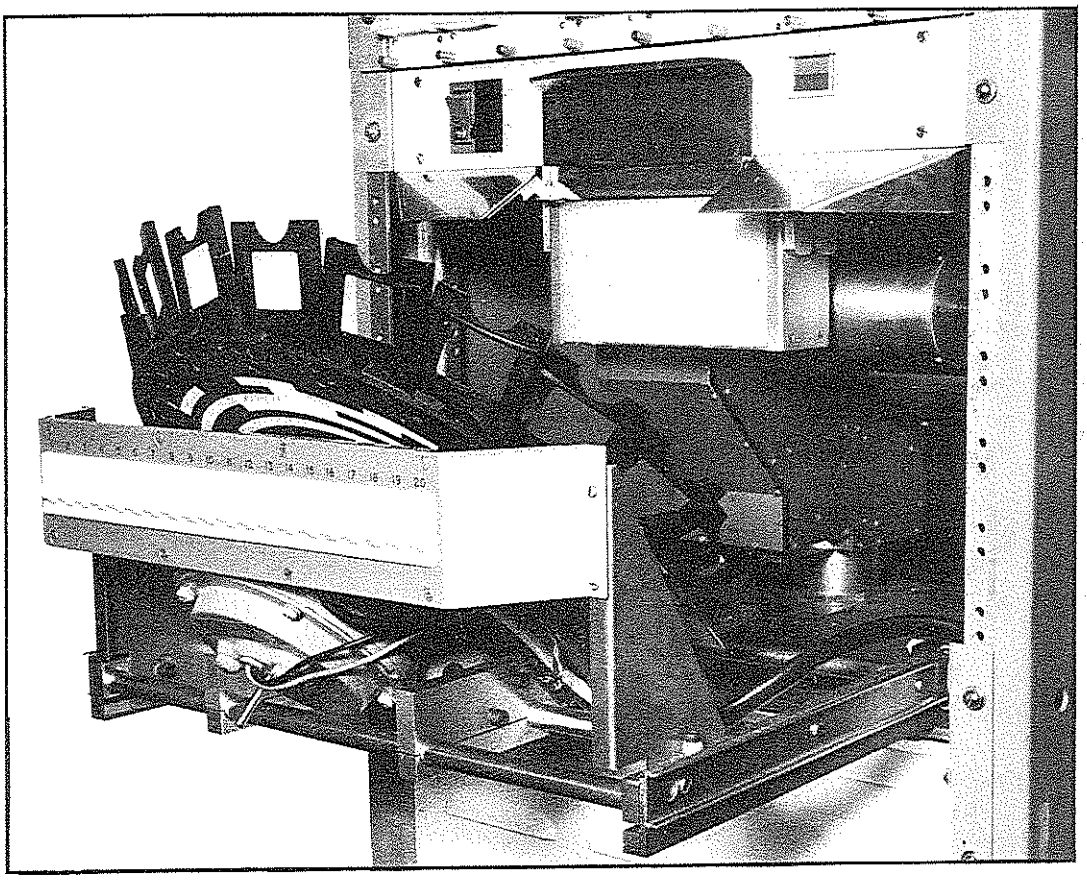
3. Slide-changing Arrangements



Slide-change assembly drawn forward from bay on its telescopic slides. The numbered local slide-selection switches are mounted on the transverse strip at the front of the assembly, behind which can be seen the optically-encoded disk bearing the slide holders. Slides can be viewed against the illuminated panel seen in the centre of the picture. To the rear is visible the optical assembly, a diecast box containing the dichroic mirrors and lenses; on this are mounted the photomultiplier-tube housings.

The scanner can be loaded with up to 20 slides, which are accommodated in holders mounted on the rim of a motor-driven disk. The motor is controlled by a servo system which makes possible very rapid changes of slide with a high degree of reliability, the achievement of which was a prime consideration in the design of the equipment.

Slides can be changed either sequentially or in random order. The pressing of a push-button labelled "sequential" causes the disk to

move through 1/20 revolution, bringing the next slide into position. Additionally, there are a number of switches, one for each slide position, which enable the selection of any slide. The servo system adjusts the power supplied to the motor in accordance with the amount of movement required, giving very rapid movement when necessary and ensuring that all changes are made within one second. The output signal from the scanner is automatically blanked during the change, and the disk is locked mechanically by a signal from the servo logic circuits when the change is completed. Each 18° sector of the rotor is optically encoded and the position is sensed by a bank of photo-cells; thus the use of sliding contacts, with their associated possibilities of malfunction, is avoided. A lamp numbered to correspond with the selected slide glows on the remote-control panel when the change is completed, provided an indication which confirms the correct operation of the equipment.

The slides are directly viewable at a point on the disk opposite the scanned position, where they appear against an illuminated translucent panel and can be removed and inserted easily. While this is being done, an interlocking arrangement prevents the movement of the disk by remote operation. Because the disk is latched between slide changes, slides may be inserted and removed while the scanner is on the air with minimum risk of disturbance of the transmitted picture.

An overall description of the transparency scanner is given on Sheet No. 10097 in this series, and the scanning arrangements and the optics and channel-electronics are described on Sheets Nos. 10098 and 10100, respectively.

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4. Optics and Channel Electronics

An image of the raster on the screen of the flying-spot tube is focused on the slide by a high-quality lens; optical focus is adjusted by a knob on a front panel of the equipment. Light transmitted by the slide is collimated, to avoid inconsistencies in colour rendering due to dichroic tilt, and is then resolved into red, green and blue components by a set of dichroic mirrors and trimming filters with characteristics conforming to BBC Specification TV 228. Further mirrors fold the light paths so that the complete optical assembly, including the photomultipliers which receive the three component light beams, and their head amplifiers, is contained within the width and depth of a standard bay and occupies a height of only 320 millimetres.

The box containing the mirrors is sealed against the entry of dirt; the photomultiplier assemblies, which are mounted on this box, are easily removable without disturbing the seal.

The output signals from the head amplifiers pass to variable gain amplifiers controlled by an a.g.c. system which prevents any of the channels from overloading and enables satisfactory signals to be obtained from a mixture of slides of widely-differing mean densities. The signals are equalised to correct for aperture losses and afterglow effects; the correction circuits are adjustable by means of continuously variable preset controls so that changes in the performance of the scanning tube can be accommodated. Gamma correction is applied and provision is made for the control of "lift" and gain. After passing through low-pass filters having a cut-off frequency of $5\frac{1}{2}$MHz, the signals are applied to a three-output distribution amplifier which produces output signals having normal amplitudes of 0.7 volt. A monitor unit enables the signal in each channel to be observed separately, as well as the colour difference signals; thus the channels can be balanced accurately by means of preset controls provided.

Stability is such that a major line-up is very seldom required; day-to-day colour balance is maintained by adjustment of photomultiplier gain by variation of the dynode potentials.