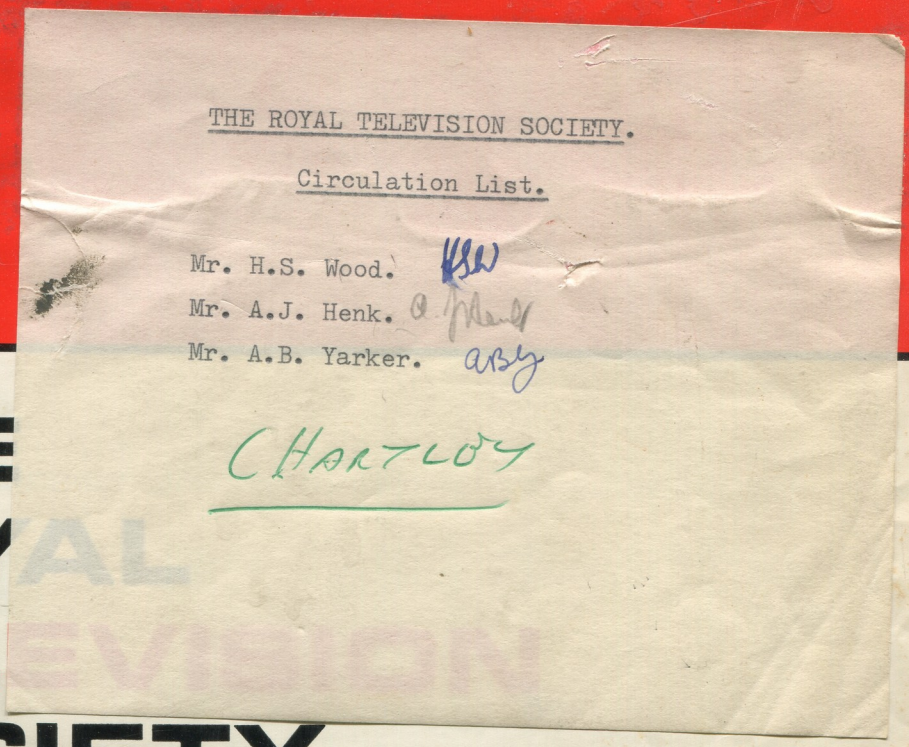

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Planning New Master Control Telecine and V.T.R. Services

By D. A. TILSLEY*

A new Central Apparatus Room at Granada Television, Manchester is described. The influence on the designs is explained of planning for (a) colour signal handling, (b) maximum equipment stability and (c) ease of installation and subsequent expansion.

A new master control room and associated network and engineering control area is also described with details of the facilities installed. A centralized Telecine and Vision tape-recording area are similarly treated, with a description of the assignment arrangements and the reasons leading to their choice.

This paper was presented at the International Broadcasting Convention, September 1967

GRANADA Television commenced operations in a new Studio Centre in Manchester in 1956.

The Centre housed studios, a transmission control centre and centralized support facilities, e.g., Telecine. There was rapid expansion in the first few years after the Centre opened, to provide additional studio capacity and extended engineering services. The advent of vision tape-recording equipment heralded the need to expand services further and extensions were soon made to the Central Electronic Apparatus Room incorporating what was probably one of the first Assignment Routing Switchers in Great Britain. The average age of this equipment is now nearly ten years, and it was all designed for a British 405 line monochrome television system.

Outline Plan

The need to re-equip for future 625 line and colour origination gave the opportunity to re-plan the television equipment for the whole Television Centre, and it is planning of the Transmission Control Centre, Central Electronic Apparatus Room, Videotape Recording and Telecine sections of the scheme that form the subject of this article.

Installation Requirements

The basic requirements of any good installation are:

(a) To provide facilities that give the best possible technical performance to produce the best possible output signal quality.
(b) To provide systems that are stable and thus require the minimum time spent in adjustment and set up.
(c) To provide a system that is reliable, gives the best mean time between failure and thus requires the minimum number of maintenance man hours.
(d) To provide a system that is easy to install and easy to expand or modify as the demands of the service change in the future.

Modern equipment design has done much to improve stability and reliability, but the overall installation design and the environment of the equipment can do much to help or hinder the equipment designer's aims. The installation under discussion was in the planning stage before definite plans for colour were formulated, but from the start it was known that part or whole origination in colour would be required within the life of the installation. To the list of basic requirements set out above had to be added the need for the system to meet a colour performance specification and be capable of easy conversion by the addition of colour equipment.

Building Layout

The original Apparatus Room was built adjacent to the first two studios, which opened on the site in 1956. Subsequent expansion had to be in the form of a straight line development away from the Apparatus Room. This led to very long cable runs with the consequent problems of signal equalization and timing (Fig. 1).

It was decided that these problems could be avoided and the basic requirements best met by two expedients:

(a) To house all possible electronic equipment in a centralized apparatus room so that, broadly speaking, all the vision signals and many of the sound signals are processed, routed, mixed and re-processed all within one room.
(b) By choosing a location for the apparatus room as near the electrical centre of gravity of the site as possible.

The Studio 8 on Fig. 1 is at present a shell ready for fitting out as a further studio in future. The floor area of 8 000ft² was considered to be larger than was likely to be required for future programme commitments.

It was therefore considered reasonable to take approximately 32ft of the length of this studio at first floor level as a new Centralized Apparatus Room. Fig. 2 shows the site layout with the Apparatus Room shown. It will be seen that as a bonus the location is in the centre of the building, giving the maximum thermal lag and minimum solar gain, and thus giving the air-conditioning plant the maximum change of maintaining constant temperatures.

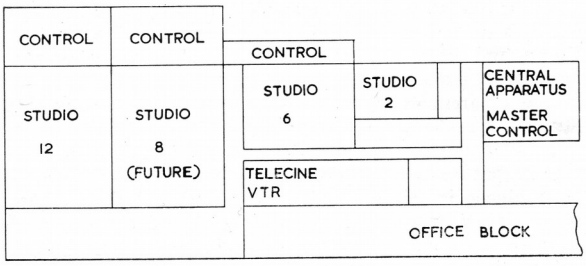
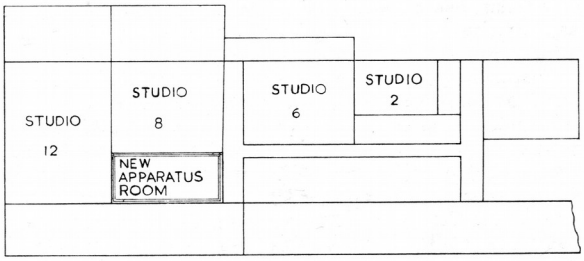


Fig. 1. Layout of building

Fig. 2. Location of new apparatus room



* *Granada Television Ltd.*

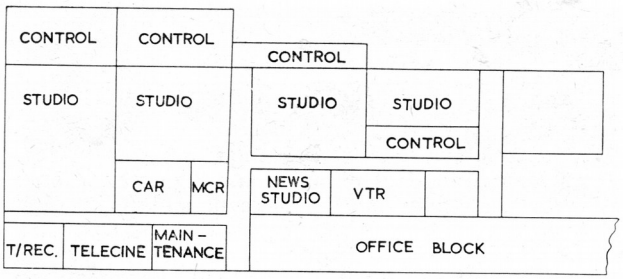


Fig. 3. Location of other technical areas

Fig. 3 shows this room with the proposed locations of the other technical areas. This layout is not ideal, but represents as fair an approximation as possible to the ideal, considering it is achieved by the adaption of existing space. Adjacent to the Central Apparatus Room is the Transmission Control Room. The layout and the reasons for its location is given later.

The Technical Maintenance Workshop is located immediately adjacent to the Apparatus Room which will be unmanned. The maintenance staff will be responsible for all setting up and maintenance of the equipment in the Apparatus Room, and workshops adjacent are an obvious contribution to minimum down time of failed equipment and minimum movement of staff and test equipment for setting up. Maintenance has windows giving good natural lighting during daylight hours.

The area for Telecine is well placed adjacent to both Maintenance and the Central Apparatus Room. V.T.R. would ideally havebeen placed in the same relative position to C.A.R. and Maintenance, but existing site conditions dictated its nearest location as shown.

Although studio installations are not part of this article, it is worth pointing out that the control rooms for the studios, although on the same floor as the central technical areas, are in three cases on the opposite side of the studios. Ideally, in a new building, they might have been placed adjacent to the other technical areas. Their positions as shown make little difference to the basic requirements set out at the start of the article, however, as in the case of vision circuits, all transmission paths from C.C.U.'s to the outgoing line are in the Central Apparatus Room, and the rooms are only connected by d.c. wires and monitoring feeds.

The apparent illogicality of having the control room for Studio 2 on the same side as the central technical areas, a layout dictated by the building, has a fortuitous advantage in that many live shows of the current affairs type will be produced in this studio. This is the type of show where direct liaison with transmission control and other central areas is so valuable, however good the communication system provided.

General Building Considerations (Ventilation)

Mention has already been made of the need to provide an environment giving maximum equipment stability. To achieve this, all technical areas are being air-conditioned to maintain the equipment operating temperature as constant as possible. Good environmental conditions for electronic equipment demand clean air, and to this end a system of introducing large quantities of fresh air has been rejected in favour of a maximum re-circulation system where air is extracted from the rooms (or in the case of the Central Apparatus Room, from the equipment bays), and double filtered, cooled, humidity controlled and returned to the room with a small fresh air bleed to maintain air freshness.

As ideal location for the air handling plants was provided by the space in that portion of Studio 8 partitioned for the Apparatus Room, between the high roof of the Studio and the ceiling of the Apparatus Room.

This location gave direct through the floor connexion between plant and apparatus bays (where the maximum heat load occurs), and minimum trunking runs to the other areas served from this plant. (Studios and their control areas have separate plants).

To provide individual thermostatic and humidity control, each major area has its own air handling plant, each fed with refrigerated water from a common refrigeration plant, installed to serve the whole centre.

Because of the recirculation principle of air handling, and the high heat loads encountered in the installation, failure of the cold water supply could mean no cooling of the equipment and damaging high temperatures could soon be reached. The 150 tons refrigeration compressor serving all the technical areas is therefore duplicated. So that the 'standby' plant is not idle, it will be arranged to provide a measure of air-conditioning to the studio areas which, at present, rely on introducing relatively large quantities of outside air to maintain reasonable conditions. In the event of the standby plant being required to take over the cooling of technical areas, the studios will be operational, although a little warmer. It is an interesting detail to record that the second compressor plant is isolated by electrical maximum demand warning meters to avoid this large plant, adding significant electrical demand at a time when a high tariff penalty would be incurred based on station maximum demand. This automatic isolation can be overridden manually in the event of breakdown of the main compressors feeding the technical areas, but normally this isolation will only deprive the studios of the extra cooling for short periods.

Ceilings

With the exception of the Apparatus Room, the problem of air distribution has been solved by the use of ventilated ceilings. They have advantages which are worth detailing:

(a) Cold air is introduced uniformly over the whole area.
(b) The ceiling forms its own plenum, minimizing duct runs and ducted distribution.
(c) It maintains all the advantages of suspended ceilings. Easy access to services above the ceiling is possible, particularly with the exposed fix system of suspension.

The air system in the Apparatus Room will be described later.

Floors

The basic requirement of flexibility and ease of installation was given much consideration and the popular system of a false tiled floor was chosen for all the technical areas and their connecting corridors. A false floor of this sort enables cables to be run in the shortest route from one area to another and provides a universal cable duct of almost unlimited cross-section, giving good flexibility for future change of layout or the introduction of new equipment.

In choosing the type of proprietry false floor to be installed, many installations were inspected and it was decided to choose a make with metal tiles not subject to warping or distortion, and a system supporting the tiles at each corner only, without stringers, leaving a

completely clear cable run when the tiles are removed. It is perfectly possible for three men to lay an extra cable in a busy area or down a corridor very quickly, without taking more than two tiles up at any one time.

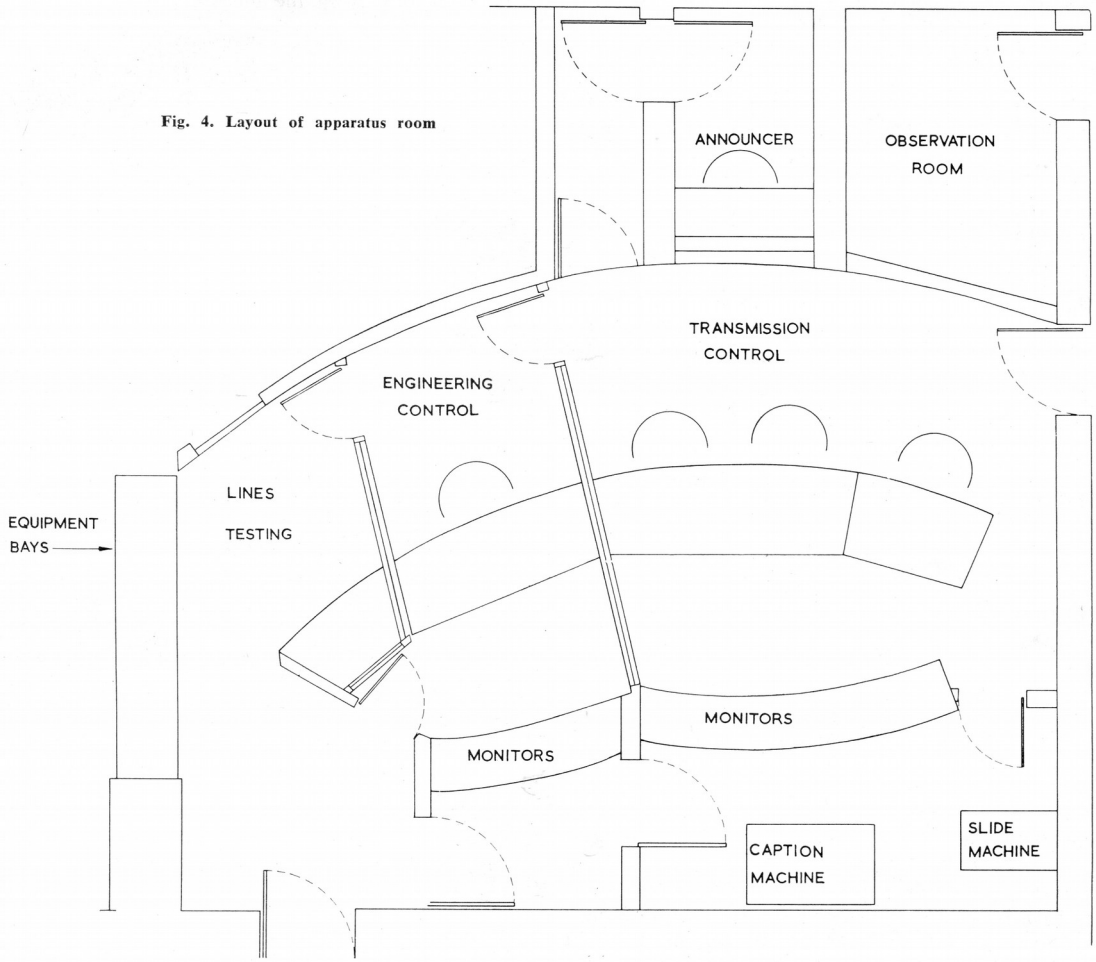
Layouts

Apparatus Room

The Central Apparatus Room has no control position and the object in deciding the layout was therefore to accommodate a large number of equipment bays (actually about 82) in the most convenient manner for servicing and ventilation.

Most of the electronic equipment is serviced and adjusted from the front, so rows of equipment bays are arranged back to back with door access to the passage between the backs of the bays used for servicing cables and installation. As well as being functional and neat, this layout is also most convenient for the type of ventilation chosen. It is desirable to avoid sucking air into the equipment racks from the cable duct or from the room as it is impossible to maintain clean air in these conditions. Air ducts to the bottoms of the bays obstruct cable access and runs, so ventilation ducts are kept above the ceiling. Adequate ventilation is achieved by extracting through grilles in the false ceiling above the equipment racks, using the ceiling as a plenum to save ducting, and by providing inlet air from nozzles sited above head height in the passage between the equipment bays. The nozzles can be adjusted to direct cool clean air at the base of the cabinet and the system is balanced to maintain positive pressure in the bays relative to the rest of the room to help in excluding dirt.

Fig. 4. Layout of apparatus room



Central Control

Granada's method of operating transmission control is to have a transmission control room with switching and monitoring equipment in which a Transmission Controller and an Assistant switch programme segments to the transmitter(s). An engineering control and monitoring position is associated with this operation and it is from the engineering control position that outgoing network programmes are switched. The layout chosen (Fig. 4) involves a curved desk running through the central control and network control. These areas are separated by glass to provide reasonable monitoring conditions and to minimize mutual interference between the two operators. The curved desk, however, emphasizes the team effort and means that there is always unobstructed visual contact which is desirable despite good talkback facilities.

The engineering control position is adjacent, on the opposite side, to the Lines Termination position. This area will not normally be manned but will be staffed from the Maintenance area next door when required, for routine testing or investigation into failure of equipment or lines.

In the, hopefully rare, case of failures of this sort, the position of the lines termination rack adjacent to the engineering control position will be a great advantage.

The lines termination racks are in the dividing wall of

the Central Apparatus Room, maintaining the principle of centralized equipment and minimum cable runs.

V.T.R.

The problems of layout of a v.t.r. area is one of reconciling the conflicting extremes of (a) providing each machine with its own soundproof booth so that the machine noise, programme sound loudspeaker and talkback do not add to the noise problem of operating any other machine or (b) grouping all machines in a tight circle so that, as advancing techniques make machines more stable, the minimum staff can set up and supervise all the machines.

The layout chosen (Fig. 5) groups machines round the perimeter of the room each in a partial open-fronted

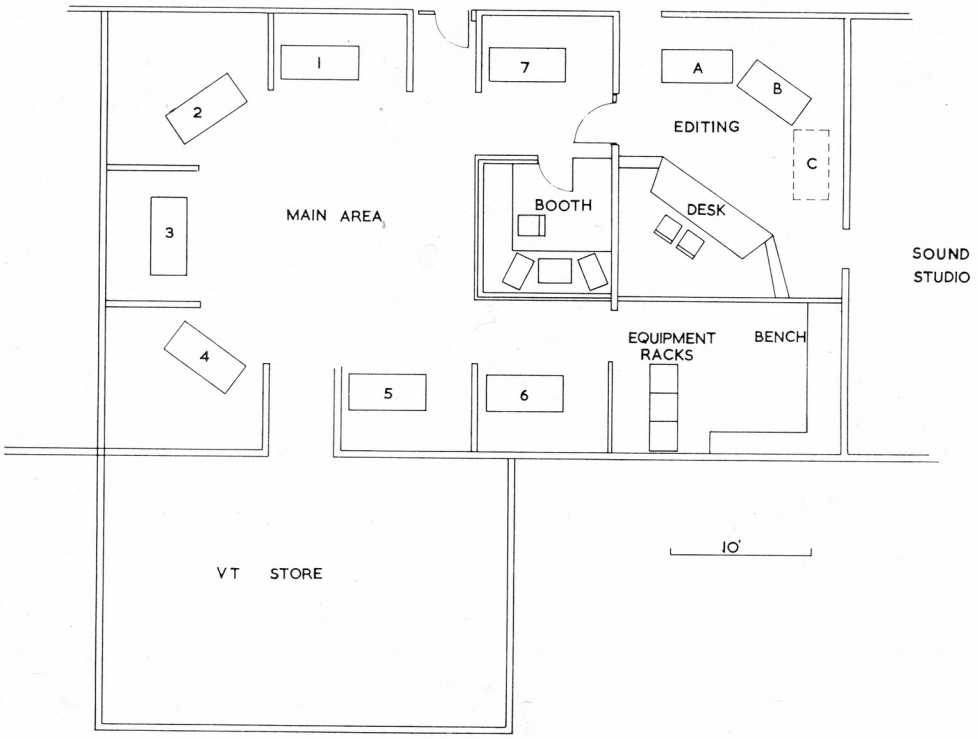


Fig. 5. Layout of v.t.r. area

booth, with a monitoring assignment and supervisory booth at one end of the room. Each machine booth is treated with sound absorbant wall cladding and loudspeakers associated with the machines are mounted on a pelmet across the front of the booth, playing into the machine area. Adjacent to the general area is an editing room conventionally laid out with an editing desk and room for three machines. The desk will house the editing counters and registers in addition to simple sound and vision mixers.

TELECINE

Again, the same compromise between noise and ease of access to machines has to be considered. The very simple layout chosen (Fig. 6) which looks almost unplanned, belies the amount of thought and consideration that went into rejecting more sophisticated layouts. Machines serving studios will be controlled from the studio control room and the work in Telecine will be confined to loading and checking. Machines serving transmission will be started from the Central Control Room, but video and sound control will be undertaken in Telecine. Schemes for a single booth for this function were rejected because of the problems of assigning the number of controls required to a single control position, which is made doubly difficult because of a mixture of machines from different manufacturers.

The control desk shown has a separate control position for each machine all adjacent and of minimum width. Each machine can be separately checked and monitored from the desk but at the same time, staff can quickly change from one machine control to another. The machines are all reasonably close and are arranged so that all projector loading doors face the desk and can be reached readily from the control position. A supervisory position at the end of the desk provides independent monitoring and machine assignment control.

ASSIGNMENT

The case for centralized apparatus made at the start of this article meant that assignment switching of Telecine and Videotape machines had to be in the Central Apparatus Room. As the Apparatus Room is unmanned, any such switching has to be controlled from either the source or the destination and a fairly complex remotely controlled switcher has had to be installed. This employs uniselector units for switching all services, except the transmission vision path i.e., Sound, Talkback, Cues, Remote Machine controls, reverse sound and picture, and pulses to the machines. Each studio has a separate pulse generator and thus machine pulse assignment is essential. A separate transmission path vision switcher is operated from the uniselector units.

The control of the assignment is provided at the Telecine and V.T.R. supervisory positions so that the Senior Engineer in each area can select which machine at his disposal should fulfil each commitment on his schedule,

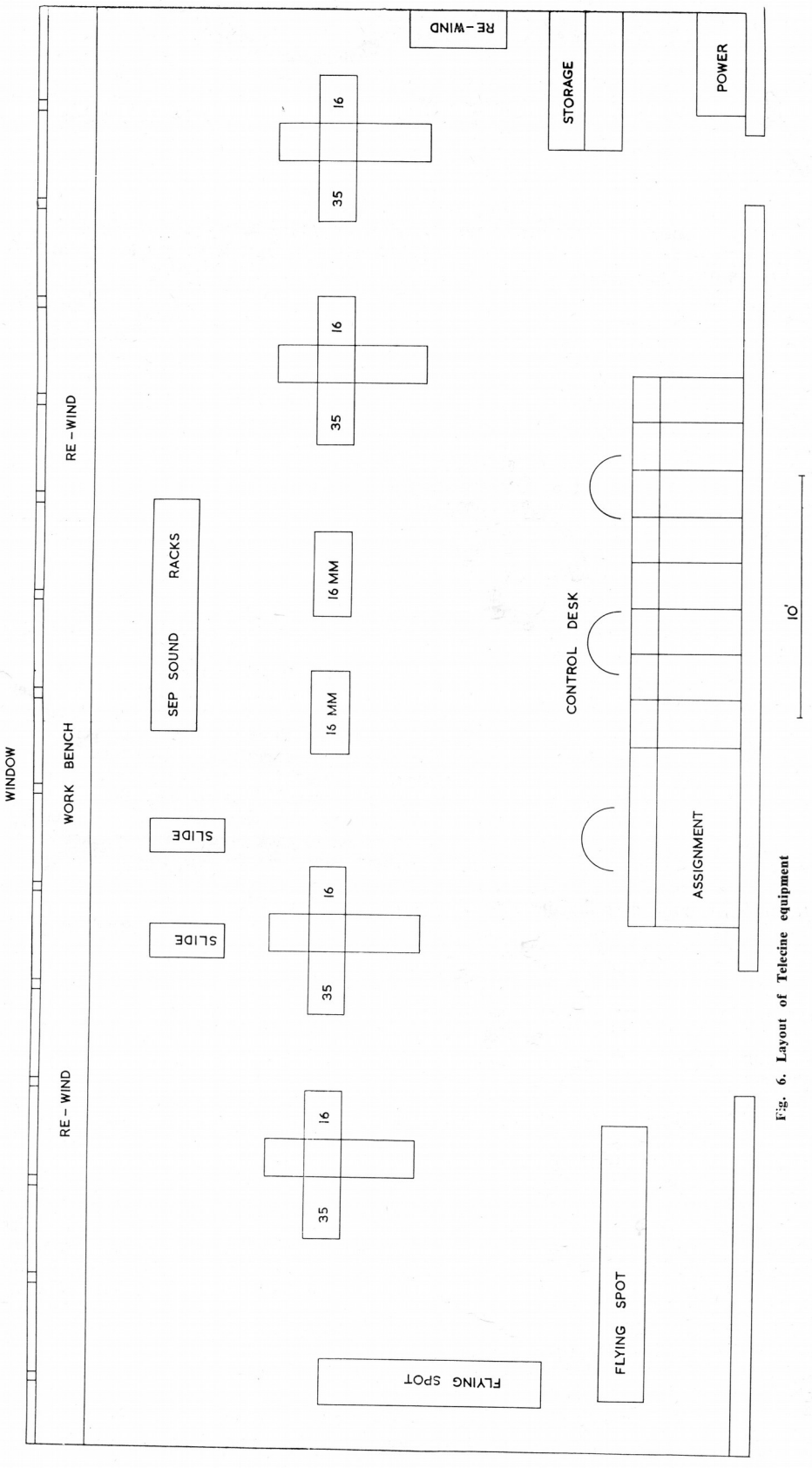


Fig. 6. Layout of Telecine equipment

in the knowledge of the state of the machine and, in the case of Telecine, where there are different types of machines, which offered the best facilities for the job.

The assignment control works in conjunction with monitoring switchers which enable the engineer to monitor the machine output and the destination prior to and after assignment. This facility minimizes the chance of wrong assignment, which in the case of a transmission machine on air could be disastrous, and helps in diagnosis of any faults which might occur within the distribution and switching system. Digital read-out of the assignment switcher state is provided at source, destination and in the apparatus room. V.T.R. machines are not treated separately for record and re-play, the same assignment serving for both. Each machine has a switched signal send and return path which is used in one direction or the other, acvcording to whether the V.T.R. is a source or a destination.

Conclusions

It has not been possible in a short article to cover many aspects of planning Telecine, V.T.R. and Master Control facilities and essentially more has been left out than included, but it is hoped that the brief outline given is of some value.

Acknowledgments

The author would like to acknowledge the large contribution made by his colleagues in the Engineering Department of Granada Television Ltd and the Application Section of the Marconi Co. Ltd in the planning to these areas, and wishes to thank the Director of Engineering, Mr. R. H. Hammans, for permission to publish this article.