G. E. WATERS, P.Eng, Canadian Broadcasting Corporation

CBC UNMANNED TELEVISION STUDIO

The installation described by Mr Waters was planned several years ago and as a result it is possible that an assessment of equipment available now might lead to the selection of a vidicon camera for this role. This, however, does not invalidate the current interest of the project. We are grateful to the Canadian Broadcasting Corporation for permission to print this article which was published originally by their Plant Department.

THE IDEA of an unmanned television studio is attractive from the point of view of running costs and not prohibitive in capital cost. Such a studio is limited in its production possibilities but is ideally suited for programmes such as talks and commentaries.

The management of the Canadian Broadcasting Corporation envisaged this type of studio as meeting a need in Ottawa to provide facilities for political commentaries on the day's happenings in Parliament. The CBC TV Production centre in Ottawa is located several miles from the down-town area and the Parliament buildings, and this inevitably resulted in delay in airing news concerning Parliamentary happenings. The Château Laurier Hotel, adjacent to the Parliament buildings, was therefore selected as a suitable location for the proposed studio, and negotiations with the hotel management led to the leasing of two rooms, adjacent to the CBC radio studios in the hotel, for this operation.

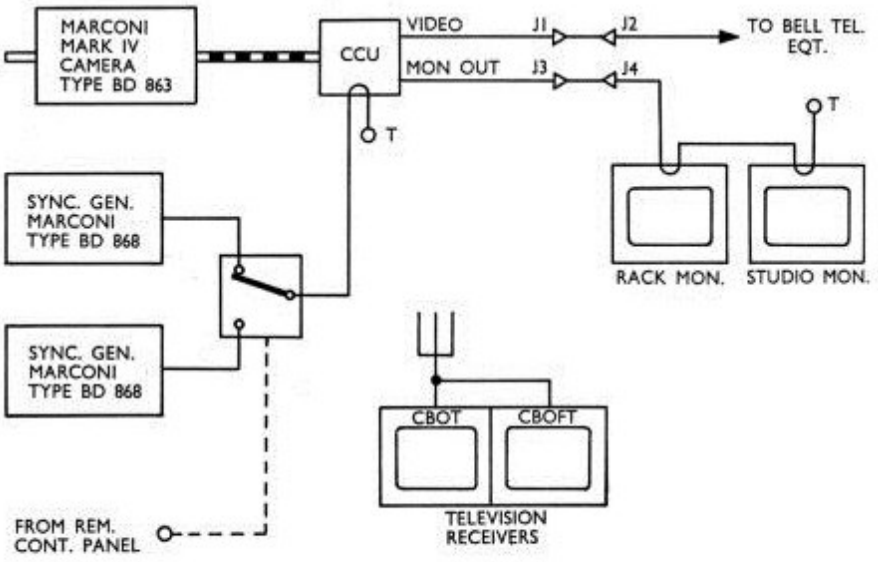

Fig. 1. Video facilities diagram.

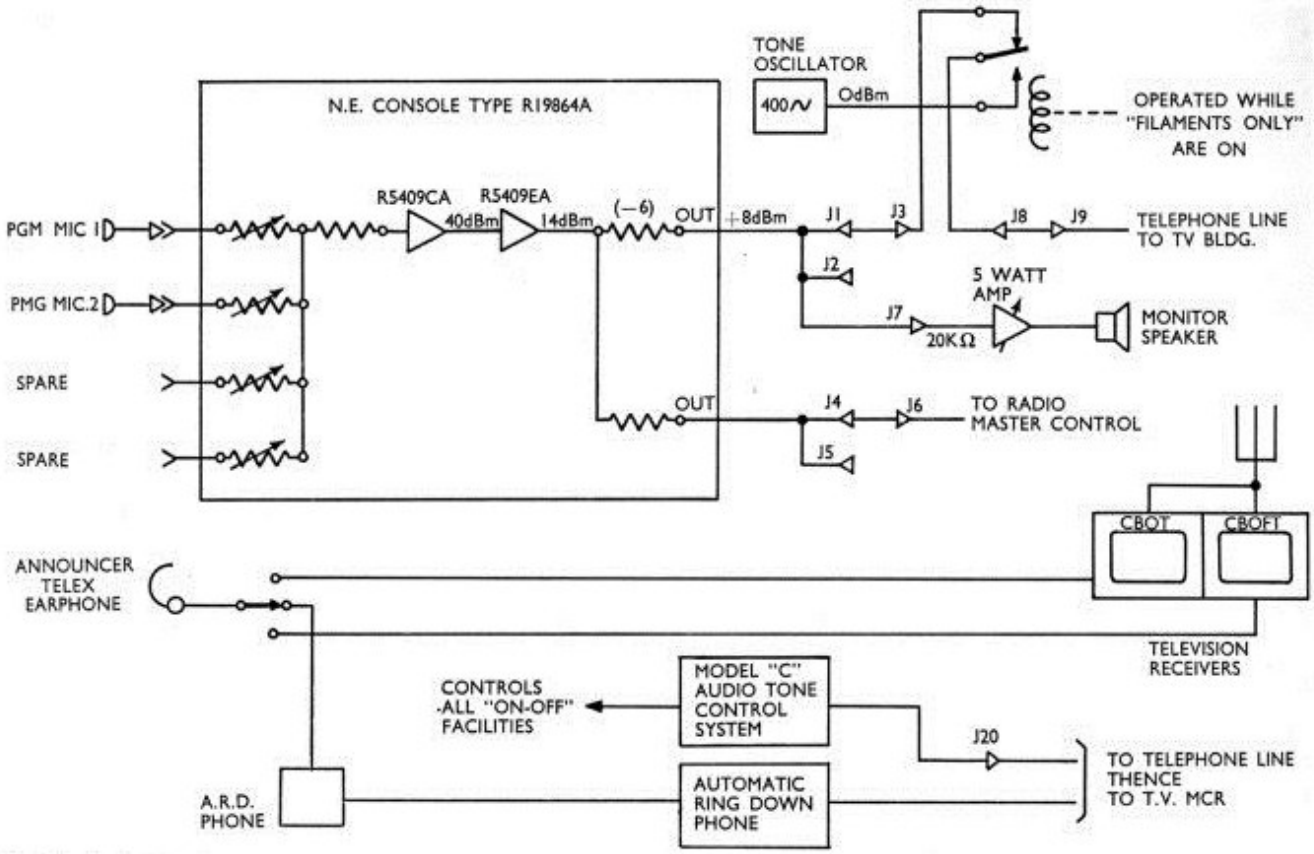

Fig. 2. Audio facilities diagram.

CHATEAU LAURIER UNMANNED STUDIO AUDIO FUNCTIONAL

TECHNICAL EQUIPMENT

The key factors in the operation of an unmanned studio are reliability and stability of equipment, and the ultimate selection was governed by these considerations. The quantity of electronic equipment must be kept to a minimum in order to reduce the chances of electronic failure. (See Figs. 1 and 2.)

The specification for equipment stability demanded that the studio be ready to transmit pictures in a maximum time of 30 minutes after switching on, a shorter period being desirable if attainable.

It is understood that vidicon cameras have been utilized elsewhere in unattended studios, hence the performance of commercially available vidicon cameras was investigated. The vidicon camera suffers from two inherent disadvantages for use in live television in that the picture tends to smear during panning shots, and it possesses a sensitivity that demands approximately 300 ft-lamberts of incident light to produce an acceptable noise-free picture with minimum smearing.

Tests were conducted on several commercially available vidicon cameras to establish their performance and, still more important, their stability. The results obtained were disappointing, because, although an acceptable picture could be obtained and smearing was not a problem on reasonable static shots, the stability of signal amplitude, black level and focus were such as to make the use of a vidicon camera inadvisable for unattended operation. Attention was therefore turned to image orthicon cameras, which also present problems for unattended operation due to the tendency of pictures to "burn in" or "stick" on static shots. After prolonged tests, results were promising from the stability aspect, as it was established that after a 48-hour period of the equipment being idle the camera was sufficiently stable to produce transmittable pictures in from 15 to 20 minutes after switching on. A horizontal resolution of 730 lines ±20 lines was obtained, and black level and signal amplitude were unchanged from previous operations. This performance looked very promising as the picture was superior in all aspects compared with that obtained from a vidicon, and additionally only 80 ft-lamberts of incident light were required. The remaining problem to be overcome was the "sticking" tendency of the image orthicon tube. Experience has

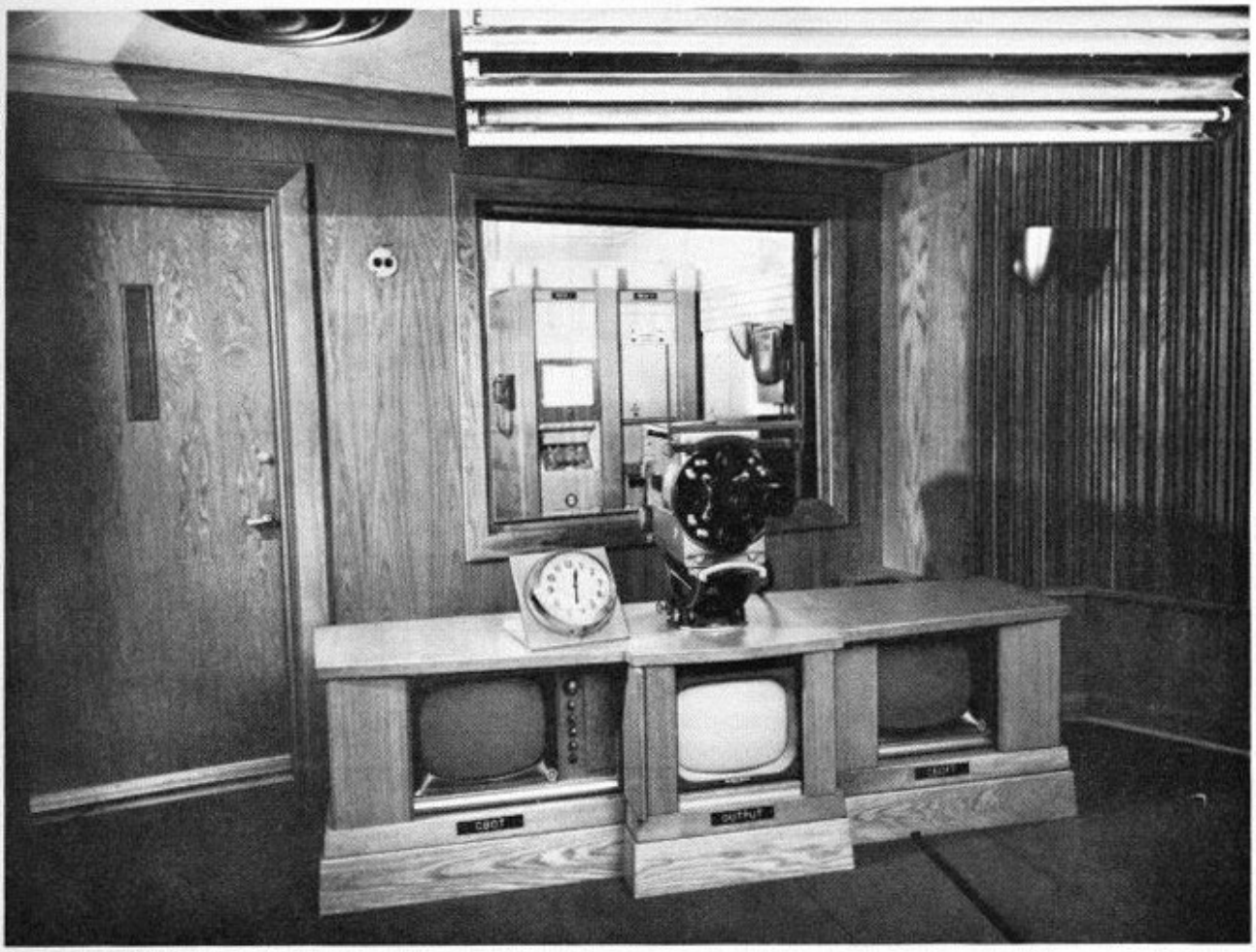

Fig. 3. The studio from the commentator's desk showing the camera and the three monitors—one output and two off-air.

shown that the 4½-in. image orthicon tube appears to be superior to the 3-in. tube in this respect and that the "sticking" tendency is reduced considerably after approximately 100 hours of operation. Steps to minimize picture "sticking" by the camera designers include a device known as an orbiter, which rotates, either by electronic or mechanical means, the image focused onto the photo cathode of the image orthicon. The movement is approximately 3% of picture height and the resultant picture shift is not observable by the average viewer. A minor modification was made to the orbiting circuit of the camera to increase the orbit from 3% to 6% of picture height. This increase has virtually eliminated sticking, but the picture shift due to orbiting is detectable to the trained observer but goes unnoticed by the average viewer. "Sticking" of course will not occur if the camera is defocused or capped up, and a convenient method of capping was included on the image orthicon camera chains tested. This capping circuit consisted of positively biasing the photo cathode of the image orthicon tube thus preventing electrons from the target landing on the photo cathode. The final selection of a camera was now possible and the type selected on the basis of extensive tests was the Marconi Mark IV using a 4½-in. Image Orthicon tube. Additional relays were added to the camera power supply to separate the B+ switching from the filaments and also to enable the cap–uncap circuit to be remotely controlled.

Other equipment installed in the studio included.

1. Dual sync generator unit with automatic changeover in the event of power supply failure. This type of unit employs transistors whose reliability and life were expected to be better than a unit employing conventional tubes. (See Fig. 4.)
2. Picture monitors and two off-air receivers, giving cue facilities for both French and English channels. (See Fig. 3.)

3. An unattended audio console employing a compression amplifier, thus taking into account variations in voice levels likely to be encountered with differing commentators.

The power for the equipment including the lighting has been regulated, thus minimizing the effect of a.c mains voltage drift.

It may be of interest to compare the relative merits of vidicon versus image orthicon cameras for unmanned studios. Assuming that a vidicon camera chain similar to an image orthicon camera in reliability and stability could be obtained, then the low capital cost of the vidicon camera chain may be somewhat offset by the increased capital cost of lighting fixtures because of the higher lighting levels necessary.

Higher power costs for lighting for the vidicon camera will also be an adverse factor. Interchangeability of spare parts with other available cameras must also be taken into consideration. If such a camera is ever to be used on panning shots then the previously mentioned shortcomings of the vidicon camera must also be borne in mind.

OPERATION

The switching on and off of the system has to be operated from the TV Production Centre at the western end of the city, and a frequency shift and pulses system, operating a stepping relay, has been employed.

In order to establish that the appropriate equipment had in fact been energized when dialled from the control point, signals from the studio are fed back to the control point. Initially the filaments of the camera chain and a 400-cycle tone oscillator are energized, the tone being fed back over the audio programme line to the TV centre, thus establishing a check on the first switching operation. The second switching operation applies B+ to the camera chain, a.c to the picture monitors and off-air receivers and a.c to the sync generators. The sync pulses are fed via the camera chain to the video programme line back to the control point and simultaneously the tone is cut and the microphones become live. The arrival of the sync signal back at the control point thus confirms the second switching operation. The third switching operation brings up the TV lighting whilst a fourth electronically uncaps the camera. No check on the operation of the lighting has been devised but the results of its operation are immediately apparent upon uncapping the camera. A further switching operation is provided to change from one sync generator to the spare in the event of pulse failure. The air-conditioning equipment for the studio is switched on by the "filaments on" operation. A 24-V power supply is permanently energized at the studio to provide power for relay operation.

A direct telephone line is available from the studio to the TV Production Centre so that contact between the programme producer and the commentator may be readily established. A small "deaf-aid" type of earphone for audio cue selection is provided for the commentator so that he may select off-air French, off-air English or verbal telephone line cue. Thus three

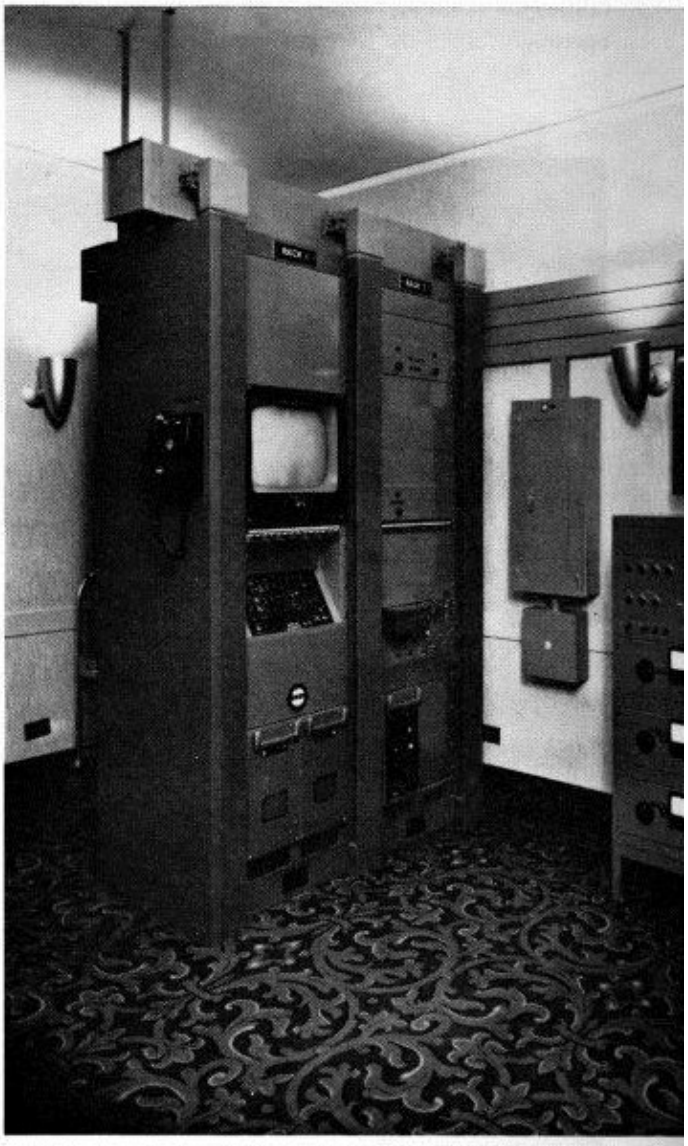

Fig. 4. The equipment room. The dual sync generator is at the bottom of the right-hand cabinet.

telephone lines are in use for switching control, programme and communications respectively.

The camera and commentator's desk have been fixed in the studio, which is approximately 200 sq ft in area, and the lighting arranged to suit. (See Fig. 5.) The studio was placed in service during the first week of July 1961 and enabled CBC commentators to provide a fast service to the public on the developments in Parliament, over both the French and English language TV networks.

After 3 years' operation the studio has fully lived up to expectations, and in the matter of reliability and performance has, perhaps, surpassed the most hopeful predictions.

It is planned in the future to investigate the possibilities of remotely controlling pan, tilt and zoom operations and with the provision of a control booth in the TV Production Centre the remote studio will become of even greater value. Remote control of pan, tilt and zoom is already in successful operation in a single camera studio in the CBC TV Production Centre at Edmonton, but in this case the control point is in a control room adjacent to the studio. In Ottawa it is hoped to accomplish this operation from several miles' distance.

ACKNOWLEDGEMENTS

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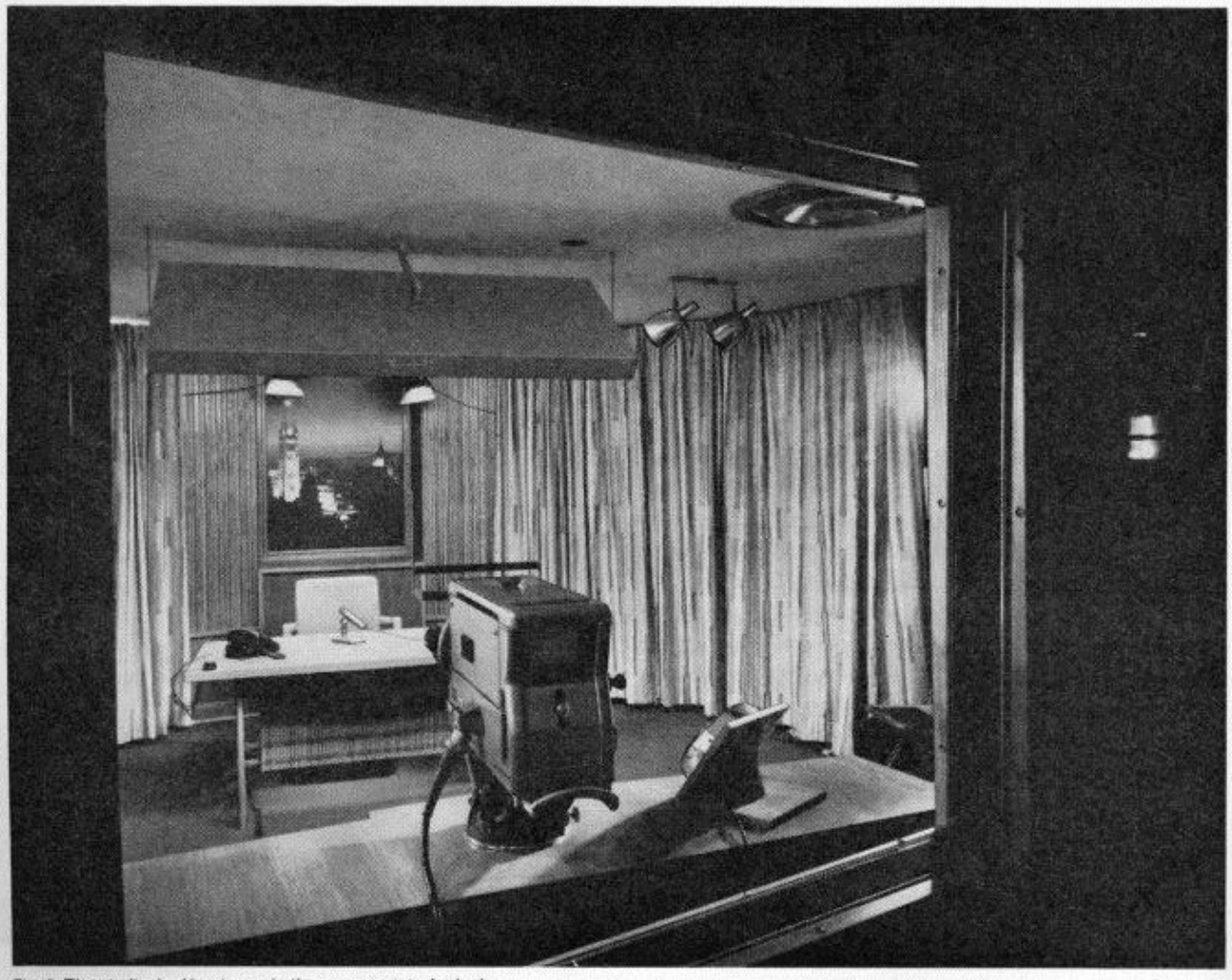

Fig. 5. The studio, looking towards the commentator's desk.