THE NEW ROSEHILL SOUND BROADCASTING STUDIOS, PERTH

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INTRODUCTION

The Postmaster-General's Department became associated with broadcasting in Western Australia in June, 1929, when it assumed responsibility for the technical operation of the studio and transmitter equipment for 6WF, one of the first Australian broadcasting stations. Since that date a succession of temporary premises, none of which had been designed for the purpose, were used as studios. The building occupied immediately prior to the opening of the new Rosehill Studios was inadequate for broadcasting purposes, with poor sound-proofing and acoustic treatment and limited accommodation for both staff and equipment. A new Western Australian headquarters for the Australian Broadcasting Commission had become a matter of urgency, and work on the design of an administrative and studio block was commenced during 1957. The Department of Works was responsible for the design of the building and the Australian Broadcasting Commission's own Buildings Branch provided designs for the acoustical treatment of the studios. The Postmaster-General's Department, which is responsible for the provision, maintenance and operation of all sound technical services, also commenced work on the design of a new technical installation towards the end of 1957. All work was completed before the target date of June 1960.

GENERAL DESIGN

From the outset several aspects of design were considered to be of prime importance. These were firstly the use of new equipment of the best quality available and circuitry incorporating the best of past designs together with new important features which would lead to reduced fault liability and an optimum in ease of operation. Secondly the housing for the equipment, that is control and announcers desks, record and tape replay cabinets, etc., was to be designed with the utmost attention to both pleasing appearance and harmony with the studio interior treatments. The use of small plug-in amplifier equipment and the subsequent need for less jacking facilities has allowed great improvement in this respect, and the familiar equipment racks in control rooms and tape booths have been eliminated.

The building as shown in Fig. 1 consists of a five-storey office block facing St. George's Terrace, with the operational floor containing all studios and technical equipment at the rear. The office block thus screens the studios from street noises. All studios and associated technical facilities are arranged on the ground floor as shown in Fig. 2. The studios, nine in all, each

with a control booth, have been divided into two main groups. Four announcing studios are arranged along the western wall and the five larger studios each designed for a particular type of production occupy the eastern wall. Together they vary in size from the large orchestral studio measuring 80 x 60 ft. and 30 ft. high with a long reverberation time, to the announcing suite 25 x 15 ft. and 9 ft. high with a short reverberation time. The usual important features for good studio design have been incorporated in the building, that is all studios are built on individual foundations giving a maximum of acoustical isolation. Observation windows, cable entries and air-conditioning ducts have all been carefully designed to assist this important aspect, and wall and ceiling treatments have been chosen and adjusted to give optimum diffusion and reverberation characteristics.

The technical installation has been designed using the continuity suite system of operation. The continuity suite system involves the use of a number of key presentation studios, each with its associated control booth, from which all programmes leaving the studios are controlled. This system has been adopted in other studio centres and offers many advantages for modern sound broadcasting techniques. Each combination of studio and control booth forms an individual continuity suite. The two officers controlling each suite have complete control of and responsibility for the programme associated

with that suite, and the responsibilities of the main switchroom staff are reduced to the setting up of certain external connections some time before the commencement of a programme. The presentation officer or announcer is responsible for the programme continuity, that is the accurate and artistic timing of his programmes, and he must make appropriate decisions concerning over and under running of programmes, poor quality and complete failure, etc. As it is the policy of the Australian Broadcasting Commission to have announcers controlling the replay of disc recordings, a comprehensive desk has been provided for this officer. The desk has three 12-inch disc replay machines with long playing and standard pickups spaced for optimum operation from the sitting position. The technical officer in the control booth has control of levels and programme pre-selection, maintains overall technical monitoring and takes the necessary steps when any equipment fails. He is responsible for the correct channelling of external programmes through his suite. The successful operation of these suites involves a maximum of co-operation between both officers and it is considered that the new desks, shown in Figs. 3 and 4, provide optimum facilities.

PROGRAMME AND NETWORK SWITCHING
General

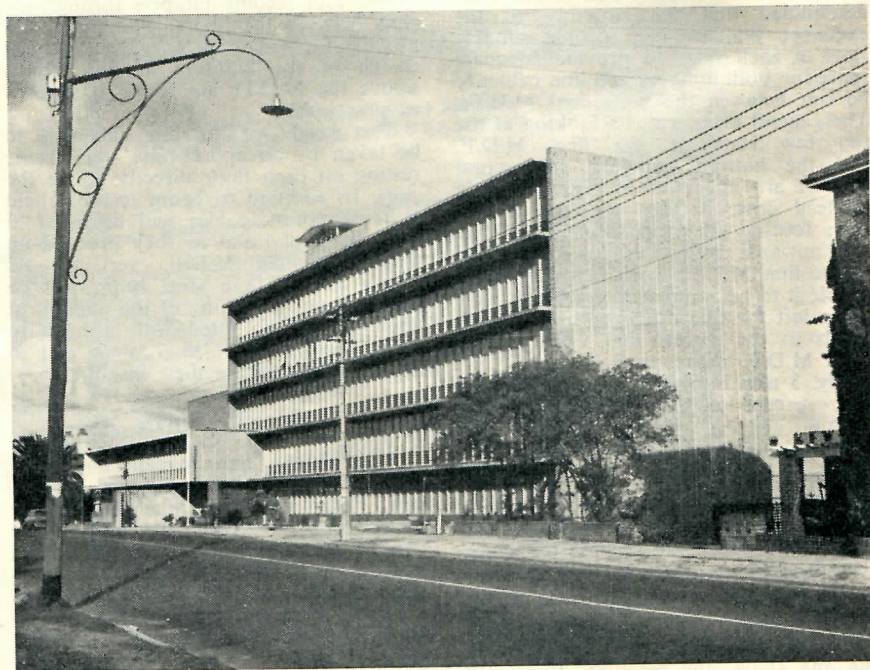One of the major problems associated with any studio installation is the design

Fig. 1.—Rosehill Radio Studios Building showing Administrative Block facing Adelaide Terrace.

of the switching systems that convey programmes from any of the different sources to the final destination. The use of the continuity suite system of operation necessitates the use of two switching systems, and these have been called the Programme Switching Scheme and the Network Switching Scheme. The general arrangement is shown schematically in Fig. 5 and a more detailed schematic is given in Fig. 6.

Network Switching Scheme

The number of programmes leaving the studios for distribution to the different National Broadcasting System transmitters throughout Western Australia varies, and reaches a maximum of four for certain periods of the day. The National and Light Programmes serve the Perth metropolitan area, and the regional and short wave transmitters generally take either of these two. However, facilities must be provided for four separate programmes and the equipment has been designed for six to take into account future expansion. With the building as it is, four continuity suites fulfil the present requirements and the four small operational studios shown in Fig. 2 are used for this purpose. Any future increase will involve the conversion of other studios to continuity suite operation. The transmitters which receive these programmes are nine in number, namely 6WF, 6WA, 6WN, 6AL, 6NM, 6GF, 6GN, VLW, VLX. Added to these is an outlet to the commercial stations (this is used for nation-wide broadcasts

Fig. 3.—Continuity Suite Desk Equipment—Announcer's Desk.

and news bulletins), a channel feeding the West-East line, and some general purpose outlets for testing purposes. Expansion in this direction could be considerable, particularly in the service to the country. It is likely that two

separate programmes could be sent to each regional centre and with this in mind the equipment has been wired to take 24 outlets.

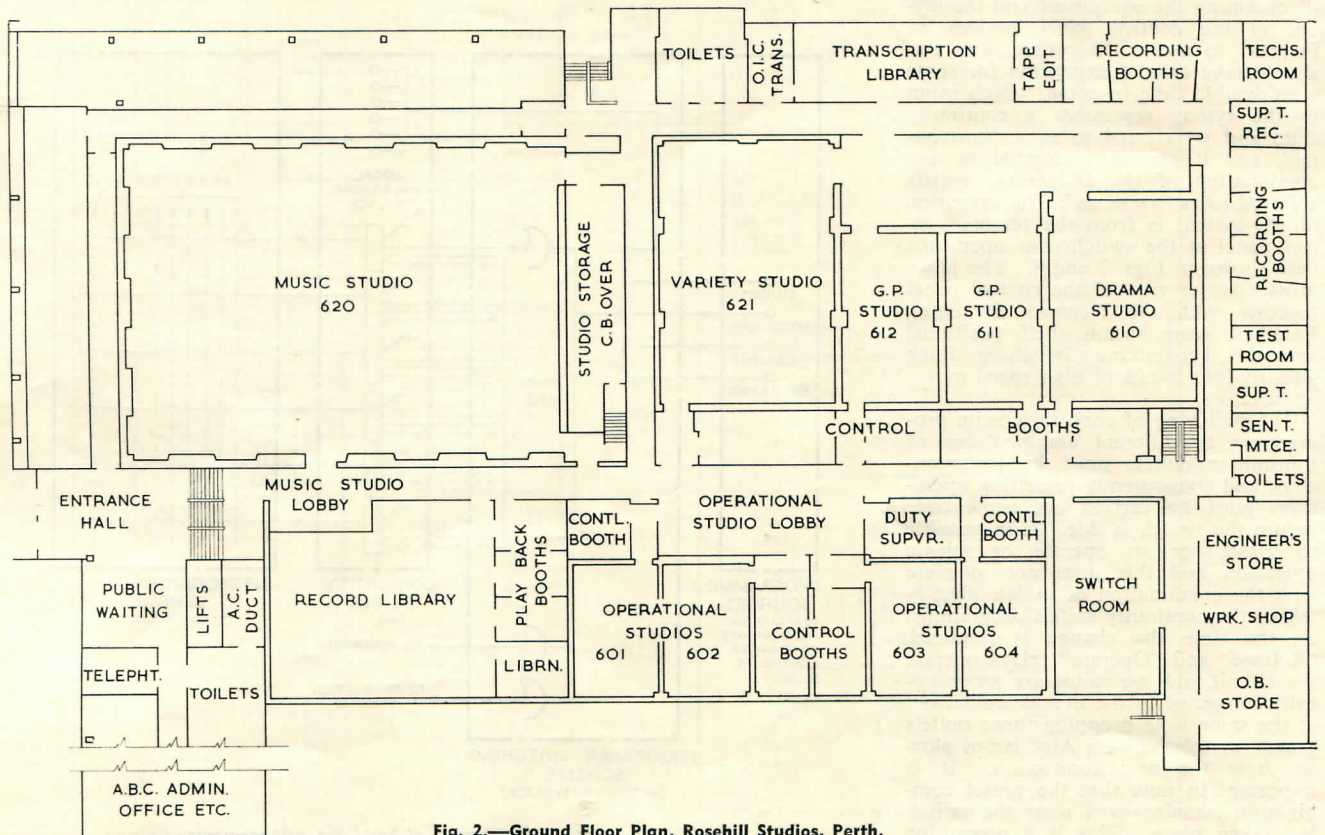Briefly then, the Network Switching Scheme must connect any of six sources

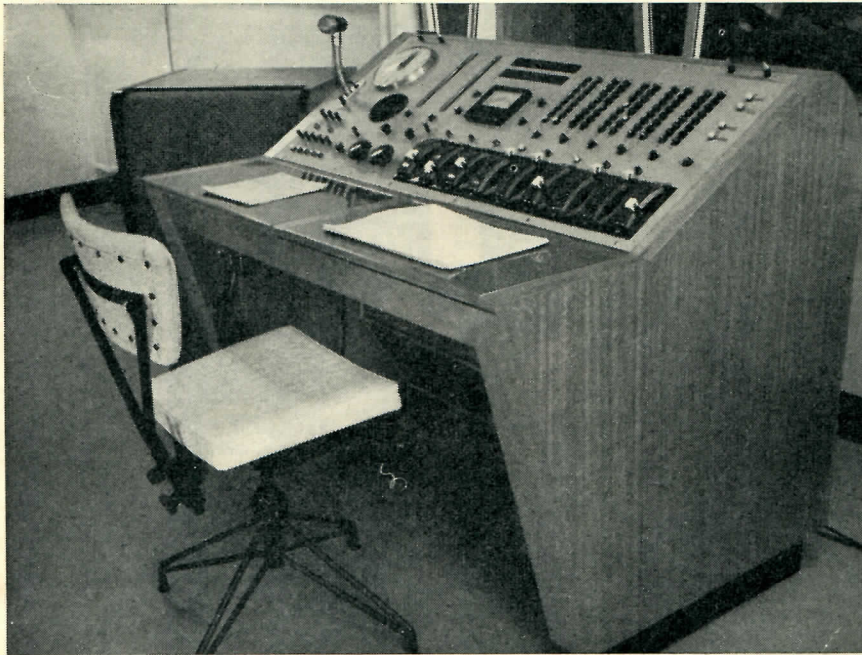Fig. 2.—Ground Floor Plan, Rosehill Studios, Perth.

Fig. 4.—Continuity Suite Desk Equipment. Control Booth Operator's Desk.

The actual operation of the "Operate" key is done by the continuity suite control booth operator. On this officer's control panel is a network switching display which shows which outlets he has "preset" to him and which are actually "on air". At the scheduled time he depresses his "Operate" key and the programme switch takes place. The "preset" combination remains till it is altered by the switchroom operator.

Programme Sources

Programme sources can conveniently be grouped under the following headings:

      Continuity Suites
      Production Studios
      Tape Recording Machines
      Outside Broadcast Lines
      Programme Lines
      Miscellaneous

The types of programme originating in the continuity suites can be announcements, news readings, replay from gramophone records, or talks from the special talks table within the studios. In addition, programmes from production studios, tape recorders, outside broadcasts, etc., are normally channelled through a continuity suite. The control booth operator moreover has facilities for handling tape replay machines, so that although the outputs of these suites normally go straight to the network switching scheme, they must still be considered as programme sources.

Production studios are the source of all live and rehearsed programmes, that is music, variety, drama, discussion, etc.

(present and future continuity suites) to twenty-four outlets (transmitters, etc.). It has been customary throughout the National Broadcasting Service to use relay "crossbar" switching for this purpose and this system has been retained in the present installation. The method of mounting the equipment and the layout of the control panel enables an increase to a 6 x 30 system, and this should take care of expansion for some considerable time to come. Each input to the system represents a continuity suite and is referred to as a "horizontal", and it can be connected to any combination of the 24 station outlets referred to as "verticals". The operation of the system is from the remote control panel at the switchroom operator's desk shown in Figs. 7 and 8. The latter gives a closer view of the control panel together with the Network Switching Rack (showing vacant shelf positions) and the Programme Switching Rack with its four banks of high speed motor uniselectors.

The switching of continuity suite programmes to different combinations of transmitter outlets must be instantaneous, and consequently presetting operations must be carried out some time before the switch is due. It is possible to preset for an operate or release operation and this does not interfere with the combination of outlets already taking the continuity suite's programme. At the time the change is required, "Release" and "Operate" relays operate the circuit and the suites are automatically connected to the new combination, at the same time dropping those outlets preset for release. "On Air" lamps glow to show the new connection. It is important to note that the preset combination remains even after the switch has taken place. This is a precaution

against faulty switching and obviates the necessity of establishing the presets again. The preset combination can be altered by cancelling via the "Preset Cancel" push button and a new combination set up by the row of locking lever keys on the switchroom panel.
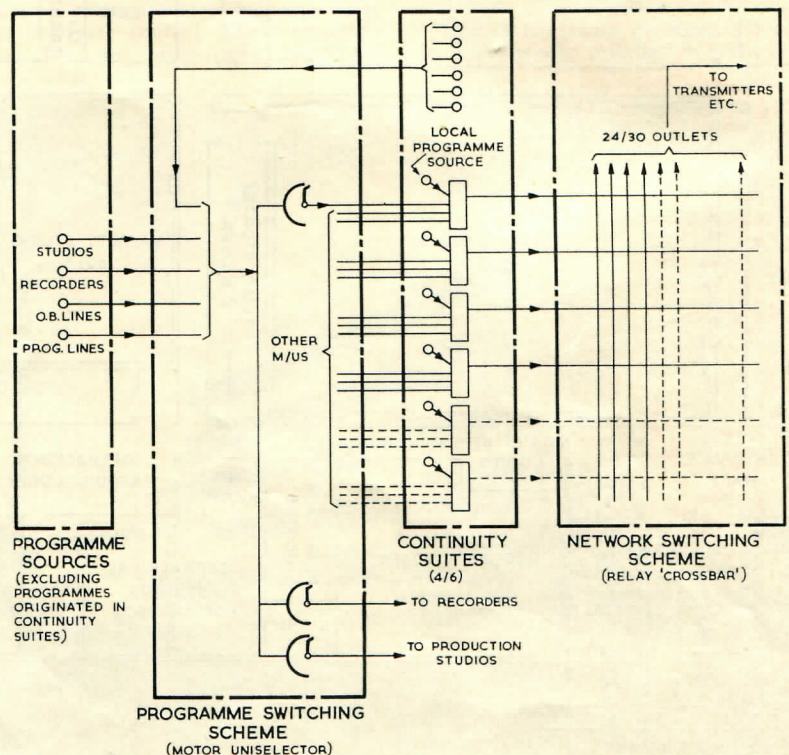

Fig. 5.—Simplified Schematic of Switching Arrangements.

The control room equipment is different from that of a continuity suite in that more microphone channels are provided and disc and tape replay facilities are available for insertion into live programes. The control desk is designed to seat the technical operator and the producer. Monitoring, "talk back", and access to microphone pattern controls, etc., are provided to assist the production. These features are illustrated in Fig. 9.

Replay from tape machines plays a very important role in modern studio practice, allowing a very high degree of flexibility in programme arrangement. At the rear of the building is a group of small rooms which contain the tape and disc recording apparatus. Five of the rooms house the console tape recorders, two per room, and these can be used independently for either record or replay. One of the rooms has a pair of disc cutting machines, one a group of portable tape recorders, and another contains apparatus for tape editing and dubbing.

Outside broadcast lines are used to send programme material to the studios from specific points throughout the city and country areas, and a comprehensive system of Post Office lines is used for this purpose. The number of these outside broadcast links entering the studio is 60 and these terminate on a jack field from where up to seven can be connected for use in programme selection. There are several other miscellaneous sources of programme, namely a line from the television studios for simulcasts, and special stereophonic replay lines from the four continuity suites.
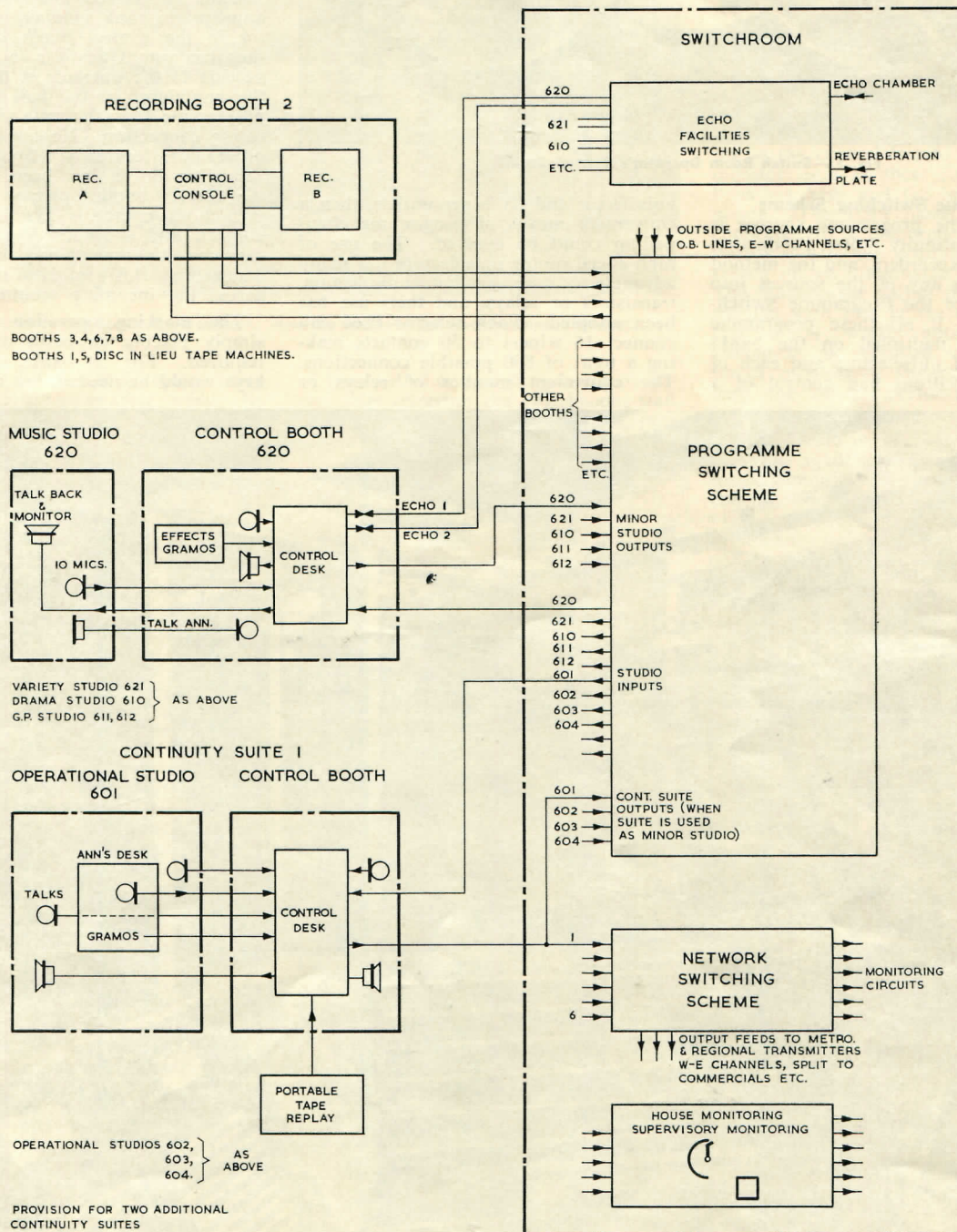

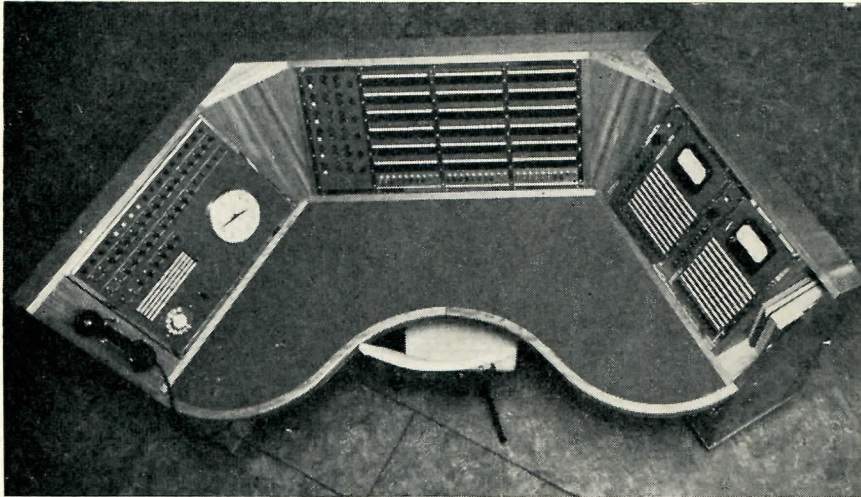Fig. 6.—General Switching Schematic, Rosehill Studios.

Fig. 7.—Switch Room Operator's Control Desk.

transistors necessary to perform a similar number of switching functions presents a formidable problem when wiring and mounting has to be considered, and their total cost is many times the cost of the uniselectors. Because 16 wipers are available, other facilities may be switched simultaneously with the programme, which takes only two wipers. Order wire and monitoring connections are made and this greatly improves the operation and simplifies the circuitry. As an example, a suite can be about to take an outside broadcast from a hall. In this case the uniselector is marked and preset on the appropriate bank number. The operator in the control booth of the suite then has automatically a telephone connection to the operator at the hall, and the announcer in the hall receives the programme from the suite via the monitoring connection. He can then cue his programme correctly. Similarly if a recording booth has been selected by the control booth operator of a suite, then both operators are in telephone contact, and the recording Technician can cue his tape replay correctly by connecting his monitoring selector across the incoming monitoring line.

The marking operation consists of simply placing an earth on the bank required. For 50 banks, 50 different keys would be needed, but advantage is

Programme Switching Scheme

Access to the programme sources is limited to Continuity Suites, Production Studios, and Recorders, and the method of channelling any of the sources into these is termed the Programme Switching Scheme. If all these programme sources were multipled on the banks of a group of uniselectors and each of the above positions had control of a uniselector and its wiper outlets, then a convenient means of programme channelling could be evolved. The use of high speed motor uniselectors has many advantages over ratchet uniselectors, transistors or relays, and their use has been adopted. Each selector used can connect 16 wipers to 50 contacts making a total of 800 possible connections. The equivalent number of relays or
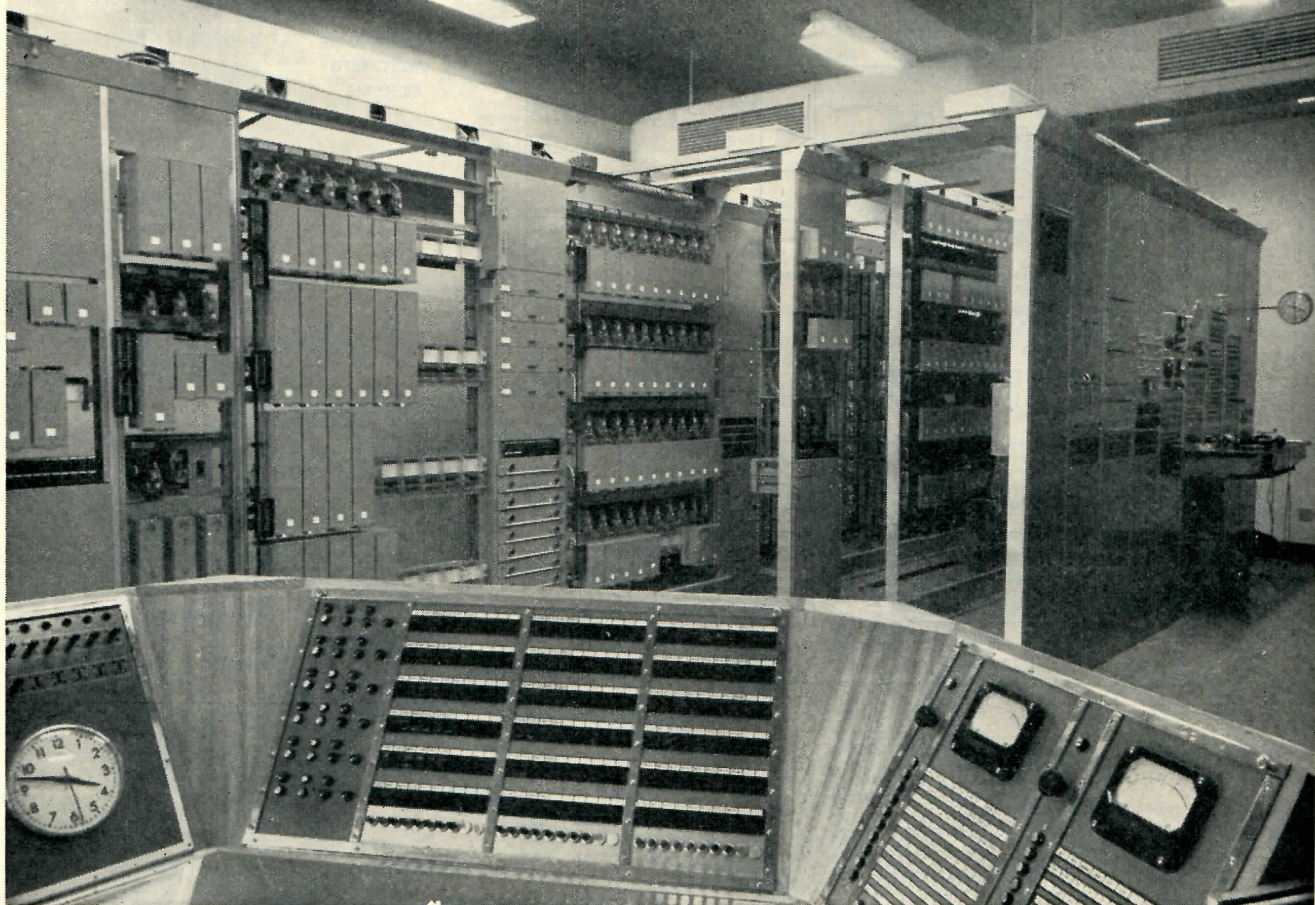

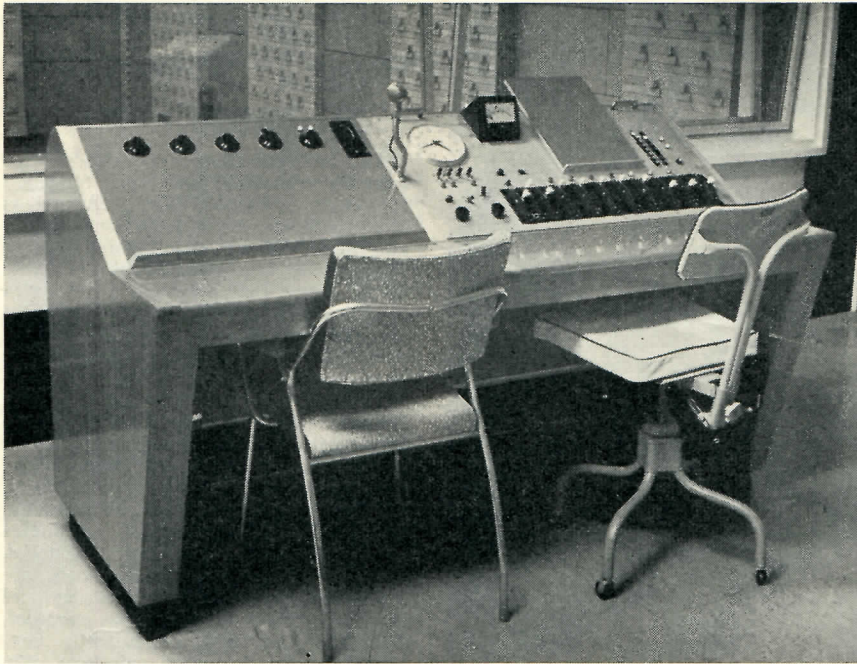Fig. 8.—View of Switchroom from Operator's Control Desk.

Fig. 9.—Production Studio Control Desk. Showing Facilities for Operator and Producer.

taken of the convenient groups of seven that the programmes fall into. By dividing the programmes into seven groups of seven, only 14 keys are needed to mark 49 positions, that is—

C.S.—(Continuity Suites),
St.—(Studios),
RECD. 1—(Recorder Group 1),
RECD. 2—(Recorder Group 2),
RECD. 3—(Recorder Group 3),
P.L. & Misc.—(Prog. Lines & Miscellaneous),
O.B.—(Outside Broadcast Lines),
1, 2, 3, 4, 5, 6 and 7.

For example if a recorder wishes to record the programme coming from Continuity Suite No. 4, he first depresses the C.S. button and then the 4 button. The switch is then ready for operation.

For optimum operating, each continuity suite has three switches, thus enabling three different programmes to be preselected. At the specified time the control booth operator can open the appropriate fader to broadcast any of these channels. In the case of the continuity suite used for Sporting Panels, five switches are available. On sporting days the control of these switches is extended to the announcer who can then handle five different outside broadcasts. With monitoring and talk back facilities to each of these O.B. points provided, excellent presentation is achieved despite the continuous changing of programme.

The production studios have access to one switch which will be used principally to carry tape replay for use in live programmes, and to add flexibility to the system. Tape recorders naturally must have access to all programme sources available, and these have one switch per machine. In all cases, operation of the switch is in the hands of the control or recording booth operator, thus relieving the switchroom staff of any responsibility as far as programme switching is concerned.

CONTINUITY SUITE DESK EQUIPMENT

The desk equipment in the sporting panel suite is shown in Figs. 3 and 4. The announcer can perform the following functions from the seated position:

(a) Use his own microphone for announcements and control a microphone over a small talks table within the studios.

(b) Use any of the three disc replay machines for playing records. The long section to the left of the desk is available for two stacks of records—nominally used and unused. The storage space below is used for theme records and others that are required frequently. Cueing facilities for each machine are provided through a small loudspeaker mounted within the desk clock housing. The three quadrant faders on his panel are used for record fading only and are either fully on or fully off.

(c) The announcer can also control up to five channels of the Programme Switching Scheme, during sporting programmes. The selection and signal level is still controlled by the technical operator in the control booth. He may also monitor each of these five programme lines via keys and the left hand headphone. The right hand headphone is connected to a comprehensive monitor source switch, the position of which is shown on an illuminated panel display. The loudspeaker within the studio is in parallel with that in the control booth, and it is worth noting that the announcer is provided with four different monitoring systems designed to help the officer perform his various tasks efficiently.

Other features of this desk are the movable reading slopes and complete intercommunication facilities with the control booth operator, studio supervisor, and commentators at any outside broadcast point. The assembly of equipment immediately in front of the announcer may perhaps be not ideal
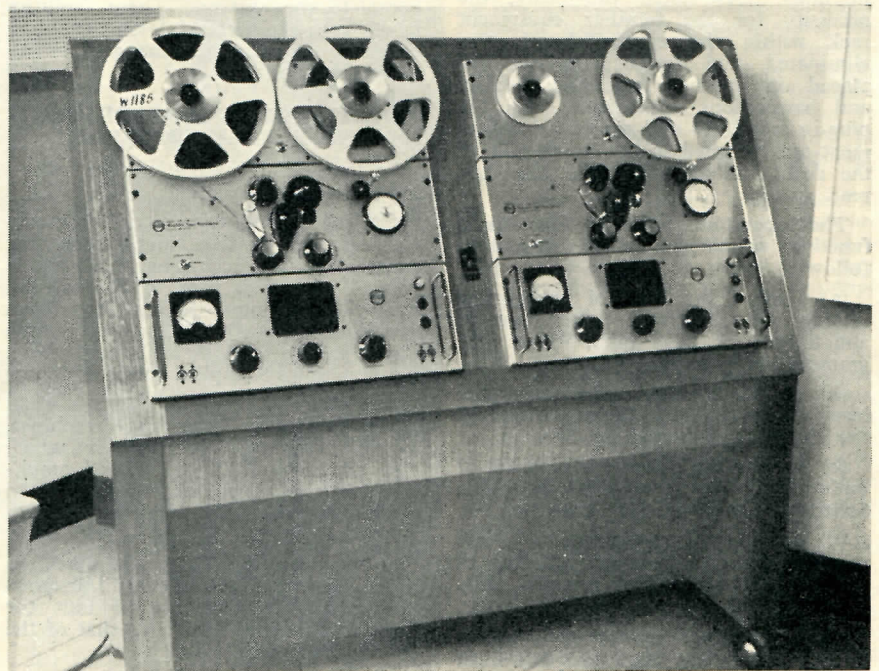

Fig. 10.—Transportable Tape Equipment Trolley. Used in Control and Tape Booths.
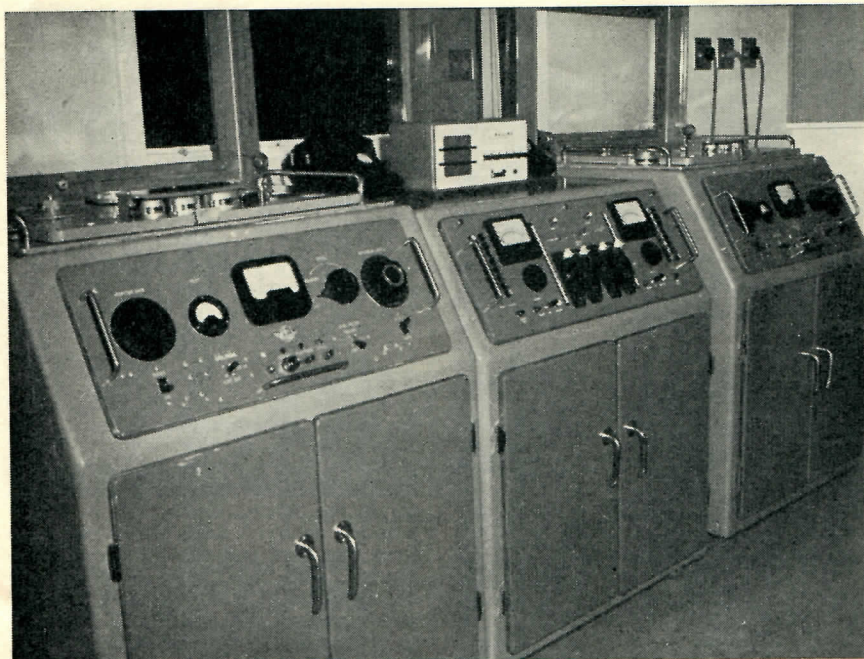
Fig. 11.—Console Tape Recorder Installation showing Two Recorders and at Centre a Matching Control Console.

from a voice reproduction aspect because of the possibility of complex reflections. However, the designers were confronted with specifications which made this unavoidable and an excellent compromise is achieved by using unidirectional microphones.

The control booth operator's desk shown in Fig. 4 illustrates the great advance in studio techniques made possible by the introduction of small plug-in units. As stated previously, the necessity for the familiar equipment rack within the control booth was eliminated, and design emphasis was placed on optimum operating facility and harmonious appearance. All the plug-in amplifiers and associated equipment are mounted in the lower part of the desk, and are accessible from the rear.

The operator performs four main functions which can be summarised as follows:

(a) Control the level of programme leaving the associated suite (that is announcer's or talks microphones and gramophone pick-ups).

(b) Select, actuate, and control the level of up to five external sources of the Programme Switching Scheme.

(c) Actuate the preset combination of outlets of the Network Switching Scheme to the "on air" condition.

(d) Control a transportable tape recorder system for either recording or replaying of programme material. Fig. 10 shows one of these units.

Comprehensive monitoring is essential to this officer and this has been made available in four different sources as in the case of the announcer, namely

right and left hand headphones, panel and floor mounted loudspeakers. Illuminated displays of monitoring points are provided and both the preset and actuated combinations in the Network Switching Scheme are also indicated by illuminated displays. Intercommunication facilities with the announcer, senior officers and other control booth operators are provided, and automatic telephone connections to any programme source connected to his suite complete the system. These facilities have proved successful in enabling excellent programme changeovers to take place.

TAPE AND DISC RECORDING AND REPLAY EQUIPMENT

In the initial installation the following units were installed:

(a) Ten console tape recording machines arranged in five pairs. Each pair is installed in a recording booth and a control console is used to channel and control programmes to and from each machine. Access to the programme banks is provided through one switch per machine. A typical group is shown in Fig. 11.

(b) Two disc recording machines. These are mounted in a cabinet which also contains all the associated amplifier and control equipment. Access to the programme banks is provided.

(c) A "Portable Tape" Booth. This room contains four Byer 77 machines housed in two of the standard transportable cabinets. The control unit for these machines is similar to that of the console recorders.

(d) Tape editing and dubbing equipment, consisting of:

(i) a pair of portable tape recording and replay machines

(ii) a pair of portable tape replay machines

(iii) one transportable disc replay machine.

The recorder control consoles provide separate recording and replay channels for each machine. Each channel is fitted with quadrant fader and type 1 amplifier. The monitoring circuit returned to the Programme banks is taken from the playback line via a type 2 amplifier. When two machines are required for a long programme, both replay outputs from the machines must be channelled into the one playback line and this is achieved by a "couple" key and a hybrid circuit. Monitoring circuits are switched to the loudspeaker in the booth by a rotary switch and a lamp display is provided. The replay outputs of any recorder are available to all sections of the studios equipped with programme switches. Monitoring and telephone circuits are established between the recorder and the first person to select this recorder. All other switches subsequently connected to this recorder can then only pass programme and cannot return monitoring and telephone circuits. Consequently, for the system to operate correctly, it is the responsibility of the recorder operator to test for correct channel connection, with the person receiving his programme, prior to programme time. This problem has been overcome by the addition of facilities at every programme switch control point, which enable the operator to over-ride all monitoring connections that may be established.

When replaying to a control booth, monitoring is received back through the Programme Switching Scheme and the monitor selector switch on the control console. This enables the recorder operator to cue properly and to check his replay programme at the output of the recorder and the output of the control room to which he is playing. This system provides an excellent means of checking programme continuity and in the case of failure, the recorder operator can quickly tell whether his equipment is functioning correctly. In the recording condition the programme to be recorded is channelled to the recorder via the console equipment. The output of the replay head is used as a source of monitoring which is returned to the switch banks via the replay fader on the control console. This feature provides instantaneous replay.

CONCLUSION

The Rosehill radio studios have now been in operation for two years. The success of the installation has been borne out by greatly reduced fault incidence and ease of maintenance. The standard of workmanship by all sections of the Postmaster-General's Department involved in the installation is held in high regard, and forms a notable contribution to broadcasting in Australia.