

Much-Switching-on-the-Lines

CONSIDERING that he belonged to the depressed non-technical classes, and didn't even know what a jack-field was, *The Listener's* one-man do-or-die squad came away from his first encounter with a wide-band line switching panel in a surprisingly unbattered condition. There had even been an occasion when, with a faint glow about the ears, he had correctly anticipated the next move of the engineer—Keith Sharp—who was taking him on a tour of the equipment.

The wide-band lines, as some *Listener* readers may remember from the article we published about a year ago, are circuits—provided by the Post Office for the NZBS—which give greater fidelity, especially of music, in long-distance linked broadcasts. Unlike the ordinary telephone toll circuits used for relays in the past, the wide-band lines are on permanent hire to the NZBS; and roughly the idea is that by using two telephone channels combined a much wider frequency range can be relayed over long distances. Another interesting point about a wide-band line is that it can't be used, as an ordinary local telephone line is used, to transmit speech in both directions—it's strictly a one-way traffic line. However, the circuits which already link six centres in New Zealand have been provided in pairs so that any centre can receive as well as transmit a programme; and by using both lines at once they can be used, as they are to a limited extent within the NZBS, for administrative telephone calls. Mr. Sharp explained that when they are used for this purpose their messages must pass through a line-combining unit before they can get past the terminal switchboard and into an ordinary telephone circuit.

Pausing in the doorway from time to time on its visits to 2YA, *The Listener* had always found the wide-band line control room a fascinating place. The control panel itself looked a relatively

straightforward affair—the sort of thing that, simply explained, might almost make a story; but it wasn't till we'd looked at the maze of wires at the back of the panel, timidly at first, then with growing boldness, over a period of months, that we asked the Head Office engineers who designed and built the equipment to explain it. By good luck we found that a switching-panel like the one at 2YA had just been completed for 4YA, and was standing, ready for packing, on the workshop floor. If we liked we could have our first lesson on this one without the distraction of "bells and buzzers and red lights flashing," which apparently are just as common in control rooms as in quiz sessions.

The wide-band switching-panels, it was explained, are simply a means of switching very rapidly—and here "very" is the operative word—so as to link any of the points in the six centres where a programme may originate with control rooms in all the stations that may wish to broadcast it. Of course, the job done on any one panel is not as big as that, but to take a simple example it may be necessary for a link of YC stations to be broadcasting a programme from Dunedin at, say, 8.0 p.m., and a link of ZB stations to be using the same lines for a broadcast from Auckland at one second past eight. The stations that can now be linked in this way are the YA, YC, YD and ZB stations, 2YX, 3YZ and 4YZ. It is hoped that there will be circuits this year also from Auckland to Rotorua by way of Hamilton, and certain other stations will join the network of lines as the Post Office is able to make further circuits available.

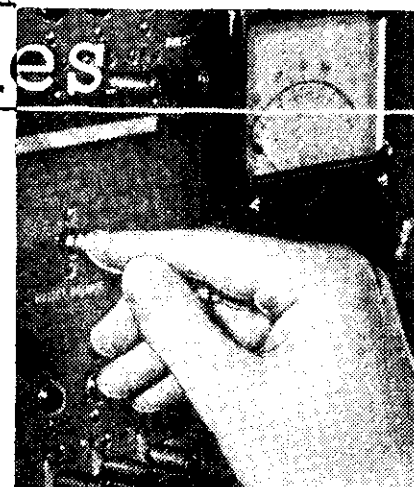
Taking Dunedin as an example—since we had borrowed their panel—Mr. Sharp seated us in front of an array of switches and told us to imagine we were handling four long-distance programme lines—lines to and from both Christchurch and Invercargill. These might have to be switched, or routed, to any one of half a dozen control rooms in Dunedin, or they might just have to be through-routed, leaving Dunedin out

altogether. The method of operation was either by master control or direct switching. If the master control were used there was a preselector arrangement in which a programme switching could be pre-set. Then at the required time a single operation completed the circuit.

Mr. Sharp illustrated this by assuming that a programme from Christchurch was to be fed to the 4YA control room. "These switches here select your long-distance programme line," he said, indicating a series of coloured keys marked "four wire lines." "This one we'll suppose is the Christchurch key, and we'll move it to the 'in' position. Yes," he answered our question, "we can use it at either 'in' or 'out' or 'both' at once. Now to complete the pre-selection we flick downward the switch of corresponding colour in the line marked 'operate.' You'll see that the down position's marked 'via master.'" His hand moved down the panel to another series of switches marked "local lines," and pressed downward one of these which he said we'd assume controlled the line to the 4YA control room. We could see that the operation of these three switches might take at most a couple of seconds. A quick stab on a button marked "master operate" and the pre-set switching became effective.

When we asked Mr. Sharp how the same operation was done by direct switching, he said that the long-distance programme switch would be operated in the same way, but the operate switch controlling the inward line from Christchurch and the 4YA studio switch would be flicked upward to the "operate" position (instead of downward to "via master"), and, of course, the "master operate" button would not be used. If the programme was to be through-routed, from Christchurch to Invercargill, omitting Dunedin, the appropriate "through circuit" key was operated instead of a "local line" switch such as we had used in our example, to reach the 4YA studio. In exactly the same way, by either master control or direct switching, the link was ended on a series of "release" keys, identical with the "operate" keys, on the opposite side of the panel. Lights coming up on the control panel above each switch provide full monitoring of the switching operation.

Was there a risk with circuits to so many local control rooms available that more than one might be fed into a long-distance line? we asked Mr. Sharp. That was a factor that had to be taken into account when the equipment was designed, he said—especially as it had to be capable of distributing an incoming programme to any number of local control rooms—and, in fact, adequate protection had been provided. "All incoming and outgoing programmes," he went on, "are monitored by means of a loud-speaker system. You simply turn this selector switch"—he indicated a knob at the bottom of the panel—"to the line you want to monitor and control the volume with this associated gain control. There are separate monitor switches for incoming and outgoing lines." Level indicators are connected across both incoming and outgoing

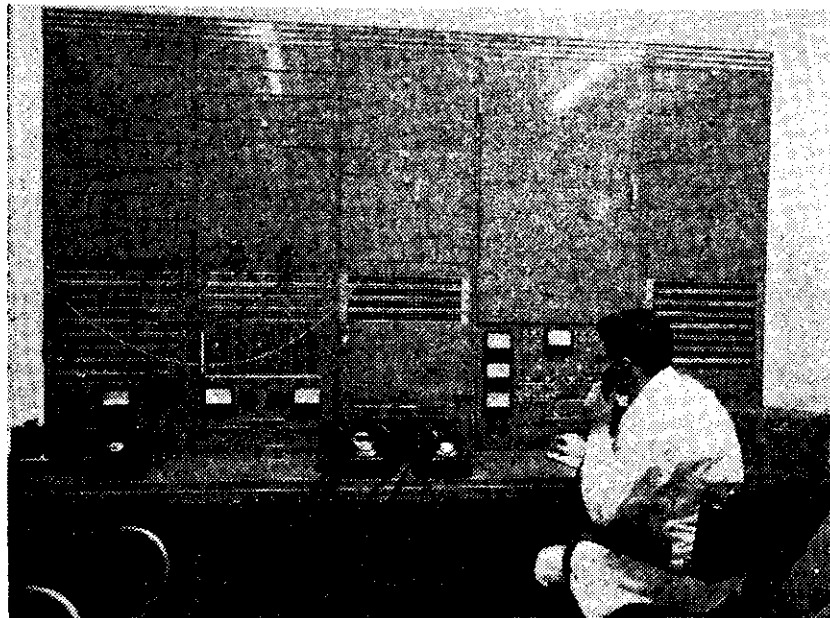


lines. Outgoing "gain" (or volume, as the ordinary listener calls it) is pre-set in the equipment and measured on a steady tone at frequent intervals. If at any time the control-panel technician finds it is not reaching the required level he informs the control room concerned. Incoming level is, of course, a matter for the originating control-room at the other end of the long-distance line.

Telephone keys on the panel control ordinary telephone circuits to local control rooms, and there are keys for use on telephone lines over longer distances. These lines may also be used for local relays. Telephone keys associated with the wide-band lines are rather more complex in operation. Calls are put through from one control-panel to another by means of coded impulses. A unit at the receiving end decodes the call and indicates the point of origin by a light on the control panel.

So far we had followed Mr. Sharp's explanation of the panel, even if we had found ourselves occasionally panting along behind. When he moved away to the jack-fields at right and left and started to explain a procedure called "normalling" our nods of understanding became a little half-hearted, and by the time he got to "control voltage," "signalling" and "uni-selectors" in the equipment above the control-panel we drew a wavy line across our note book and confessed we couldn't go on treading water much longer.

The wide-band control-panels were designed at the NZBS Head Office Engineering Section by S. W. McDonald, N. B. Johnston and Keith Sharp himself—who has been working on them for several months. He showed us a fat volume of plans and explained others which he still had on the drawing board. "Each station provides its own special problems," he said, indicating a plan for the Greymouth panel. "Existing equipment in control rooms varied in type, and we have to take this into account when designing these panels, but on the whole they're much simpler than the panels we use in the main centres." We went out feeling glad it wasn't our headache. Before the wide-band relay lines were brought into use stations had to be linked by the radio pick-up and rebroadcast method when the programme involved music, and this often brought in static, fading and various forms of electrical interference. For more than a year now a growing number of listeners have had the benefit of the better service the new lines provide, and even more will get it in the future. The work goes on.



N.P.S. photograph

IT LOOKS EASY: The wide-band line switching panel at 2YA