

"RADIO AUSTRALIA'S TIME SIGNAL"

On twenty-two of the day's twenty-four hours, Radio Australia's transmitters at Shepparton, Victoria, send out the official time signal for Australian Eastern Standard Time. The signal consists of six "pips"—as we call them—the first at fifty-nine minutes fifty-five seconds past the hour, with the other five following at one-second intervals. The beginning of the new hour coincides with the beginning of the final "pip." The "pip" time signals are used by most of the broadcasting stations in Australia. The ones transmitted by Radio Australia originate at the Melbourne Research Laboratories of the Postmaster General's Department.

Accurate time-keeping is made possible by modern precision equipment; much of it is made in Australia. The basic equipment is a set of synchronous clocks, driven by ring-type quartz crystal oscillators operating at a steady one-hundred-thousand cycles per second. By the use of multi-vibrators, this is reduced to one-thousand cycles a second for driving the clocks.

The clocks are housed in steel cabinets about five feet high, and have a dial much the same size as the ordinary alarm clock, with a large hand making one complete revolution each minute. They are driven on a similar principle to the domestic electric clock, except that the standard of frequency is kept at a steadier level. The crystal ring is housed in a vacuated container to avoid atmospheric changes, and the container is kept within precise temperature limits.

Besides indicating the hours, minutes and seconds, the "Crystal" clocks produce second impulses of very high precision. These second impulses are converted into electrical power by the use of gas discharge tubes as impulse generators, and the pulses of power are fed into an electrical circuit controlling the signalling clocks, which generate the actual time signals. These signalling clocks are of the pendulum type, and look much like an old-type grandfather clock. They are not as accurate as those driven by the crystal oscillators, but they are controlled by one of the "crystal clocks", so that they can't deviate by more than ten-thousandths of a second.

The signalling clocks generate the "pip" signals every minute, but the signals are allowed out to the broadcasting studios only once an hour, being transmitted

from the research laboratories to one of the city telephone exchanges, which distribute them. The signals leave the research laboratories as relay contact closures, and the "pipping" noise we hear over the air is created when they are converted into tone signals at the broadcasting stations.

The Victorian Time Signal Service is based on the determination of Australian Eastern Time at the Commonwealth Observatory at Mount Stromlo, twelve miles from Canberra. The astronomers at Mount Stromlo make star observations six nights a week, and by means of a decimal counter chronometer, time signals broadcast by stations WWV (in the United States), WWVH (in Hawaii), GRX (in Britain), TMA-2 (in France) and RZI-1 (in Moscow) are checked against the Australian Time Standard. Every week-day, the seconds signals generated from the "Crystal" clocks at the PMG Research Laboratories in Melbourne are transmitted to Mount Stromlo over a normal telephone carrier circuit. The comparison of these signals at the Observatory with star observations and overseas radio time signals provide the link between Fundamental Time and the time signals generated in Melbourne and broadcast by Radio Australia.

The accuracy of this method of timekeeping is indicated by the fact that, at any time, the difference between the Melbourne signals and Fundamental Time, as determined at Mount Stromlo, would be no more than 50-thousandths of a second.

*From a recent Radio Australian talk prepared by
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