

## MODERN POLICE WIRELESS.

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Attention is drawn, in this article, to the strenuous demands which a modern police organisation makes on the technical means of communication at its disposal. Here, it will be shown that the police wireless system developed by Brown Boveri has great advantages as compared to earlier equipments, as two different wave bands are made use of for conversations, one of which is operated by frequency modulation. On the other hand, reference is made to ultra-short wave receivers the switching on and off of which is carried out through the automatic telephone system.

THE efficiency of a police force depends not only on the sound technical training of each member of the staff, but also on a number of auxiliary sources of assistance. Modern engineering has made these available to the criminal investigation department; to-day's methods of detection are based to a great extent on a smoothly working information service which, up till quite lately, was mainly dependent on communications by wire.

Wireless has already been used to render detection more reliable, but the operation of most of these wireless equipments proved to be too complicated and their performance was often impaired by their being liable to breakdowns. Moreover, their use was based on the assumption that every member of the police force had a certain amount of special technical knowledge and this among other reasons explain why, in many police forces, wireless did not have the success predicted for it.

Brown Boveri have followed, in various respects, fundamentally new methods in developing their police wireless system, with the view to simplify the equipment in such a way that operation and maintenance would become as easy as in an ordinary telephone plant. As a result, such a high degree of reliability is obtained under all conditions that the system works even when the operator is completely absorbed by his specific tasks as a member of a police force and is, thus, unable to give his attention to the coaxing of delicate equipment to make it work. Some of these apparatus are described in detail in the following paragraphs, they have been developed and produced to fulfil the requirements of a modern police force directed from headquarters.

Fig. 1 shows diagrammatically a modern police wireless system of the kind in question. It consists of a transmitter and receiving unit at headquarters. The transmitter is designed for remote operation, the operator's office being equipped with the necessary remote control and auxiliary devices. The mobile transmitters and receivers have to work under very strenuous conditions. They may be mounted in police patrol cars, motor boats, or other vehicles belonging to flying squads. There are, also, light weight portable receivers with an automatic calling device, which are slung on a strap over the shoulder of police officers.

If the topographic configuration of the country impairs reliable communication between the mobile stations and headquarters, remote-controlled receivers are utilized. These are mounted on the top of the obstacles to enable the whole area of service to be covered.

The Brown Boveri police wireless system permits automatic selective calling of different groups of mobile or portable stations. Calling the mobile road patrols is effected by transmitting a continuously modulated carrier, while the portable sets are alarmed by the carrier itself.

As a matter of fact, the organization of criminal investigation services has often to be changed on

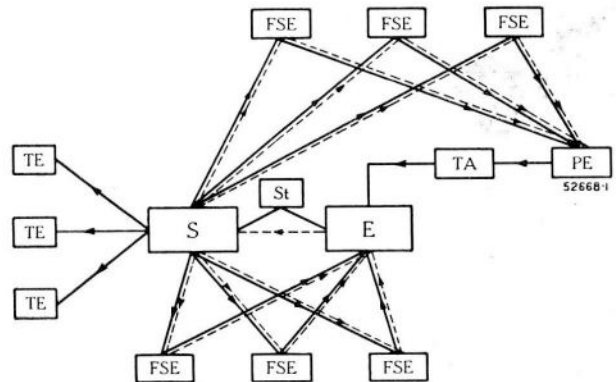


Fig. 1. — Diagrammatic representation of a modern police wireless organisation.

— > — Communication between controlling station and mobile and portable stations.

.....>..... Communication between mobile stations either through remote receivers or directly through the wireless controlling station.

- S. Transmitter.
- E. Receiver.
- TE. Portable receivers.
- PE. Remote receivers.
- FSE. Mobile transmitters and receivers.
- TA. Telephone central station.
- ST. Remote-control device.

This diagram shows what numerous connections are possible, these embrace practically every branch of a police organisation.

the account of the continual expansion of cities. To prove of real value to a police force, the fixed and mobile equipments must be designed so that they can be used anywhere and adapted, later, to new or extended working conditions, without great change or cost.

One of the most modern headquarters equipments, which was developed in our laboratories and which is actually working in one of Switzerland's biggest towns, where there is a very efficient police force, covers a wave range of 110—220 m. In this band three fixed and one continuously variable wave may be instantly selected by means of push-buttons. This combination of frequencies permits maximum flexibility and reliability in service because, in case of emergency, the variable wave can be brought into action as a stand-by wave, for one of the three fixed waves, within a few minutes.

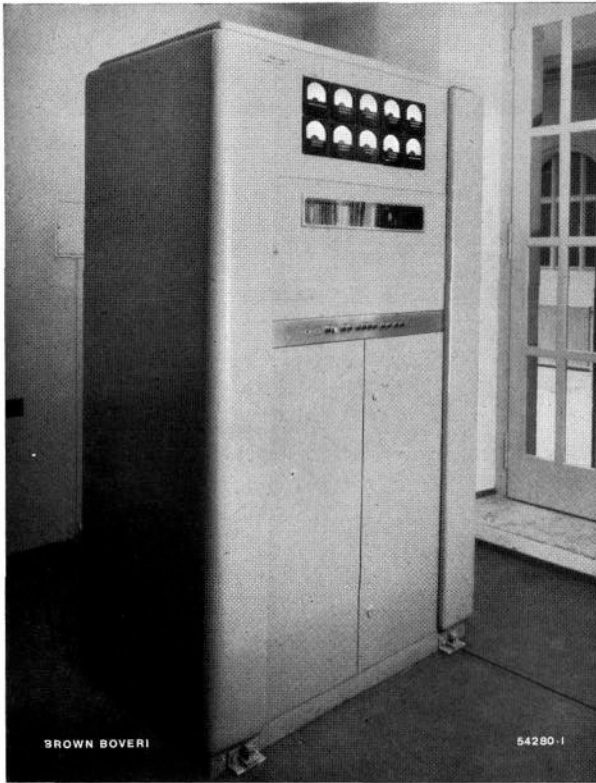


Fig. 2. — 500-watt police transmitter for telephony and modulated carrier-wave telegraphy.

Power adjustable in three steps to 125, 250 and 500 watts. Wave range 110 to 220 m with three fixed waves chosen as desired and one variable wave. The totally enclosed design gives a compact and pleasing appearance to the transmitter cabinet. It also contains all auxiliary apparatus for direct connection to a three-phase system, besides all the transmitting and modulating parts.

Fig. 2 shows the headquarters transmitter. The power output of this unit naturally depends upon the kind of service and the area to be covered. The operator can select three different stages of power output between 125 and 500 watts. If the transmitter is needed for different services, to each is allocated a wave-length best suited to its requirements. One of the fixed waves may for instance be adjusted to the wave-length of the local broadcasting station. Thus, in case of emergency, the police headquarter station can replace the local broadcasting station. Another fixed wave may be reserved for the specific police requirements and a third one may be used by the headquarters of the criminal investigation department and fire brigade, for alarming purposes. The fourth variable wave is a stand-by wave or it may be used for special remote control work, such as is frequently required in modern days for the transmission of

black-out or A. R. P. orders. The transmitter can be fully controlled from the transmitting room itself, or remotely from an operator's table in one of the rooms at headquarters. By means of a suitable amplifier, modulation over a two-wire post-office line is possible from any distant studio room. Should the transmitter have to replace the local station, broadcasting quality must be maintained. All parts are, therefore, conservatively designed. The maximum distortion factor, for instance, does not exceed 3% for full modulation of 100%. For special police requirements this high degree of quality is not necessary. In this case a special filter network is switched into the modulation channel to cut off the lower frequencies in order to increase the intelligibility of speech.

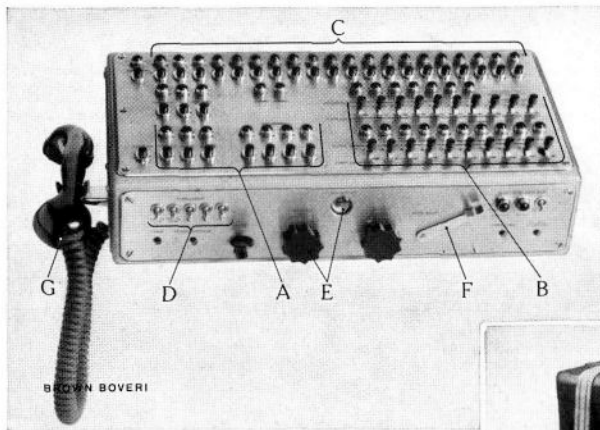
Operation and control of all the apparatus belonging to extensive installations, such as this, is effected from one central point at headquarters.

Fig. 3 shows the interior of a dispatcher's room of the kind in question. There is a microphone and a remote control equipment on the operator's table. This apparatus enables the operator, by means of pilot lamps, to supervise continuously the whole installation and to control remotely not only decentralized transmitters, but also distant receivers. By means of selector switches he calls certain groups of mobile and portable stations or he enables mobile stations to communicate directly with any telephone subscriber. He also effects the necessary switching if two mobile stations desire to communicate with one another while running on the road.



Fig. 3. — Interior of a modern police wireless controlling station.

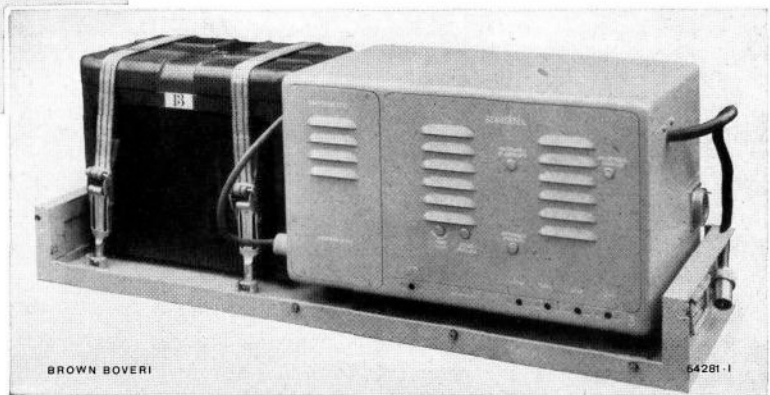
Left: Receiver frame with auxiliary apparatus. Right: Microphone, control and supervisory equipment, telephone line-selector and controlling loud speaker. The practical layout of the equipment allowing the operator to work quickly is very striking. He can reach all switches and buttons which he has to manipulate from his seat without difficulty.



**Fig. 4. — Controlling and supervising equipment.**

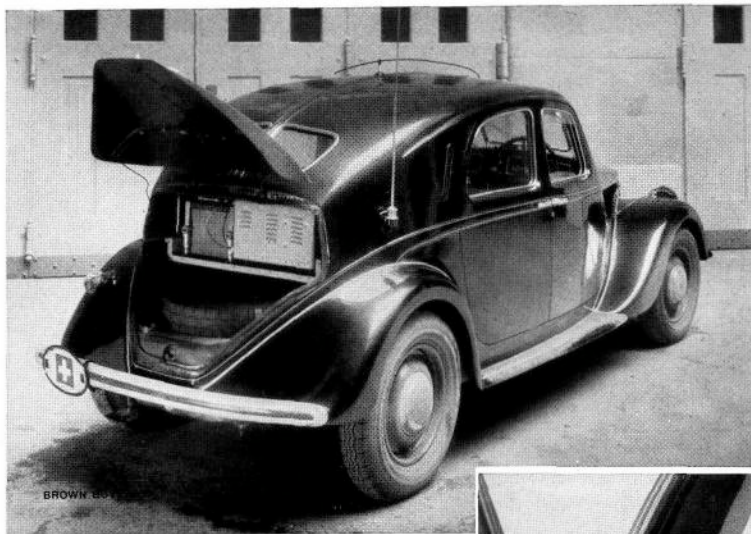
- A. Control switches for the headquarters transmitter.
- B. Lever switches for changing over incoming lines and signals to the transmitter; also for remote control of the remote receivers.
- C. Signal lamps to indicate selective calling up of mobile stations.
- D. Switches for selective calling up of groups.
- E. Control of modulation.
- F. Selector switch for the remote controlled ultra short-wave receivers.
- G. Micro-telephone.

This is the brain of the whole plant. Here about 300 control and supervision lines converge. One glance suffices to inform the operator of the actual service condition of the entire police wireless organization.



**Fig. 5. — Mobile ultra short-wave transmitter with frequency-modulation, output 10 watts, with supply storage battery 105 Ah, mounted on a portable frame.**

The compact, strong design is very noticeable. The mounting on a frame allows quick interchanging from one car to another of a police wireless organization.

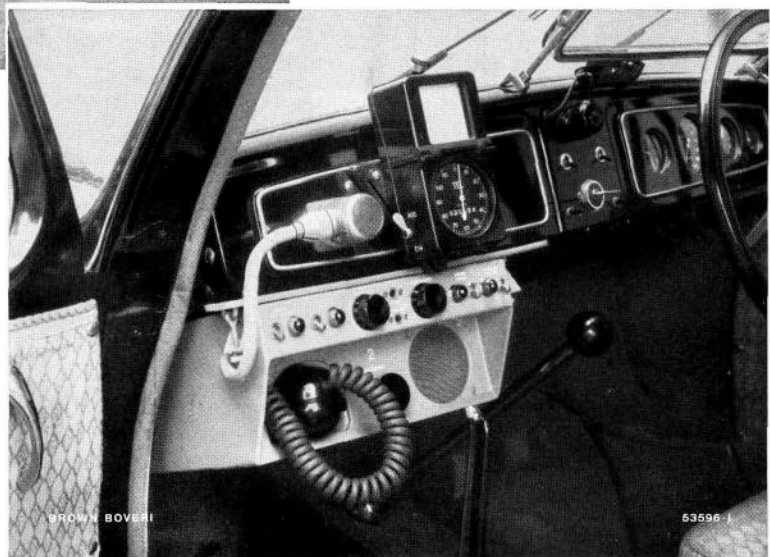


**Fig. 6. — Police patrol car with ultra short-wave transmitter built into the luggage holder, with rod transmitting aerial and short-wave receiving aerial on the roof.**

The aerial layout is made to suit the external appearance of the car as well as possible and really is very unnoticeable. Thanks to a compact design, it is possible to find room for the transmitter in even the smallest luggage holder.

**Fig. 7. — Mobile short-wave receiver and control equipment in the driver's seat of a police patrol car.**

It comprises a short-wave receiver with loud speaker and micro-telephone, control buttons for the remote control of the transmitter part as well as a device for passing automatic calls. Here, also, the dimensions of the equipment are reduced to a minimum because experience tells that there is never too much space available in the driver's seat of a police car. In the layout of the signalling and operating buttons, special care has been given to making them as accessible and as easy to supervise as is possible.



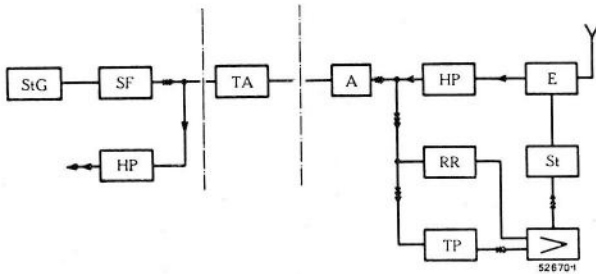


Fig. 8. — Fundamental diagram for the remote control of an ultra short wave receiver which can be switched in through a telephone line.

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|--------------------------|-------------------------|
| Transmitting station:    | Receiving station:      |
| St. Controlling device.  | H. P. High pass filter. |
| StG. Control generators. | T. P. Low pass filter.  |
| SF. Transmitting filter. | E. Receiver.            |
| TA. Telephone station.   | RR. Calling relay.      |
| A. Matching.             | Fk. Headquarters.       |
|                          | >. Amplifier.           |

As the diagram shows, the control device developed by Brown Boveri operates with a minimum of switching elements, in consequence we get excellent efficiency and good transmission qualities.

An interesting point about the mobile stations is that this is the first time *frequency modulated ultra-short waves* are used in Europe for communication purposes. Numerous measurements and tests have proved this kind of wave to be particularly suitable for wireless communication in towns where electric



Fig. 9. — Policeman with short-wave super-regenerative receiver slung over his shoulder.

Battery, aerial and call-up device are built into the receiver. The latter is a fine technical achievement as all switching elements besides the source of power are lodged in a very small space. The illustration shows clearly that the man is not impeded by the equipment from carrying out his duties.

interference from motor-car ignition and X-rays apparatus is very frequent. Compared with the well known amplitude modulation system, the new method shows a far better ratio of signal strength to noise.

Regarding propagation properties, it has been found that this special kind of wave can be used to great advantage even in towns with numerous obstacles, without impairing the high degree of performance, which can easily compete with that of normal telephone lines.

As a matter of fact, mobile stations have to work under very adverse conditions because police patrol cars often move with great speed over very rough roads. The mobile transmitter is lodged, together with a low-voltage battery in a welded frame, which is mounted in the patrol car. The short wave receiver with built-in automatic calling device is fixed in front of the driver on the dash board. It is of very small size and light in weight, to meet the demand of mobile police work. The police forces, generally, possess different types of vehicle and the construction shown in Fig. 5 enables parts of the whole equipment to be interchanged within a few minutes.

The remote-controlled receivers, which are generally placed in the suburbs of large towns, are operated by a new Brown Boveri system. Switching on and off, as well as tuning, is effected over a normal telephone line, preliminarily switched in by an automatic telephone selector. Low-frequency oscillators, which are placed in the headquarters station, produce control voltages of different frequencies which reach the remote receiver over the line through different low-frequency filter networks. These control voltages operate remote relays which act upon the receiver. When all traffic has ceased, the remote receivers and the lines are automatically switched off. The performance of this new system is extremely good and precautions have been taken to prevent interference by unauthorized persons from outside.

A modern police organisation must provide for the calling of every member of the police force at any moment. This is of special importance in case of emergency. For this purpose every policeman is equipped with a light-weight portable receiver. This set is of the super-regenerative type and possesses an extremely high sensitivity. A built-in automatic calling device enables the wearer of the set to be alarmed within a radius of 6 miles from the headquarters' transmitter.

Flying patrols on motor-cycles may also be equipped to great advantage with the same type of set. Thus they, too, remain continually in contact with headquarters.

A police force, which has availed itself of this latest advance in the high-frequency field, will certainly show maximum efficiency in emergencies.

(MS 815)

A. Wertli.