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THE TROUBLE-SHOOTER

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The Post Office operates a fleet of specially-equipped vehicles to investigate complaints by the public of interference to their TV and radio reception. A new prototype vehicle incorporates improvements suggested by operating staff.

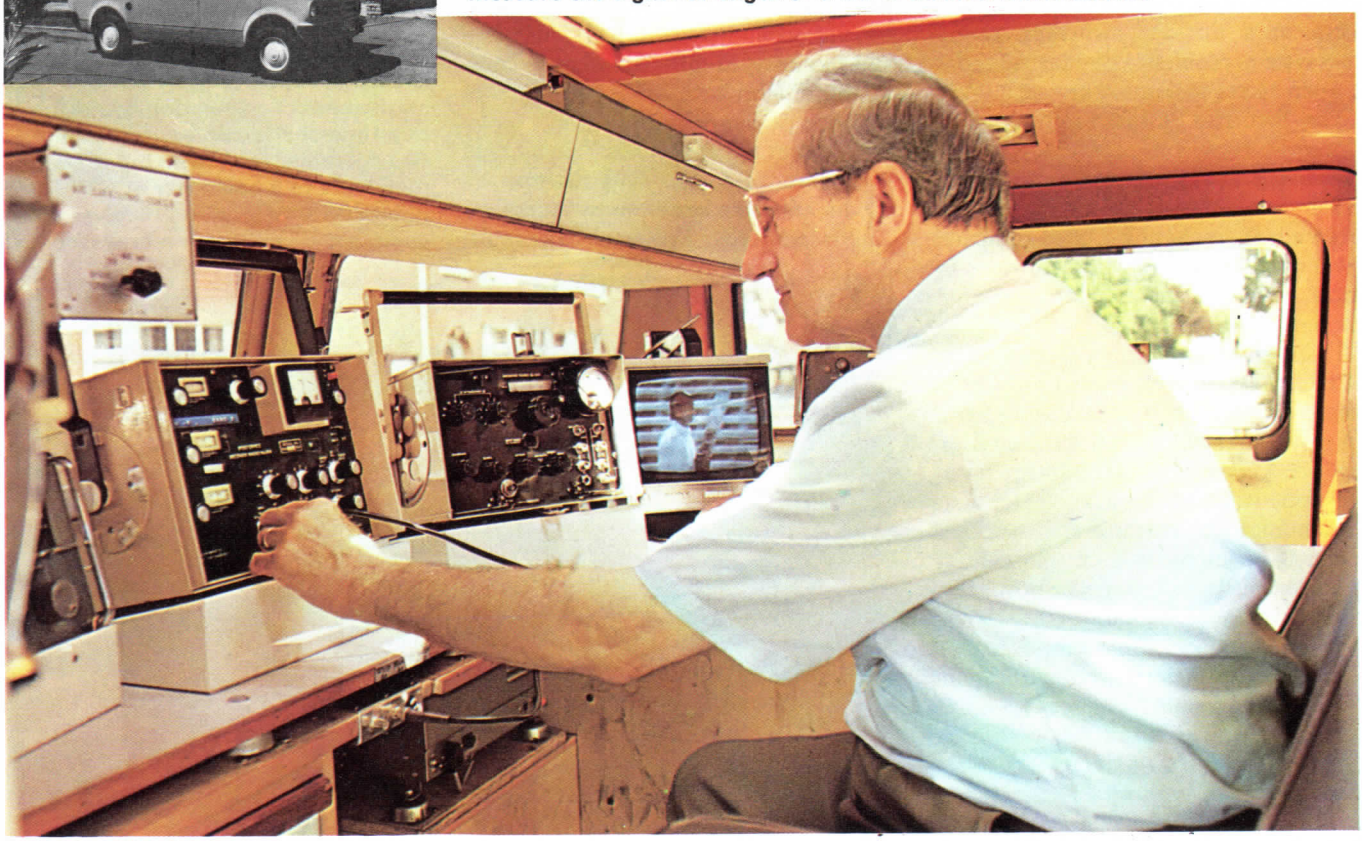
INTERFERENCE to radio and television broadcasting services may be caused to some degree by any appliance or equipment which uses electricity for its operation. Under the Wireless Telegraphy Act 1949 regulations have been introduced to control interference from sources such as the motors used in electrical appliances, refrigerators and the ignition systems in motor vehicles. These regulations require manufacturers or users, as appropriate, to comply with conditions designed to protect radio reception.

Prior to 1969 the Postmaster General was the authority responsible to Parliament for the national control of wireless telegraphy, including the investigation of interference to authorised broadcasting. When the Post Office became a public corporation, headquarters control of this radio interference service was taken over by the Ministry of Posts and Telecommunications (MPT), but in April this year responsibility passed to the Home Office. However, day-to-day operation of the service is still carried out by the Post Office as an agent of the Home Office.

If a member of the public experiences interference to his radio or television reception he can obtain a form from the Post Office to request an investigation. Staff are employed in Telephone Areas throughout the country to investigate complaints, using a fleet of about 275 special vehicles equipped with measuring and tracing equipment. Their task is to identify and locate reported sources of trouble.

Having ascertained that interference is from outside a complainant's premises, the Post Office engineer can often identify the cause by its characteristics. He may then be able to easily pin-point the source if it is in the immediate area,

Left: The prototype vehicle incorporates a pneumatically-operated mast which can be extended to a height of 25 ft. It enables the operator to check television reception without using the complainant's aerial.
Below: In the operating compartment of the new vehicle a test is made to measure the signal strength of a vhf broadcast transmission.



or it may be necessary to use direction-finding techniques if it is more distant. After the source has been located it is his job to inform the owner of the device causing interference, and to offer advice on how to have it suppressed.

For most types of domestic appliance the Post Office can, if requested, install a suitable suppression component for which they make a charge. Alternatively, the owner may have his appliance suppressed either by the manufacturer or a local dealer. If nothing is done to eliminate the cause of the problem, the case will ultimately be referred to the Home Office.

Radio interference staff are provided with 5 cwt vehicles to carry the tools and equipment enabling them to deal with the most common and simplest complaints, such as those caused by domestic appliances. In addition each Telephone Area has a 10 cwt vehicle fitted with test equipment and a 25-ft extending aerial mast to cope with the more complicated interference problems, such as those caused by unwanted signals from radio transmitters, or cases which require the strength of the local television signal to be measured.

The existing fleet of 10 cwt vehicles is nearing the end of its working life and plans have been made for its replacement. At the time these plans were drawn up the MPT was the authority responsible for headquarters control of the radio interference service, including the design of vehicles and equipment. Post Office Telecommunications Headquarters (THQ), which purchases the equipment on behalf of the authority, therefore co-operated with MPT (and, later, the Home Office) in the design and construction of a new prototype vehicle.

Before drawing up a specification for the new vehicle, a questionnaire was circulated to obtain the views of staff operating the existing 10 cwt fleet. Many suggestions by the staff were incorporated in the prototype, which has been shown to and agreed by representatives of the relevant staff association. Purchasing of 74 new vehicles is under way, and it is expected that the first replacements will go into service early in 1975.

Assessment of the questionnaires indicated that a larger vehicle than the existing 10 cwt would be needed, so the prototype has been based on a 15 cwt Bedford body. This will provide more working space for operating staff and allow for the later provision of more up-to-date equipment to measure and locate sources of interference.

Initially it is intended that the equipment used with the present 10 cwt vehicles will be transferred to the replacement fleet. Normally a vehicle will carry test equipment to cover long-wave, medium-wave and very high frequency (VHF) radio, and VHF and ultra high frequency (UHF) television channels.

Portable receiving equipment is used to trace the source of television interference. The operator uses headphones while monitoring the broadcast to avoid causing a nuisance in the street.

A high frequency communications receiver, used in conjunction with a roof-mounted whip aerial and an aerial tuning unit, will also be carried to monitor frequencies used by amateur radio enthusiasts.

A working bench is provided in the operating compartment together with storage facilities for small components, test leads and tools. The bench is fitted on anti-vibration mountings to protect the sensitive electronic equipment when the vehicle is driven on uneven surfaces, perhaps in crossing fields to investigate interference from power lines. Mounting brackets on the bench secure the measuring and tracing receivers, and allow them to be quickly removed for portable use. The operating position in the vehicle body is equipped with a swivel chair and the permanent equipment is arranged in a semi-circle around the operator.

Most of the measuring and tracing equipment is designed to operate from dry batteries or rechargeable cells and is fully portable. For example, the monochrome television receiver can be operated from an associated battery pack, an external 12-volt DC supply or 240 V AC. To avoid creating a nuisance, the operators use headphones to monitor broadcasts or interference with the measuring and tracing receivers outside the vehicle. However, the equipment can be linked to a loudspeaker unit within reach of the operating position when used inside the vehicle. To ensure that each item of equipment can be operated to the limit of its sensitivity within the body compartment, additional suppression has been incorporated to reduce noise from the petrol motive power unit and other items of electrical equipment.

Many complaints of interference to television reception are caused by poorly installed or inadequate aerial systems. A selection of aerials suitable for different localities will be carried so that demonstrations can be given at complainants' premises to show the benefits of correct installation. These aerials can be quickly fitted to a pneumatically-operated mast mounted through the roof of the new vehicle and extended to a height of 25 ft by means of a compressor which is controlled from the operating position.

A transparent panel in the vehicle roof enables the operator to check the direction of an aerial on the mast, which can be rotated to the correct position from the operator's chair. In cases where the vehicle is unable to approach a complainant's premises the mast can be removed, mounted on tripod legs at a suitable point and raised by means of a hand-operated pump.

A second roof-mounted whip aerial is provided at the rear of the new vehicle for use with a land mobile radio transceiver to provide a means of communication between an operator and his headquarters. The transceiver is not being supplied as standard, but if Telephone Areas decide that such communication is required, the equipment can be installed without major modifications to the layout of the operating compartment.

All power supplies in the vehicle are controlled from a distribution panel within easy reach of the operating position. A heavy duty battery which is charged by the vehicle system together with other equipment provides an electronically-generated 240-volt AC supply. This supply is distributed in trunking along the offside to feed standard 13 amp sockets and can be used to recharge the secondary cells of portable equipment as well as to operate domestic appliances which require suppression. In addition, 12 V DC supplies are available from terminal connectors, and can be used to operate the television receiver and any other equipment requiring this form of power supply. A battery condition indicator near the distribution panel and an ammeter on the vehicle dashboard show ▸

the operator the state of the batteries.

An operator may be required to carry out tests of a protracted nature, for example in cases where any one of a large number of machines in a factory is causing interference. Facilities have therefore been provided for an external 240 V AC mains supply to be connected to the vehicle so that operation can be independent of its batteries. A mains cable mounted on a drum and fitted with weatherproof connectors is supplied for this purpose.

Great attention has been given to operator comfort and convenience during production of the prototype vehicle. Fluorescent lighting is fitted in the operating compartment, and the windows have darkened glass to cut down glare from outside and to aid security. Drop-fronted cupboards provide easy access to stored aerials, and there are facilities for storing wet-weather clothing at the rear of the vehicle. A heater working from the engine cooling system heats the operating compartment, and a roof-mounted ventilation fan has also been installed.

Radio interference staff often alternate between the vehicle and a complainant's premises when making tests. Easy access to the vehicle is therefore essential, and a nearside door opening into the operating compartment has been provided, as well as two doors at the rear. A partition with a lockable door separates the driving and operating compartments. Most of the existing 10 cwt radio interference vehicles are operated by one man, and the new vehicle has been designed to the same concept. However, seating is available to carry a passenger for training and similar purposes.

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IN MEMORY OF A PIONEER

Born in Italy 100 years ago, Guglielmo Marconi first demonstrated his system of wireless telegraphy in this country in 1896. From the roof of Post Office Headquarters (now Postal Headquarters) in St Martins-le-Grand, London, he successfully transmitted Morse signals to a receiver on a building about 150 yards away.

In one of the events to commemorate the centenary of Marconi's birth his widow, the Marchesa Maria Christina Marconi, and her daughter recently visited the site of the demonstration and were shown the apparatus used. Their visit also marked the co-operation Marconi received from the Post Office when he first came to England to continue his work. In Italy, he had experimented with radio waves as a basis for communication without wires and by the summer of 1895 had succeeded in transmitting signals over a few yards of space. Later that year, using an earth and an elevated aerial at both the transmitter and receiver, he was able to pass Morse code over $1\frac{3}{4}$ miles. When he came to England in 1896 he filed the world's first patent for a system of telegraphy using radio waves.

The apparatus demonstrated by Guglielmo Marconi to Post Office officials in 1896 is inspected by his widow and Mr. Edward Fennessy, Managing Director of Post Office Telecommunications.

Soon after his arrival in this country Marconi met A. A. Campbell Swinton, a well-known electrical engineer, who gave him a letter of introduction to William Preece, Engineer-in-Chief of the General Post Office. Preece was himself experimenting with 'wire-less' telegraphy, but was not using radio waves. On the strength of preliminary demonstrations in the laboratory, Preece invited Marconi to give his first formal demonstration to Post Office officials from the roof of the St Martins-le-Grand building.

Following the success of the first demonstration, Preece asked for further tests at greater range. These took place on Salisbury Plain and good results were obtained at a range of $1\frac{3}{4}$ miles. Although he had achieved success in Italy with elevated aerials, Marconi chose to conduct many of the tests with apparatus in which the transmitting and receiving circuits were each placed at the focus of a parabolic, copper reflector.

Preece, to whom Marconi always acknowledged his indebtedness, gave the young inventor every encouragement and the support of the technical resources of his department. He also gave an historic public lecture on the subject of Marconi's invention in London. During the lecture Marconi moved around the auditorium carrying a receiver with an electric bell which rang whenever Preece, on the platform, pressed the transmitting key.

In the summer of 1897 another successful demonstration was carried out in co-operation with the Post Office. An obvious application for wireless telegraphy lay in bridging stretches of water as an alternative to submarine cables, and it was therefore important to establish that radio waves could in fact be transmitted over water. Preece arranged for tests to be made across the Bristol Channel and they resulted in a record transmission of 8.7 miles.

In 1897 the world's first radio company was formed to develop Marconi's apparatus commercially. One member of the technical staff recruited was George Kemp, assistant in charge of Preece's laboratory, who from the outset of Marconi's association with the Post Office had been detailed to act as his personal assistant.

● An exhibition is currently being held at the Science Museum in London to commemorate the centenary of the birth of Marconi.