

The Suppression of Interference

POINTS TO BE CONSIDERED WHEN INSTALLING CAR RADIO RECEIVERS

RECENTLY, a well-known radio manufacturer introduced a car radio to be installed by the purchaser himself. Suppression equipment is provided with the radio, and in practice it will be found that a very large proportion of cars will require little in the way of special precautions and it will only be necessary to fix the receiver and aerial to the vehicle, connect up the battery supply to the receiver, fitting a suppressor in the main distributor lead, to achieve completely satisfactory results.

In some cases, however, it may not be quite so straightforward, and it is the writer's aim to illustrate all the suppression problems that could possibly be met with, and their various remedies. It is earnestly hoped that the following discourse will not convey the impression that the installation of a wireless receiver in a vehicle is a big undertaking only capable of being carried out by an expert.

Ignition Interference via Aerial or Lead-in

If interference is picked up only when the aerial is connected, it is reasonable to assume that the aerial, or the lead-in, is transferring interference into the receiver. First, disconnect the aerial from its lead-in and ascertain whether interference is still present. If this is the case, the trouble lies in lack of bonding of the outer screen of the lead-in to the vehicle. Eliminating the lead-in as the offender, interference may still be present and being picked up by the aerial itself. The suggested treatment for the different types of aerials is as follows:

(a) Roof Aerial

Interference is usually caused by re-radiation from the car wiring to the roof light, trafficators or other accessories which are in close proximity to the aerial. The remedy is to by-pass these leads at the fusebox or insert a filter in the lead at the fusebox end. A useful filter should consist of a closely-wound coil $\frac{1}{2}$ in in diameter made up of 14/16 s.w.g. D.C.C. copper wire, with two .25 to .5 μ F condensers connected, one between each end of the coil and earth.

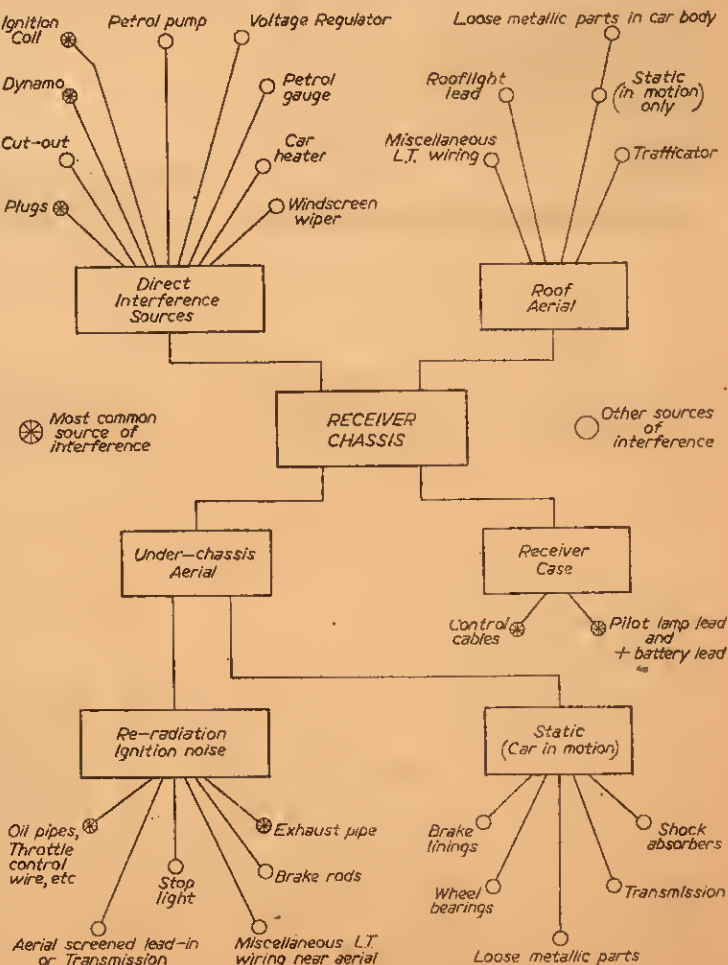
(b) Telescopic (Whip) Type Aerial

This type of aerial should be mounted as far away as possible from the ignition coil, distributor and sparking plugs and preferably

on the side of the car nearest to the receiver so that the lead-in is as short as possible.

(c) Under-car Type of Aerials

Re-radiated interference from various sources such as exhaust pipe, brake cables or rods, tail lamp wiring, etc., is liable to be picked up by this type of aerial. Bond exhaust pipe, brake rods, etc., to chassis with heavy copper braid, allowing sufficient slack in the braid to allow for movement. Tail light leads and/or other wires should be treated by fitting filters as previously described. Keep the under-car type of aerial as far away from the exhaust pipe as possible and on the side remote from the ignition coil. The best signal-to-noise ratio is obtained by



A chart showing interference sources.

fitting this aerial as low as practicable, consistent with the ground clearance of the vehicle.

Ignition Interference

This type of interference is identified by a staccato "clicking" sound at tick-over speeds, increasing in periodicity as the engine speed increases.

First ascertain whether or not the ignition interference is present with the aerial disconnected. Assuming that disconnecting the aerial does stop the noise, it is safe to assume that the interference is being picked up by the aerial or lead-in; either directly from the points of the sparking plugs, or due to the ignition wiring being too close to the aerial. Fitting a resistance suppressor (approximately 10,000 Ω) in the lead between the coil and the distributor head, as closely as possible to the distributor, should effect a cure. In extreme cases the fitting of suppressors at both ends of the lead and possibly additional suppressors to each sparking plug may be required.

If the latter are fitted they should be as close as possible to the sparking plug, but plug suppressors are seldom required with the modern well-designed receiver. Odd cases have been known where it was necessary to alter the position of the ignition coil, or even screen this component in a metal box. Other difficult cases have been cured by screening the sparking plug and distributor leads in flexible copper braid tubes. Generally, however, the only remedy needed is the fitting of a distributor suppressor, provided the aerial has been mounted in a carefully selected position.

It is a good idea to connect the aerial to its lead-in and to move the aerial about in relationship to the vehicle until a point most free from interference is obtained, when the aerial can then be secured. Make sure that the screening of the lead-in from the aerial to the set is bonded to the vehicle in a sufficient number of places. It is essential that it is bonded at least once, and this should be as close to the aerial as possible, using a short length of copper braid. Most of the modern aerials bond themselves automatically on fixing (ensure that the metal is thoroughly cleaned at the fixing point). Make sure also that the set itself is making a first class electrical connection with the bulkhead, dashboard or place of mounting.

In the case of engines which are rubber mounted it is worth while to bond engine to chassis with heavy flexible copper braid in several places. Bonding together the silencer, exhaust and tail-pipes is also advantageous.

The roof aerial is the type most free from interference pick-up troubles, but where interference is experienced check on the bonding of the lead-in and suspect wires which run near to the aerial, e.g., leads to roof light, spotlights, petrol gauge, etc. By a simple process of elimination, using a by-pass condenser, the faulty lead can be found and very often only the one condenser is required.

Any interference from electric screen wipers, electrically operated pumps, trafficators, etc., can be eliminated by using these condensers. (See chart.)

As previously mentioned, it is of the utmost importance that the receiver case is making good electrical contact with the car body, and also that any bolts, fixing screws, control cables, etc., on or entering the case are well earthed.

The battery supply leads may also have R.F. interference induced in them. Also, if the receiver battery lead is connected to the ammeter it must be remem-

bered that this instrument is connected directly to the ignition system. A condenser of .5 μ F to 2 μ F placed between this point and earth will eliminate the trouble. A 1 μ F condenser placed between the "S.W." terminal on the coil and chassis earth will sometimes cure interference via the L.T. supply.

If R.F. interference is being picked up by control cables, oil pipes, etc., which run from the engine compartment through the bulkhead and are near to the receiver and/or its external connections, this can be removed by bonding these to chassis earth.

Static Interference

This is experienced usually only when the vehicle is in motion and can be intermittent or continuous.

In the case of intermittent noises, the trouble is often to be found where movement is taking place between two parts of the vehicle which are not electrically connected, and the cure is to bond the two parts together with copper braid.

Continuous interference is often associated with brake shoes, wheel bearings or fan belt. Static generated by rubbing brake shoes can often be removed by adjustment of the shoes to give clearance, and, failing this, by bonding.

Front wheels offend the most, and sometimes packing the hubs with a good quality graphite grease after removing the old grease will ensure success.

Brake static can generally be cured by connecting the brake shoes with copper braid to the axle. (Leave sufficient slack for free movement.) Interference from the dynamo which can best be described as a whine can be easily cured by fitting a .1 μ F condenser between the "field" terminal of the dynamo and earth.

Static discharge from fan belt or pulley can be cured by smearing with a light coating of graphite—soft lead pencil will often do this job most satisfactorily.

General Hints

1. Bonding. As a general rule bonding wires that are up to 4in. long should be made with $\frac{1}{8}$ in. wide braid, 4in.-8in. long with $\frac{1}{4}$ in. wide braid, and above 8in. with 1 $\frac{1}{2}$ in. wide braid. Of course, $\frac{1}{4}$ in. braid can be used in single, double or treble strands and perhaps this is the cheapest way to buy it.

Always use the shortest possible length of bonding and try several strips of braid if each in turn is reducing the interference. Good electrical connections are absolutely essential for good results cannot be obtained without them.

2. Ensure that all leads which have been screened and isolated and which are carrying H.T. have adequate insulation.

3. Make a thorough check of those H.T. leads for noises may result from defective ignition wiring causing intermittent arcs to earth. Do this checking in the dark by increasing the engine revolutions and inspecting the wiring for visible arcing, particularly in the region of the H.T. terminal on the ignition coil.

Replace any defective wires immediately.

4. By-pass condensers and suppressor resistors should always be installed as close to the source of interference as is practicable and any external leads on these components should be kept as short as possible.

5. When testing keep one's body away from the ignition system and ensure that the engine bonnet when closed is effectively earthed to the chassis.