FM SIGNALS, FM ANTENNAS

and all that jazz!

The prospect of additional FM/stereo broadcast stations has raised, for some, the question of a suitable antenna for their FM tuner. Rod or ribbon dipole? Should the tuner have a special outdoor antenna of its own, or can it share the signal from an existing TV antenna?

One of the factors which have tended to confuse the issue is that FM sound transmissions are often heard under quite adverse conditions or at distances much greater than would normally be expected. This can lead to the very dubious conclusion that an FM tuner or receiver can get by, for an antenna; with little more than the proverbial "piece of wet string"!

However, there can be a considerable gap between merely hearing an FM transmission and receiving it to best advantage, particularly when it is hoped to do so in stereo mode. Ideally, and for all practical purposes, it should be noise-free.

A disturbing anomaly that has occurred in Australia arises from the Broadcasting Control Board's early guideline that the polarity of FM transmissions should be the same, in each area, as that assigned to the TV stations. In many centres, including all the state capitals, this implies horizontal polarisation; yet it is in these very areas where there is a heavy concentration of AM/FM car radios and portables operating from vertical whip antennas

Having in mind the dissimilar polarisation and the fact that the whips are seldom adjusted to a resonant length, FM reception in these circumstances is already prejudiced. There have been complaints, particularly from the Melbourne area, of FM signals "fluttering" with the motion of the vehicle and of severe distortion in the case of stereo reception. This is not surprising, considering that the receiver is having to rely, for much of its signal, on random scatter of polarisation.

There is little that the listener in a car can do to alleviate these problems other than, perhaps, experiment with the antenna, to discover the length which seems optimum for the preferred station, and to switch to mono mode when stereo is unsatisfactory.

With a portable receiver having one or more whips for FM reception, it may be necessary to discover by experiment where it operates to best advantage and the best adjustment for the whip(s).

In this general connection, support is growing for the idea that all Australian FM broadcasting stations should use an antenna system which provides mixed or circular polarisation for the transmitted signal. This will ensure a deliberate rather than random feed to vertical whips on car radios and portables, while still leaving an ample horizontal component for properly in-

(Continued overleaf)

stalled rooftop antennas.

Of special note is the fact that Sydney's newest stereo broadcaster (2CBA-FM, 103.2MHz) has opted for circular polarisation. This follows lengthy discussion with the Broadcasting Tribunal and the P&T Department and the installation is likely to serve both as a test case and a trend setter.

For a domestic hifi installation, some kind of provision has to be made to receive FM signals, if only because FM tuners rarely have antennas attached. An internal signal feed from the mains, or a random length of wire clipped to an antenna lug are altogether too makeshift for most situations.

Widely accepted as a minimum provision is a dipole made up from 300-ohm antenna ribbon, as shown.

Assuming that the wanted stations operate with horizontal (or circular) polarisation, the antenna should be positioned horizontally and broadside — on to the general location of the transmitters. Within the listening room, it can be pinned to a wall or shelf or cupboard, but not adjacent to metal surfaces.

While possibly adequate in strong signal areas, an antenna within a room can be affected by the movement of people, or metal furniture or metal blinds.

If suspended from the rafters above the ceiling, such problems are minimised but signal pickup can still be compromised if there is a layer of foil under the tiles, or if the roofing material itself is metallic.

For most householders, the best compromise is probably to provide one good quality TV antenna and to divide its output between the TV set and the FM tuner. While capital city TV antennas (ch. 0,2,7,9,10) are not optimised for the FM band, their signal pickup from the FM transmitters will be ample in most suburban locations.

Since most householders will already have a reasonable TV antenna — a heritage from the colour revolution — it simply becomes a matter of arranging a junction point and an extra run of cable; it's a job that should not exceed the capabilitlies of the average handyman.

Antenna cable can be bought from electronic parts suppliers — Dick Smith, Tandy, etc — and should logically be similar to what is already installed between the antenna and the TV set: either 300-ohm twin ribbon, or 75-ohm coaxial cable. FM tuners commonly have provision for both.

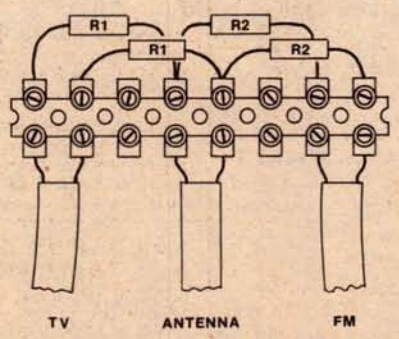
Whichever is used, however, it should not simply be joined in parallel with the existing cable as, for example, by continuing the run onwards from the terminals of the TV set. At the frequencies involved, lengths of cable tend to exhibit obvious reactive properties, so that the mere presence of a branching cable can play havoc with the signal level elsewhere. For these reasons, it is essential to provide proper "pads" or "splitters" at the junction point, to isolate runs of cable, one from the other.

TV aerial splitters can be bought from electronic parts supply stores, for either 300-ohm or 75-ohm down leads, for indoor or outdoor mounting, and for a 2-way or 4-way split. All splitters introduce some signal loss by their very nature and, for this reason, a 4-way splitter should not be considered unless the antenna is a high gain type, so placed as to intercept a generous level of signal.

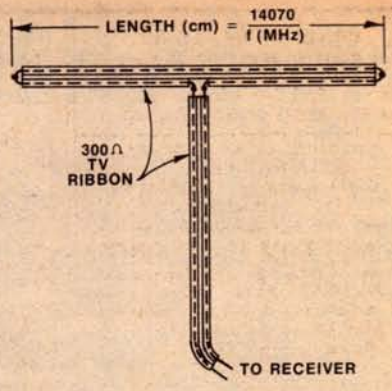
For those who prefer to make their own, a 2-way 300-ohm splitter can be put together as per Fig. 2.If installed in the ceiling area, it can be left bare, as shown. Elsewhere, it may have to be protected from the weather or hidden from view.

The resistors can be quarter — or half — watt types and normal practice would be to make them all 150 ohms. If one considers that the receivers themselves each represent an impedance of 300 ohms, each branch would aggregate a resistance of 150 + 300 + 150, or 600 ohms. The two branches in parallel would thus represent 300 ohms, thereby correctly terminating the incoming cable from the antenna.

The splitter can quite easily be modified slightly to give the TV receiver a greater share of the signal possibly warranted because "noise" tends to show up so readily in a high definition colout picture. Thus the R1 resistors serving the TV set can be dropped to 120 ohms and the R2 pair increased to 180 ohms. The input inpedance to the combination stays close to 300 ohms,



Shown above is a simple way of making a 2-way splitter for a 300-ohm TV antenna down-lead. The arrangement of the isolating resistors varies from this in some of the commercial splitters but, presumably, they would do the same job.



For use indoors, this dipole can be made up from a length of ordinary 300-ohm antenna twin-head, either black or opaque. The joints could be twisted but soldering provides a more reliable connection.

thus terminating the main feedline. Each of the branches would be terminated by the respective receivers and one must assume that they are what they purport to be: 300 ohm inputs.

Other combinations of resistors can be used, provided the net load on the main down lead is maintained at 300 ohms. Yet again, a 3-way splitter can be made up, but using three sets of isolation resistors, all around 300 ohms.

Splitters for coaxial feed cables tend to be somewhat more difficult to construct — and more costly to buy — because of the hardware involved: coaxial sockets for the input and outputs, and coaxial plugs to fit to the ends of the cables. Even so, the cost of a coaxial splitter ($6 to $7) is a lot less than a separate outdoor antenna installation.

However, there are locations where even half the signal from a TV antenna is going to be insufficient to guarantee a consistent noise-free stereo signal. In such a case, even the total signal from a TV type antenna may be suspect if for no other reason that a TV antenna (at least a capital city design) may be a dubious performer over the FM band.

Where the are problems of this order — usually in areas shadowed by intervening hills, the appropriate course is to buy and install a multi — element antenna especially designed to cover the FM band. As with TVantennas, the greater the number of elements, the higher will be the price; but there is reason to hope that the gain will be improved also.

FM antennas are advertised by various organisations but one series that should be especially worthy of consideration is that designed in Australia by the well known authority on antennas and propagation, Dr. R.J.F. Guertler. Without knowing all the distribution arrangements, details and prices can be obtained through Audiosound Electronic Services, of 148 Pitt Rd, Nth Curl Curl, NSW 2099.