



Building and Designing Transistor Radios

A Beginner's Guide

R.H. Warring



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Written and Illustrated by
R.H. Warring



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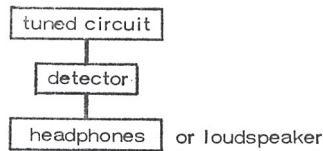
Contents

	Introduction	7
1	Aerial Circuits	13
2	Aerials and Aerial Coupling	25
3	Semi-Conductor Diodes and their Characteristics	32
4	The Diode Detector	39
5	Transistors	48
6	Understanding Transistor Characteristics	57
7	Audio Amplifiers	75
8	Regenerative Receivers	87
9	The Superhet	93
10	Interstage Connections (Coupling)	103
11	Field Effect Transistors	111
12	Miscellaneous Circuits	118
13	Checking Radio Circuits	125
	<i>Index</i>	127

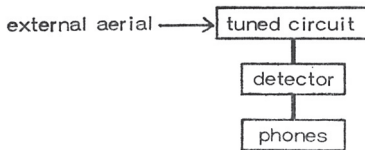
Introduction

Any radio receiver consists of a number of separate 'stages', suitably interconnected, each stage representing the equivalent of an electronic 'building block'. The three basic 'blocks' are a *tuned circuit*, to extract radio signals from the ether; a *detector*, to turn these radio signals into *audio frequency* signals (or *af*); and an electro-mechanical device to turn these *af* signals into sound (either headphones or a loudspeaker).

Thus the simplest combination of 'blocks' is:

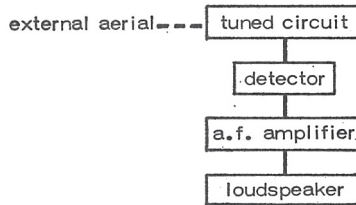


This combination has the particular limitation of providing only very low strength *af* signals – so weak, in fact, that they would certainly not work a speaker, and only give very weak signal strength in phones. Without going to more 'blocks' the only way to improve 'listening strength' is to add an external aerial.

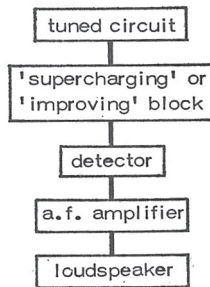


Much better results are possible by adding further 'blocks', especially one which magnifies or amplifies the signal output from the detector.

This four-block combination can work quite well, and an external aerial may not be necessary (although an advantage in some cases). Also it can be made to operate a speaker.

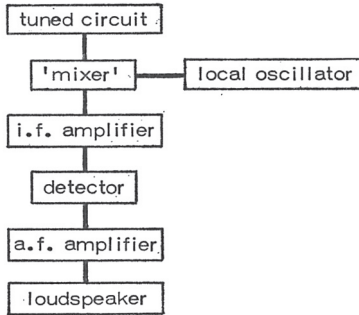


There are limits to what can be done with *af* amplifiers as these will magnify 'noise' and distortion, as well as the required *af* signals. Thus a further step, is to add another block to improve the signal quality in some way or another before detection and amplification. At this point it should also be possible to dispense with an external aerial.

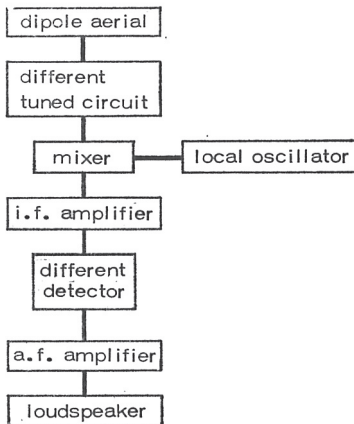


A simple solution to the 'improving' block is a regenerative circuit, which may also be designed to work as a detector as well. The more or less universal solution in modern radio receiver design, however, is the adoption of a *superhet* front end. This has the effect of extracting a

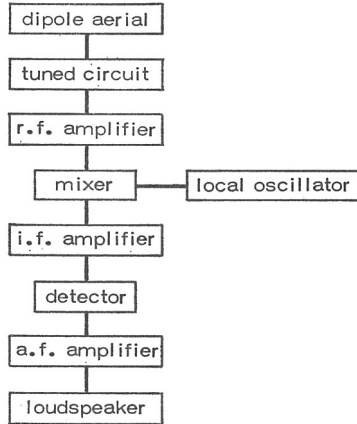
signal frequency intermediate between the *radio frequency (rf)* picked up by the tuned circuit, which *intermediate frequency (if)* can itself be amplified before being passed to the detector stage.



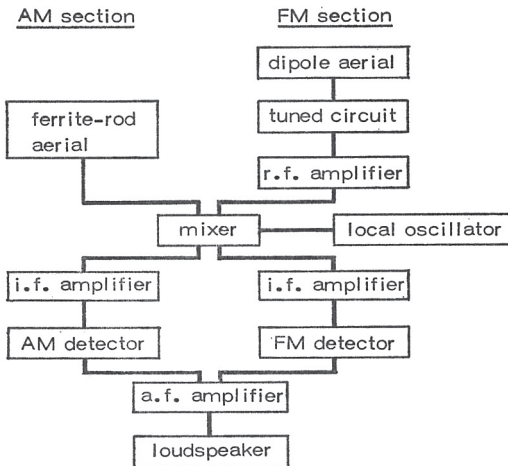
That, in fact, is as far as it is necessary to go for satisfactory reception of long wave and medium wave frequencies – or amplitude modulated (AM) broadcasts. Very High Frequency (VHF) or Frequency Modulated (FM) broadcasts, however, pose further problems for the *nature* of the *rf* signal is different, as well as the signal frequency being much higher. The latter means that the conventional form of tuned circuit for AM (usually comprising a ferrite rod aerial) is no longer suitable. Instead an external *dipole* aerial is necessary. Superhet working is more or less obligatory, so the building blocks now become:



Because of the higher signal frequency at which FM is broadcast, it is also desirable to *preamplify* the incoming *rf* signal, so one more block can be added with advantage:



Finally, of course, you may want to build an AM/FM radio, when some of the blocks have to be duplicated, the appropriate 'blocks' being selected by a wavechange switch:



It is the purpose of this book to describe and illustrate the design and working characteristics of the various 'blocks' from which radio receivers can be constructed. In some cases there are more or less standard designs which have evolved, e.g. for tuned circuits, AM and FM detectors, superhet mixer-oscillators, *if* amplifiers and *af* amplifiers. It would be difficult to improve on them with simple constructions. The main field for experiment is possible combinations of these various 'blocks' – and in particular the manner in which they should be connected together or *coupled* for most efficient working.

By treating all the major subjects separately it is hoped that the various design principles will have been made clear – and also how 'standard' types of 'boxes' can be connected together to make a working unit. It is also shown how additional simple circuits can be incorporated to improve the performance of any basic design.