

Using the RF24

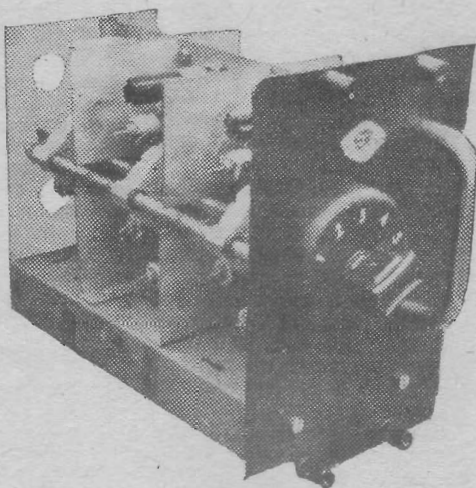
THIS EX-GOVERNMENT UNIT CAN BE USED WITH MANY RECEIVERS

By D. Noble and D. Pratt

MANY receivers have a maximum frequency range such that they are unable to receive transmissions on the 14, 21 and 28Mc/s amateur bands. Many people are, therefore, faced with the problem of how the frequency range of their receiver may be extended without too much trouble.

Crystal Control

The cheaply-obtainable R.F.24 unit, is, in its original condition, very suitable for use as a converter for 21 and 28Mc/s. It has, however, certain drawbacks. The oscillator tends to drift, and thus it cannot be accurately calibrated. By using a crystal oscillator circuit in place of the original variable local oscillator, however, and if the



receiver dial at 6Mc/s, and 30Mc/s will be on 8Mc/s, and the intermediate frequencies pro-rata.

By careful selection of a local oscillator crystal, it can be arranged that either the fundamental or the second or third harmonics will give approximately the same I.F. output frequency for each of the 14, 21 and 28Mc/s amateur bands. A different crystal may be used for each band, of course, but then the cost may become prohibitive, while if a crystal is chosen so that the I.F. frequencies corresponding to the three bands differ widely from each other, it will be necessary to add another switch wafer to retune the I.F. coil of the converter to the appropriate frequency for each band.

TABLE I

Switch position	R.F. padder	Mixer padder
1	82 pF (C43)	150 pF (C46)
2	15 pF (C44)	47 pF (C47)
3	15 pF (C45)	47 pF (C48)
4	not required	not required
5	not required	not required

receiver with which the converter is used is suitably calibrated, there will be no need to calibrate further. Say we had a local oscillator frequency on 22Mc/s, then 28Mc/s will appear on the

"Birdies"

If crystals of certain frequencies are chosen it will be found that as the receiver is tuned over the I.F. frequencies concerned a number of apparent carriers will be heard. These are not a

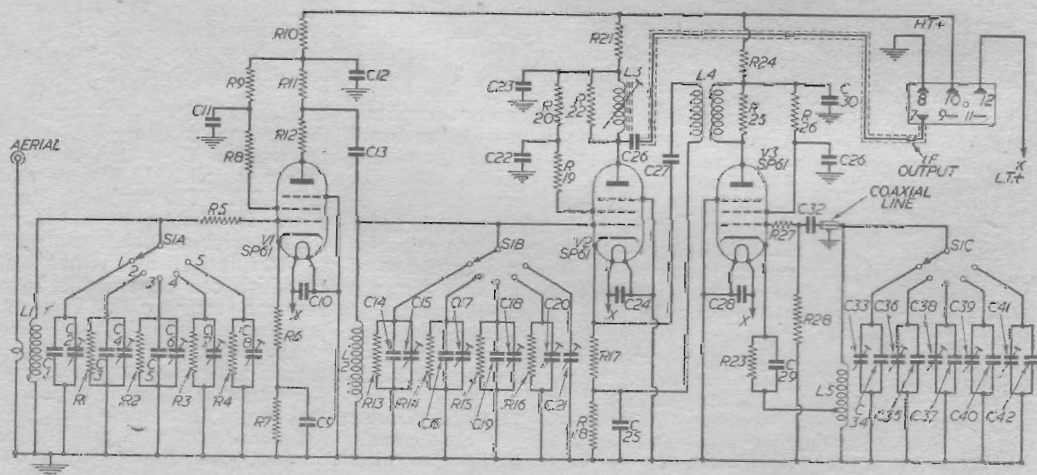


Fig. 1.—The original circuit diagram.

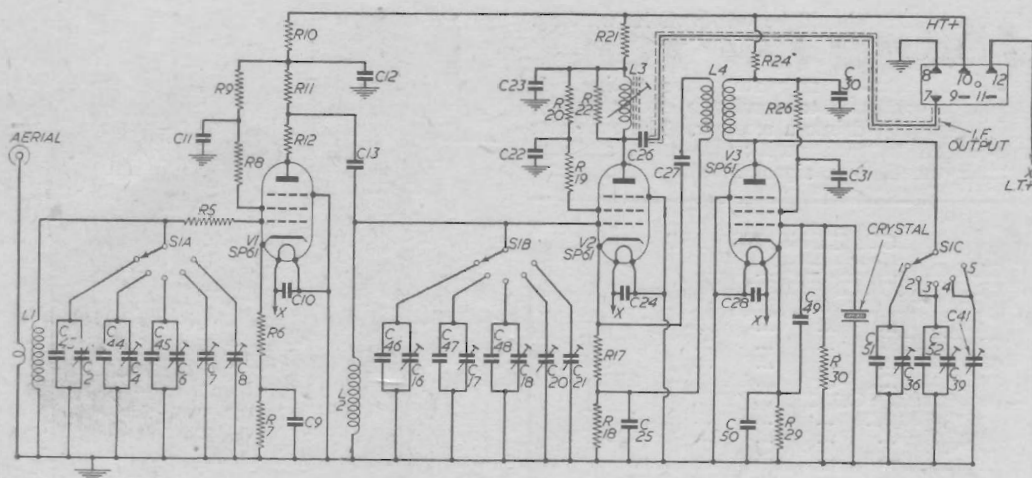


Fig. 2.—The modified circuit diagram.

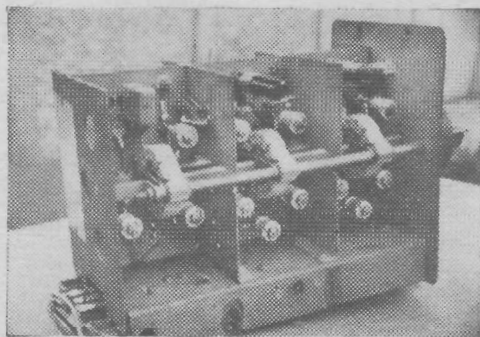
number of thoughtless people who have left their transmitters running by mistake, but they are what are known as "birdies." These are caused when the I.F. tuning range is extended over the local oscillator harmonics and fundamental frequency. If a 7.5Mc/s crystal is employed, then, apart from the harmonics of the receiver local oscillator appearing on the converter input frequency range, the only "birdy" caused by the converter itself will be on the fourth harmonic of the crystal on 30Mc/s and can be put to good use as a band edge marker (see Table II).

Before commencing modification, the R.F.24 converter should be tested in its original form so that if it is faulty, it can be ascertained that any fault is not due to the modifications. After connecting up as indicated in Fig. 1, with a short aerial, signals should be received when the main receiver is tuned around the I.F. frequency of about 7.5Mc/s.

Procedure

The first stage in the modifications is to remove all the padding condensers and damping resistors connected in parallel with the concentric trimmers. The wiring of the oscillator stage above the chassis should be stripped, and the oscillator

trimmers for ranges 1 and 3 removed. The coaxial line fastened to the dividing screen should be taken out as should also the oscillator grid coil. There should now be sufficient space avail-



able in which to fit the 7.5Mc/s crystal and its holder, and the crystal oscillator can be wired up according to Fig. 2.

Padding condensers should be fitted across the trimmers of the R.F. and mixer stages, and are given in Table I.

The damping resistor across the oscillator anode coil is not necessary, and may be removed. Also, so as to enable the oscillator anode coil to tune on each

TABLE II

Switch position	Converter freq. range	Local oscillator harmonic used	I.F. tuning range	Tune R.F. and mixer stages on:
1	Mc/s 14.0-14.35	Mc/s 7.5	Mc/s 6.5-6.85	Mc/s 14.2
2	21.0-21.2	15	6.0-6.2	21.1
3	21.2-21.45	15	6.2-6.45	21.3
4	28.0-29.0	22.5	5.5-6.5	28.5
5	29.0-30.0	22.5	6.5-7.5	29.5

band, five turns should be taken off its winding.

Alignment

The converter is now ready for testing. It should be connected to a suitable power supply, and its output fed into a receiver. The converter is switched to each position in turn, and the receiver tuned to a signal at about the centre

COMPONENTS LIST

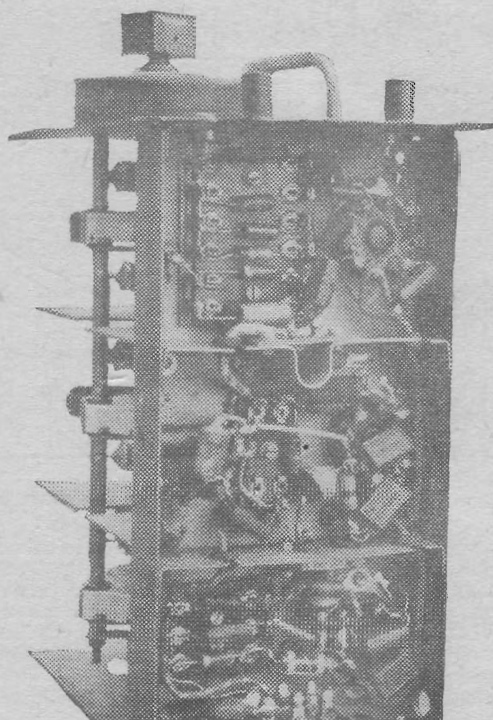
C1, C42, C44, C45, C49	15pF
C2, C4, C6, C7, C8, C15, C17, C18, C20, C21, C33, C36, C38, C39, C41	3-30pF trimmers
C3, C19, C26	10pF
C5	5pF
C9, C11	0.001 μ F
C10, C12, C22, C23, C24, C25, C28, C29, C30, C31	300pF
C13	100pF
C14	40pF
C16, C37	25pF
C27, C32	50pF
C34	35pF
C35	30pF
C40	20pF
C43	82pF
C46	150pF
C47, C48, C50	47pF
C51	680pF
C52	22pF
R1	3,900 ohms
R2	4,700 ohms
R3	6,200 ohms
R4	6,800 ohms
R15, R17, R27	47 ohms
R6	27 ohms
R7, R19	100 ohms
R8	12 ohms
R9, R16, R22, R26, R28	10,000 ohms
R10, R14, R21, R24	2,200 ohms
R11	3,000 ohms
R12	22 ohms
R13	1,500 ohms
R15	3,600 ohms
R18, R25	1,000 ohms
R20	100,000 ohms
R25	2,400 ohms
R29	270 ohms
R30	68,000 ohms
V1, V2, V3	Mazda SP61 (VR65)
S1	3-bank, 3-pole, 5-way ceramic switch
Xtal	7.5 Mc/s quartz crystal

COMPONENTS REMOVED DURING MODIFICATION:

C1, C3, C5, C14, C16, C19, C29, C33, C34, C35, C37, C38, C40, C42, R1, R2, R3, R4, R13, R14, R15, R16, R23, R27, R28.

COMPONENTS ADDED DURING MODIFICATION:

C43, C44, C45, C46, C47, C48, C49, C50, C51, C52, R29, R30, 7.5 Mc/s crystal.



modified to crystal control has the advantage that the frequency is accurately known, and it is, therefore, more suitable for serious amateur radio listening.

Books Received

Principles of Frequency Modulation

THIS book is intended primarily for students, radio engineers and radio amateurs. In concise form and logical sequence it gives a comprehensive account of the fundamentals of frequency modulation and its application. This book is published by Illiffe & Sons Ltd., Dorset House, Stamford Street, London, S.E.1, and costs 21s., postage 10d. extra. It consists of 147 pages and 87 diagrams. The size of the book is 8 $\frac{1}{2}$ in. X 5 $\frac{1}{2}$ in. The contents include Basic Principles of Frequency Modulation, Theory of Frequency Modulation, Frequency Modulation and Interference, F.M. Receivers, etc. Now that the incorporation of V.H.F. in broadcast receivers is standard practice this book is of great value for all radio technicians and students.

The Television Annual for 1960

THIS year's edition of the Television Annual includes many interesting articles by television personalities including Tommy Steele, Charlie Drake, Dr. Bronowski, Sir Kenneth Clark, Peter Scott, Max Jaffa, Perry Como and Gilbert Harding. It is published by Odhams Press Ltd., 96, Long Acre, London, W.C.2, and costs 10s. 6d. It consists of 158 pages and many photographs of television actors, actresses and personalities.

frequency of the range given in Table II, column 4. The corresponding trimmers in each stage should then be tuned for maximum response either aurally, or by the deflection of the S-meter if the receiver has one fitted.

Many amateur stations use the R.F.24 both as modified and in its original form; but the unit