Resistors

R1, R2	47R 1W
R3,	3R3
R4	330k
R5, 14, 22, 23, 37	1k
R6, 38	4k7
R11, 17, 33	10k
R9	56R
R10	100k
R12	22k
R24	27R
R7, 8,18,21,34	100R
R15, 29, 30	1k5
R19	18R
R20	150R
R26, 35,	220R
R27, 28	4R7
R31	330R
R32	2k2
R39, 40	10R
R13, 36	390R

RX 22k (mounted underside across L4

RY (mountedunderside L5-see text) 4k7

VR1 50k preset, vertical mounting

Capacitors

C1,C4, C31 to 36, C38 to 49	1nF
C2	2p2 (for 3W drive)
	8p2 (for ½W drive)
C3	10uF/15V tantatalum
C5, 6, 7, 8, 10, 12, 13, 14, 16, 17, 18, 20, 21, 22, 23	10nF
C9, 15, 19, 24	2u2/15V tant
C25, C27	220p
C26	330p
C28, 30	68p
C29	150p
CX	2p2
TC1, 2	2 to 22p trimmer
VC1	250 or 500p variable
C37	6p8

RFchokes

RFC1	4u7
RFC2, 3, 4, 6 ,7	5turns 30swg through ferrite bead
RFC5	10u

Semiconductors

TR1	BC238, BC239
TR2	BFY51
TR3, 4	BC327, BC328
TR5	3N204 or 3SK45/51
TR6, 10, 11	BSX20, 2N2369
TR7	2N3553
TR8, 9	2N4427
D1, 2, 3, 4, 5, 7, 9, 10, 11	1N4148 1N914
D6	1N4001
D8	10V1 Zener diode

Miscellaneous

65MHz · (20m) HC18/u crystal
61.5MHz (15m) HC18/u crystal
58MHz (10m) HC18/u crystal
RLY1 to 6 1150-060-1 9V PCB mounting (J Birkett)
T1 to 5 10mm block ferrite cores (J Birkett)
6 off T50-6 Amidon toroids
TMP Electronics, Ambit
SBL-1 balanced mixer
SW1 2 pole 3 way Veropins

NOTE: L3 and L4 may be replaced with TOKO pre-wound coils type 301-KU-0800. There are extra holes and pads shown in the oscillator board PCB artwork to accomodate them.

The components of one oscillator section only have been included in this parts list. If operation on all three bands is required then the extra components associated with two further oscillator strips will be required.

lator circuits, differing only in the fundamental frequency of the crystals. Taking the 20 metre conversion system as an example; if we have an IF of 144MHz, and wish to tune 14MHz, a local oscillator injection of 130MHz is required at the mixer. Here the sum (144 + 130 = 274MHz) and the difference (144 – 130 = 14MHz) frequencies are generated and suitably filtered by the tuned circuits in the preselector. It will be noted that the conversion crystals are within a few MHz of each other, which greatly simplifies the construction of the injection oscillators. The stabilised overtone circuit around TR10, tuned by L3 produces a signal half that required at the output. The small inductance L4 in series with the crystal allows precise frequency control. Resistor RX mounted underside across L4 reduces any possibility of the stage self-oscillating. This signal is lightly coupled into the next stage TR11 operating in a grounded base mode which acts as a doubler. The resultant frequency appears across L5, tuned by TC1. L6 and TC2 form the second section of the band-pass filter which is sharply tuned at the output frequency. The output from each oscillator is connected to the same point via diode D9, thus eliminating manual switching at RF. As HT is applied to each oscillator, D9 conducts through R37 and R38, allowing low impedance injection into the mixer. At the same time the other output diodes are reverse biased, and so effectively isolate the signal from the other tuned circuits.

The required mixing product is selected by a twin-section torroidal filter (active both on transmit and receive) tuned by a twin-section 250pF variable capacitor. Low impedance transformation is achieved by the link-windings on the input and output. Originally, inductive coupling between the toroids was used, but later abandoned as the capacitive coupling between the preselector components proved to give very satisfactory performance.

Transmit and receive signals are directed through relay RLY3. On receive the incoming signal passes through the low-pass filter and appears at the receive side of relay RLY4 (point 'A'). This must be connected to RLY3 (point 'A') via a short length of coaxial cable. Depending on the VHF source in use, it is possible to add a wide-band receive pre-amplifier at a later stage, particularly if the unit is modified for higher output frequencies. In the author's case, signals were so strong that a switched attenuator was envisaged to prevent over-loading the prime-mover! On transmit, the low level signal is amplified by the broad-band class 'A' amplifiers producing an output of around 3 watts into a 50ohm load. No originality whatsoever is claimed for the design. The information is readily available to anyone who has a copy of the 'constructors bible', *Solid State Design for the Radio Amateur*.

It appears that Frank, our illustrious Editor, and myself were thinking along the same lines when he described the broad-band transmit pre-amplifier chain in an earlier edition of this magazine. In fact, I thank him most sincerely for the information on the wide-band transformers which are used at each stage. TR5 acts as an impedance matching device. Any attempt to self-oscillate is halted by R9 across the input. To further reduce the possibilities of self-oscillation, the tantalum capacitors provide the necessary LF decoupling. The high gain VHF devices used for TR6 and TR7 increase the signal sufficiently to drive the push-pull amplifier TR8 and TR9