R.C.M. & E. Test Report

EDITORIAL REVIEW & TEST

● Raven Electronics 10 Channel Tx, Superhet Rx. and Super-regen Rx.

WE are always interested to see new manufacturers, particularly British manufacturers, in the radio control field. Raven Electronics showed prototype equipment at the 1965 British Nationals. Whilst the electronic development has, we understand, since that time undergone no significant change, the presentation of the cases and production methods have now just been finalised.

From the start, the designers intended that the equipment would be a rival to the well established imported equipment. Without making any direct comparison, it would appear that a great deal of care and thought has gone into this new equipment. Certainly this presentation of the equipment shows very well. The initial trial batches of equipment were in coloured anodising on aluminium, two piece folded cases for the multi equipment and Hammertone paint finishes on the single channel equipment.

The cases are now to be produced in high gloss black anodised aluminium. We saw a sample of a new case which gives the final quality touch to a piece of advanced electronic production.

Further examination of the equipment shows that a high standard of workmanship is apparent in the construction of the circuit board and the choice of components indicates that nothing has been left to chance in respect of stability and safety. It will be noticed from the test figures that the current consumption of the transmitter is quite high. One cannot have high output otherwise and the apparent radiated power of both multi and single transmitters should be adequate to reduce the chances of distant interference quite effectively.

The Tx. employs 7 slicon epitaxial plana transistors. The P.A. stage uses a single high voltage transistor which is allowed to pass almost double the power when tone is transmitted.

The tone oscillators use vacuum impregnated ferrite core transformers and voltage is Zenner stabilised.

Transmitter Physical Data

Size

8 in. high x 6¼ in. wide x 3½ in. deep + ¾ in. lever projection.

Aerial

Chrome plated telescopic 10 section 41 in. long, retracted ¾ in.

Weight

2 lb. 9 oz. plus 17 oz. with two VT1 or PP1 batteries.

Keying switch travel

$\frac{3}{16}$ in. each side of neutral to make $\frac{3}{16}$ in. total travel each side of neutral.

Pressure required to make: 2.25 oz. Total pressure for full travel: 9 oz.

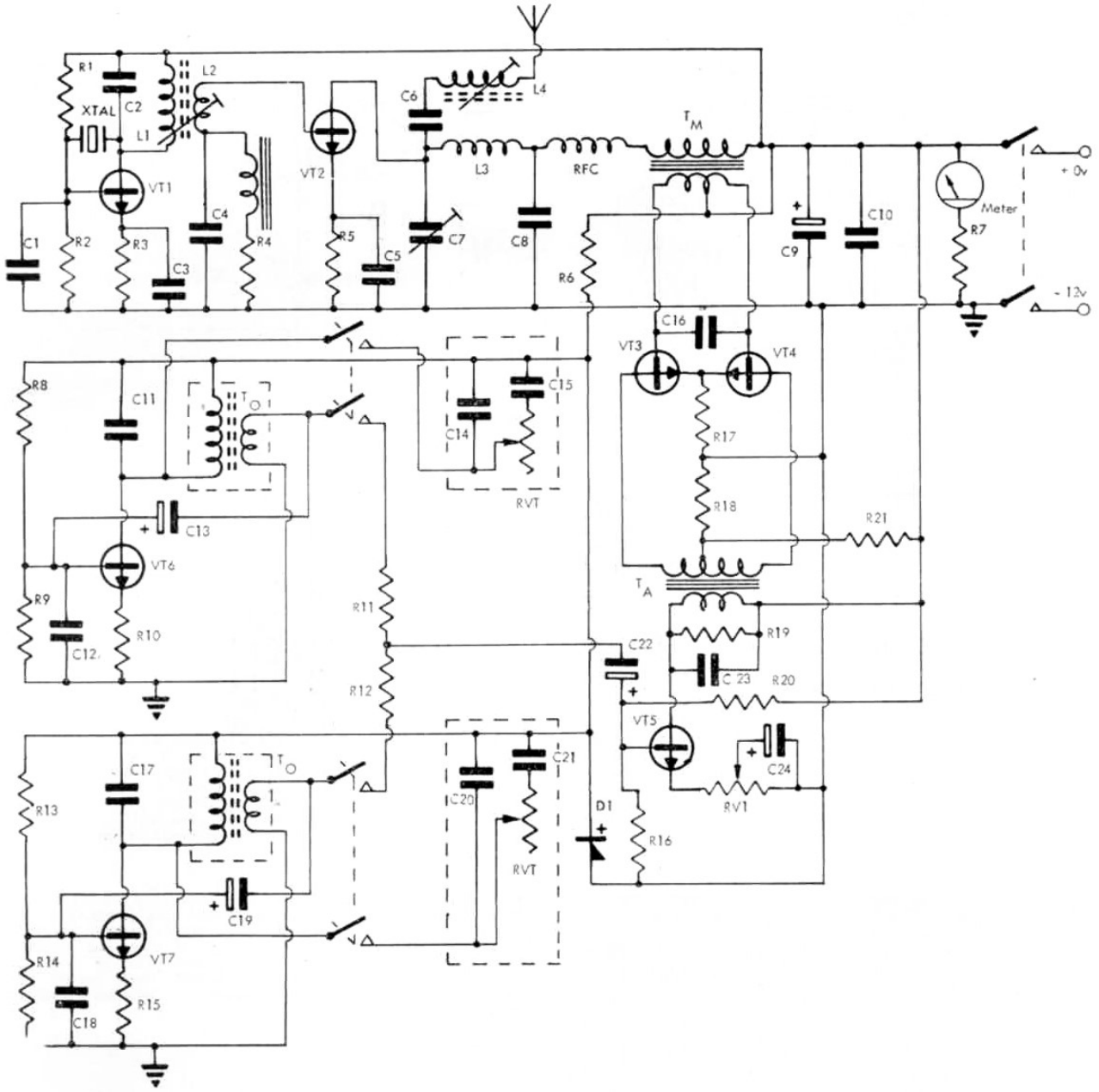
Materials

Case; 18 s.w.g. hard aluminium polished and anodised black. The circuit board $\frac{3}{32}$ in. glass epoxy laminate mounted with the copper side towards the front of the case. Lands are rectangular, maximum copper system and components placed neatly in a horizontal layout. Sealed type tone adjustment pots are used and are positioned appropriately to the control keys, although not identified on the board. The land side of the board is coated with anti-humidity varnish and the Bulgin lever switches are mounted directly to the front of the case with flying lead connections to the p.c. board.

A battery state meter of the edgewise type is incorporated in the front panel, the red mark thereon indicating voltage of approximately 8 volts; the figure at which the 12 volt supply should be changed.

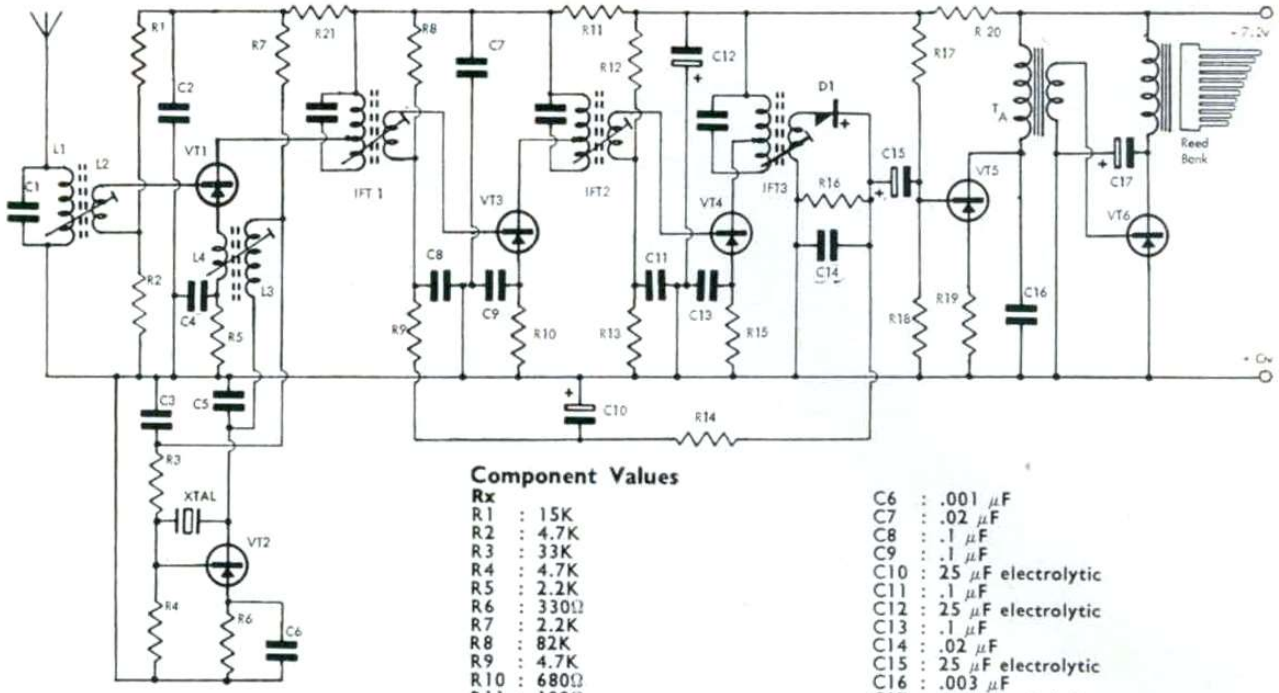
The makers recommend a DEAC 500 DKZ pack although the 12v. supply from 2 VT1 or PP1 batteries is considered adequate for normal operation. The DEACs will supply sufficient current for 3 hours continuous operation on carrier and two hours on continuous **tone.** No charging socket has been provided in the standard transmitter so it is presumed that the majority of users will install dry batteries.

The aerial is led through a large shrouded grommet in the top of the case, which also serves as a waterproofing device. The lower end of the aerial screws into a polypropylene block behind, and fixed to, the front face of the case. Foam plastic pads prevent movement of the batteries. A double pole on/off switch braks both battery connections so that those users fitting DEAC cells, have the battery completely isolated when in the "off" position.



RAVEN ELECTRONICS 10 CHANNEL TX. CIRCUIT VALUES

R1 : 10K
R2 : 1K
R3 : 100Ω
R4 : 100Ω
R5 : 10Ω
R6 : 150Ω
R7 : 39K
R8 : 15K
R9 : 5.6K
R10 : 100Ω
R11 : 1K
R12 : 1K
R13 : 15K
R14 : 5.6K
R15 : 100Ω
R16 : 2.7K
R17 : 4.7Ω
R18 : 100Ω
R19 : 4.7K
R20 : 4.7K
R21 : 2.2K
C1 : 30pf
C2 : 15 pf.
C3 : .001 μF
C4 : .001 μF
C5 : .001 μF
C6 : .001 μF
C7 : 3.30 pf
C8 : .001 μF
C9 : 125 μF electrolytic.
C10 : .001 μF
C11 : To suit tone
C12 : .001 μF
C13 : 10 μF electrolytic.
C14 : To suit tone
C15 : To suit tone
C16 : .22 μF
C17 : To suit tone
C18 : .001 μF
C19 : 10 μF electrolytic.
C20 : To suit tone
C21 : To suit tone
C22 : 10 μF electrolytic.
C23 : .047 μF
C24 : 10 μf
D1 : Zenner Diode
VT1 : R.E.1
VT2 : R.E.2
VT3 : R.E.1
VT4 : R.E.1
VT5 : R.E.3
VT6 : R.E.3
VT7 : R.E.3
L1 : 18 turns 28 s.w.g., e.c.w.
L2 : 3 turns 28 s.w.g., e.c.w.
L3 : 10 turns 16 s.w.g., e.c.w.
L4 : 9 turns 22 s.w.g. e.c.w.
RFC : 25 mH
RVT : To suit tone
RV1 : 1K variable
TO : Raven Electronics
TM : Raven Electronics
TA : Raven Electronics

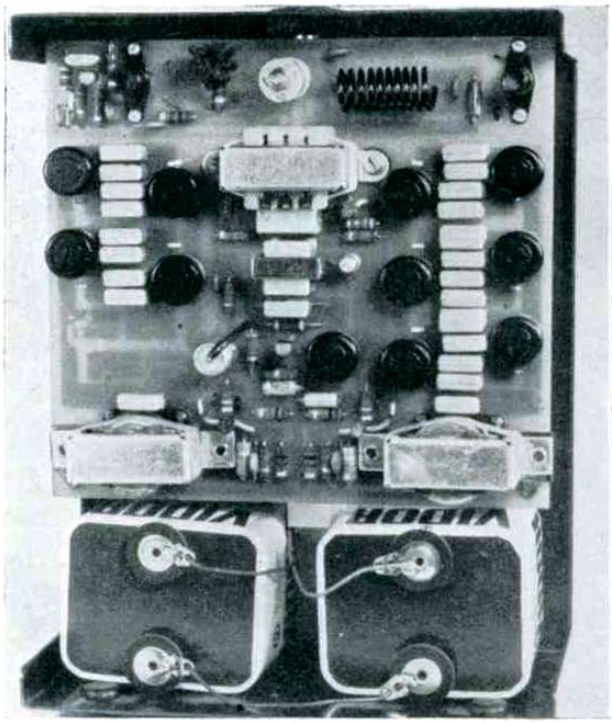


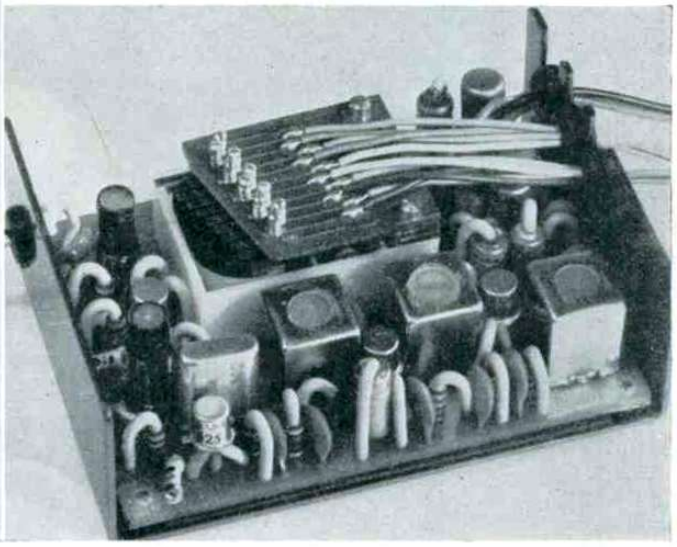
RAVEN ELECTRONICS 10 CHANNEL RECEIVER CIRCUIT

Component Values

Rx

R1 : 15K
R2 : 4.7K
R3 : 33K
R4 : 4.7K
R5 : 2.2K
R6 : 330Ω
R7 : 2.2K
R8 : 82K
R9 : 4.7K
R10 : 680Ω
R11 : 100Ω
R12 : 18K
R13 : 4.7K
R14 : 3.3K
R15 : 220Ω
R16 : 2.2K
R17 : 47K
R18 : 2.2K
R19 : 220Ω
R20 : 220Ω
R21 : 220Ω
C1 : 30 pf
C2 : .02 μF
C3 : .02 μF
C4 : .001 μF
C5 : 22pf
C6 : .001 μF
C7 : .02 μF
C8 : .1 μF
C9 : .1 μF
C10 : 25 μF electrolytic
C11 : .1 μF
C12 : 25 μF electrolytic
C13 : .1 μF
C14 : .02 μF
C15 : 25 μF electrolytic
C16 : .003 μF
C17 : 4 μF electrolytic
D1 : OA90
VT1 : 2G415
VT2 : 2G415
VT3 : 2G415
VT4 : 2G415
VT5 : 2G301
VT6 : 2G382
L1 : 15T 28 s.w.g. e.c.w.
L2 : 3T 28 s.w.g. e.c.w.
L3 : 18 T 28 s.w.g. e.c.w.
L4 : 1T 28 s.w.g. e.c.w.
TA : Ardente D1001
Reed Bank : 40Ω Deans 10
IFT's: To Raven specifications





Left: Rear shot of the transmitter with back removed shows the three special Raven transformers and neat grouping of components. The crystal is soldered in. This also applies to the superhet shown below . . . like a number of other outfits not so convenient for changing from spot to spot. The Rx neatly laid out and exposed components leads sleeved. These constructional remarks also apply to the Super-regen version illustrated opposite.

Test Figures

Currents

The test was conducted with two 6v. dry batteries in series (VT1 or PP1 types). Aerial up, carrier 82 mA.

tone 96 mA (bi-simultaneous)
tone 100 mA (one tone)

Aerial retracted, carrier 110 mA.

tone 112.5 (bi-simultaneous)
tone 113 mA (one tone)

Waveform

The waveform is a chopped sine, and the display shows an increase of envelope of 50 per cent over carrier level on either single or bi-simultaneous tone operation.

Voltage Stability

The batteries were allowed to run down to 8v. with no loss of reed response in the receiver. It was first not necessary to adjust the tone frequency pots during this experiment. When voltage fell below 8v., tone was not continuous so it may be concluded that this voltage figure represents a minimum working level to be tolerated.

Estimated Output

The most noticeable feature of the transmitter is the increase in the output with tone. This does not necessarily show up on a field strength meter, as it will be appreciated that modulation reduces the duration of a signal, even though the amplitude may be increased.

Temperature Stability

This will be dealt with under the complete equipment test.

Superhet Rx.

The superhet receiver, at first sight, seems to contain fewer than normal number of components, however, these are particularly small and the layout is not cramped. The 18 s.w.g. aluminium case chassis seems adequately strong and the circuit is built on a $\frac{3}{32}$ in. glass epoxy board. There is provision for further connections to suit the power input cables for a complete set of 5 Bonner Transmitter type servos. As supplied, the superhet has a Deans reed-bank with colour coded pairs of cables for the bias connections of each servo. The tones are arranged so that each third reed operates the same servo. In other words should two adjacent reeds operate together then the relayless servo, if of the older type, is less likely to be damaged.

The six transistor circuit has three I.F. transformers and the aerial and oscillator coils are both sealed with wax in addition to the I.F. adjustment slugs.

Physical Data

Size

Length $2\frac{7}{8}$ in.
Width $2\frac{1}{8}$ in.
Depth 1 in.

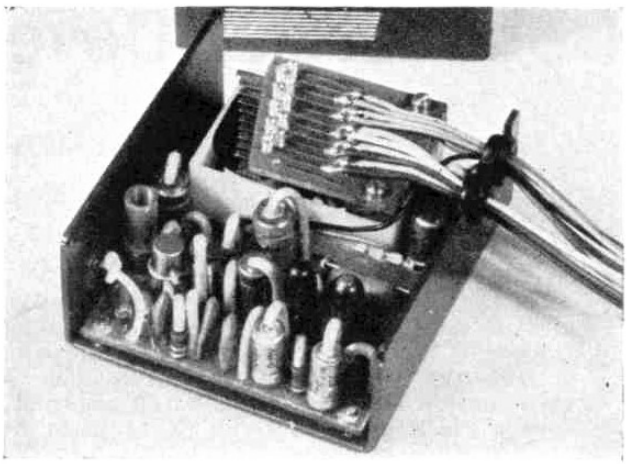
Weight

3.45 oz.

Harness length: 10 in. comprising two sets 5 pairs colour coded bias wires for servo connections, one set three (pos. neg. and separate reed bank comb bias connection).

Aerial: 30 in. long (no colour coding reference as to spot frequency).

Case material 18 s.w.g. hard aluminium chassis, 20 s.w.g. aluminium cover. Both anodised high gloss black with white silk screen legend. Receiver board secured with 4 P.K. screws at corners, no spacers, insulating plate between lands and case. There is $\frac{1}{8}$ in. clearance between top of reed contact screws



and case, approximately $\frac{5}{16}$ in. clearance between other components and top of case to allow case to "give" without damaging components in the event of a severe crash. Underside of p.c. board coated with anti-humidity varnish.

Test Figures

Currents

Common 7.2v. input from DEAC pack.
No signal 7 mA.
Carrier 6 mA.
Tone 70 mA.

A.F. Range

Lowest tone 350 c.p.s.
380 c.p.s.
415 c.p.s.
440 c.p.s.
480 c.p.s.
510 c.p.s.
535 c.p.s.
590 c.p.s.
610 c.p.s.
640 c.p.s. (highest)

Sensitivity

The sensitivity seems to be better than 1 microvolt using our standard method of test.

Voltage Stability

Receiver continued to respond to the Tx. down to 3.2v. input, but at a much lower method of sensitivity.

Interference Check

A worn Mighty Midget motor was brought into contact with the aerial, there was no effect produced by this procedure even with the Tx. carrier off.

Combined Test

Temperature Stability

The equipment was cooled to approximately 32 deg. F. and heated to 120 deg. F. and continued to function.

Range Check

With servos connected and the Rx. mounted on a board placed on the ground with aerial horizontal to Tx., Tx. normally held with aerial parallel to Rx aerial, a range of 1,350 yards was obtained before simultaneous operation was lost. A maximum range of 1,500 yards was achieved. (Cold, rainy conditions).

Comments.

No tuning of the tones was necessary as received. The output of the Tx. appears to be the highest so far tested.

(continued on page 99)

Test—*Continued from Page 93*

Super-regen 10 Rx.

Using the same Tx. the test was conducted on the super-regen version of the receiver. The super-regen is a compact little device using the same reedbank and a four transistor, one transformer circuit. Construction is similar to the superhet and the same high standard of workmanship is evident. The receiver is as small as some earlier single channel super-regens and is rather lighter in weight than the superhet. It should make a good alternative receiver for those modellers who are lone hands or fly in clubs with a small number of radio enthusiasts where waiting for air time is not such a lengthy business. The receiver naturally has a rather lower sensitivity than the superhet but this appears to be adequate for normal use.

Physical Data

Size $1\frac{15}{16}$ x 2 in. x 1 in. deep. 18 s.w.g. hard aluminium chassis 22 s.w.g. aluminium cover. Finished polished anodised black. Harness 7 in. long, two bundles of servo bias wires, separate reed comb connection and + and − supply. Aerial 30 in. long. Single tuning adjustment accessible through top of case.

Weight

2.1 oz.

Test Figures

Currents (7.2v. DEAC supply)
No signal 10 mA
Carrier 3.9 mA
Tone 29—40 mA

Sensitivity

6 microvolts

Voltage Stability

The receiver operated down to 3.6v with reduced sensitivity.

Interference

A worn Mighty Midget motor was brought into contact with the aerial, this procedure produced no apparent effect even with the Tx. carrier off.

Temperature Stability

The receiver continued to operate at temperatures between 32 deg. F and 120 dg. F.

Range Check

This was conducted with the multi Tx. in a similar manner to the Superhet. A ground range of 604 yards simultaneous operation and 760 yards total range was obtained.

Summary

The Multi Equipment

We have only two adverse comments both in respect of the multi transmitter.

1. This comment may be applied to other transmitters and we feel sure that if manufacturers got together they could persuade suppliers of lever switches for multi transmitters to make a special soft action keying switch. The spring rate of many we have tested is a little high and the action consequently feels rather less comfortable than those on some of the American transmitters. The switches used on the Raven equipment are Bulgin type 01367 which from examination would appear to be easily modified by use of a different spring material . . . How about it British manufacturers, we are sure a few extra shillings on each lever switch would be well worth a slight price increase for the competition modellers. We are sure there are sufficient switches now used in British multi equipment to interest the supplier in a sensible batch numbers of "specials".

2. The second point concerns the protection of the output transistor which, equipped with a weighty heat sink, fractured a lead possibly due to vibration, but a spacer below the transistor would have obviated this.

In all other respects the equipment can be classed as a quality job for a relatively economical price. The performance shows well and the manufacturer has the confidence to place a 2 year guarantee on the equipment.

Instruction booklets issued with the equipment gives wiring instructions in addition to the installation details and specification.

Manufacturer

Raven Electronics, 5, Meadow Close, High Lane, Near Stockport.

Prices

10 channel Tx. and Superhet	£72 0s. 0d.
10 channel Tx. and Super-regen Rx.	£61 0s. 0d.
(Six channel versions also available)	
Superhet version	£57 0s. 0d.
Super-regen version	£45 15s. 0d.
Non simultaneous 6 channel superhet version	£57 0s. 0d.
Super-regen version	£45 15s. 0d.