



QUANTUM '70

New super selective receiver for the Quantum Six

WHILST the only piece of technical test equipment required to build either transmitter or receiver is a volt meter, it is essential that the constructor does use a good quality soldering iron, with a 3/32in. dia. bit and, in the case of the receiver, uses a small pair (4in.) side cutters, preferably those with a cutting edge which is flush with the outer side of the cutter. The comments given in the transmitter section regarding soldering, are especially applicable here; since, by necessity, the layout of components is compact. However, the printed circuit pattern is such that, with a little care, no trouble should be experienced. It is relevant, at this point, to confirm that all Remcon supplied printed circuits are pre-fluxed and, therefore, require no preparation before use. Neither is the use of any other flux permissible, since cored solder is supplied and this type of solder must be used.

It will be seen by careful study of the photographs that it is very important for the constructor to ensure that he checks at every stage that he has (a) inserted the correct component in the correct position and (b) he double checks that it is sitting correctly on the board in regard to closeness and squareness.

The circuit

It will be noticed that this latest circuit of the Remcon receiver employs a double front end tuning together with a separate crystal oscillator with AGC being applied to first two stages. The whole design of R.F. section has been employed in order to prevent adjacent channel interference as well as interference from paging systems and similar transmissions operating both on the image frequency as well as within

the 27MHz band. The remainder of the circuit, pulse amplifier, Schmitt trigger, pulse omission detector and decoder are identical with our previous circuits which we have found to give extremely reliable and repeatable performance.

Construction

Please read these instructions completely through before commencing building, and study the photographs and diagrams carefully. Whilst there are many orders of assembly we have found it simplest to fit the crystal and I.F.T's (T.1, 2 and 3) first, noting that each of these components must be pushed right home, so that their bases sit tightly on the p.c.

After fitting these four components, VT.1, 2, 3 and 4, are next fitted.

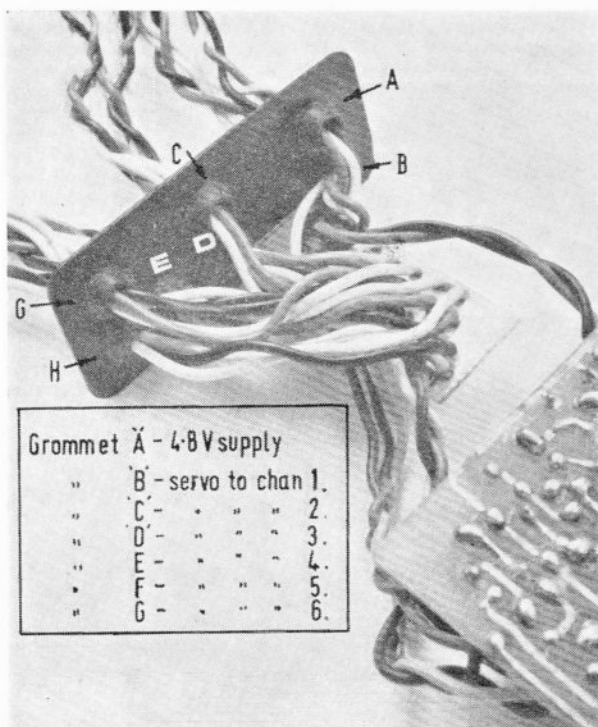
Construction may proceed in any order, but we suggest numerical order of components is followed to prevent any being forgotten.

Set out below are points to which the constructor's attention is particularly drawn.

A. If a particular area appears "tight"—i.e. congested with components, we suggest these components be first inserted without soldering, to ensure that there are the correct clearances between wire end and metal cans, etc., then solder them in place.

B. To avoid problems of identification Capacitor C2 is supplied with L3 (they are matched) in Pack Q9. C5 is supplied with the semiconductors in Pack Q11. C3 and C4 are identical and supplied with C9 in Pack Q10.

C. Whilst it is normally recommended that the wire is turned close but not tight to the upper body end of a component, it is asked that a loop about



Grommet A - 4-BV supply
 " B - servo to chan 1.
 " C - " " " 2.
 " D - " " " 3.
 " E - " " " 4.
 " F - " " " 5.
 " G - " " " 6.

Fig. 16 (above). Wiring to sub p.c., showing which plait goes through which hole. Wire up only for those channels to which you intend to connect servos to avoid short circuits.

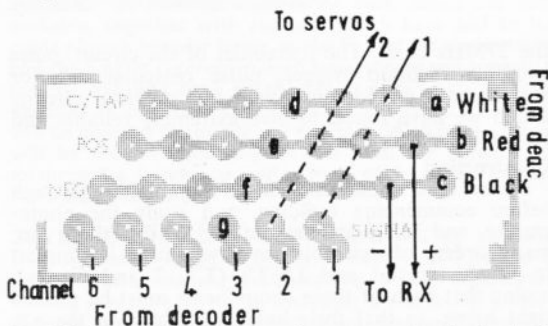
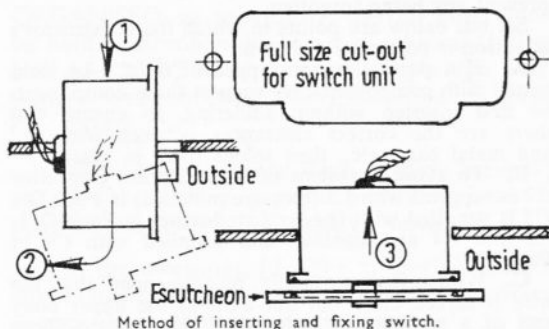
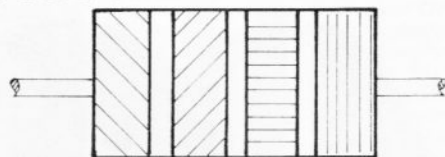


Fig. 18b (above) shows wiring of connector sub printed circuit viewed from copper side. Note how servo output wires (typically holes d, e, f and g) lie obliquely across the board, careful laying of wires will avoid bunching. Please adhere to the layout given. Scale approximately 2½ times life size.



Method of inserting and fixing switch.

Rx COMPONENT SCHEDULE



Resistors		Orange	Orange	Orange	Silver
R.1	33K	Orange	Orange	Orange	Silver
R.2	10K	Brown	Black	Orange	Silver
R.3	1K	Brown	Black	Red	Silver
R.4	2.2K	Red	Red	Red	Silver
R.5	1K	Brown	Black	Red	Silver
R.6	18K	Brown	Grey	Orange	Silver
R.7	470 ohm	Yellow	Violet	Brown	Silver
R.8	4.7K	Yellow	Violet	Red	Silver
R.9	8.2K	Grey	Red	Red	Silver
R.10	1K	Brown	Black	Red	Silver
R.11	6.8K	Blue	Grey	Red	Silver
R.12	4.7K	Yellow	Violet	Red	Silver
R.13	220 ohm	Red	Red	Brown	Silver
R.14	4.7K	Yellow	Violet	Red	Silver
R.15	220K	Red	Red	Yellow	Silver
R.16	47K	Yellow	Violet	Orange	Silver
R.17	10 ohm	Brown	Black	Black	Silver
R.18	10K	Brown	Black	Orange	Silver
R.19	22K	Red	Red	Orange	Silver
R.20	220 ohm	Red	Red	Brown	Silver
R.21	2.7K	Red	Violet	Red	Silver
R.22	68K	Blue	Grey	Orange	Silver
R.23	1K	Brown	Black	Red	Silver
R.24	100 ohm	Brown	Black	Brown	Silver
R.25					
R.26					
R.27	2.7K	Red	Violet	Red	Silver
R.28					
R.29					
R.30					
R.31					
R.32					
R.33	1K	Brown	Black	Red	Silver
R.34					
R.35					

Capacitors		As shown on page 21 style.	Style
C.1	.047 or .05µf		B
C.2	18pf (supplied with L3 in Q9)		F
C.3	47pf		F
C.4	47pf		F
C.5	2.2pf (supplied in Q11)		F
C.6	.047 or .05µf		B
C.7	32-50µf	E or	D
C.8	.01µf (10K)		F
C.9	.002µf		F
C.10	.01µf		B
C.11	2.5µf		B
C.12	.1µf		B
C.13	.1µf		B
C.14	.033µf (33K)		B
C.15	5-10µf	E or	D
C.16	.047 or .05µf		B
C.17	.047 or .05µf		B
C.18	5-10µf	E or	D
C.19	.001µf (1K)		B
C.20	.005µf (4.7K)		B
C.21	.1µf		B
C.22			
C.23			
C.24	.01µf		B
C.25			
C.26			
C.27			
C.28	.047 or .05µf		B

Semiconductors			
VT1, 5 and 6	2N4286		U
VT2, 3 and 4	SF115		U
VT7, and 8	2N4288		U
D1	OA47		N
D2 to D9	BAX13		P
S1 to S6	BRY39		V

Inductances		
L1	— 9½ turns 28g.	
L2	— 9½ turns + 2½ turns 28g.	
L3	— 10µH (C2 18pf)	
T1	— Yellow IF	} 1 pin is removed see p.c. layout
T2	— White IF	
T3	— Black IF	
Xtal	— Lower frequency of matched pair.	
AE	— 39 inches of stranded insulated wire, colour as frequency.	

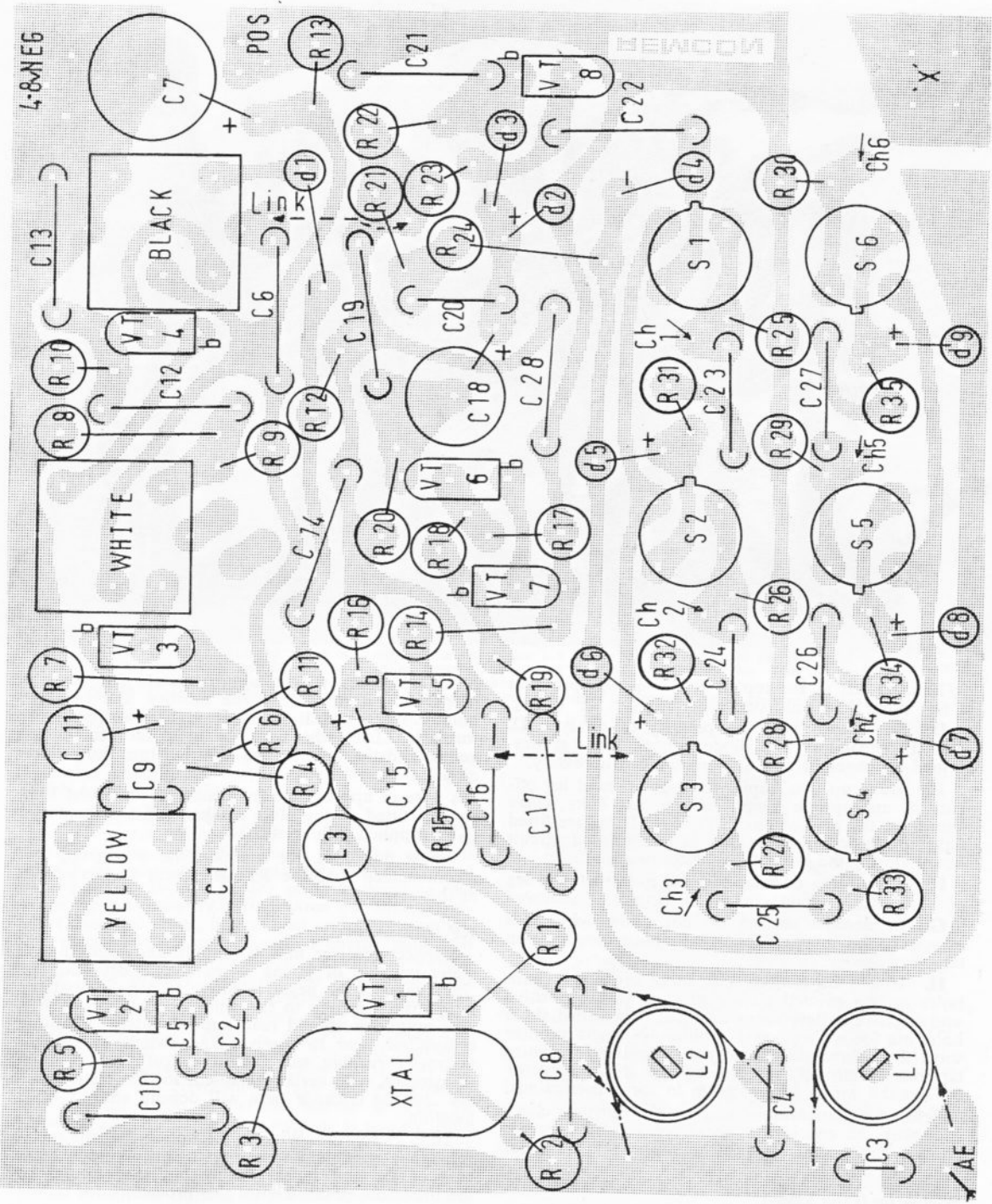
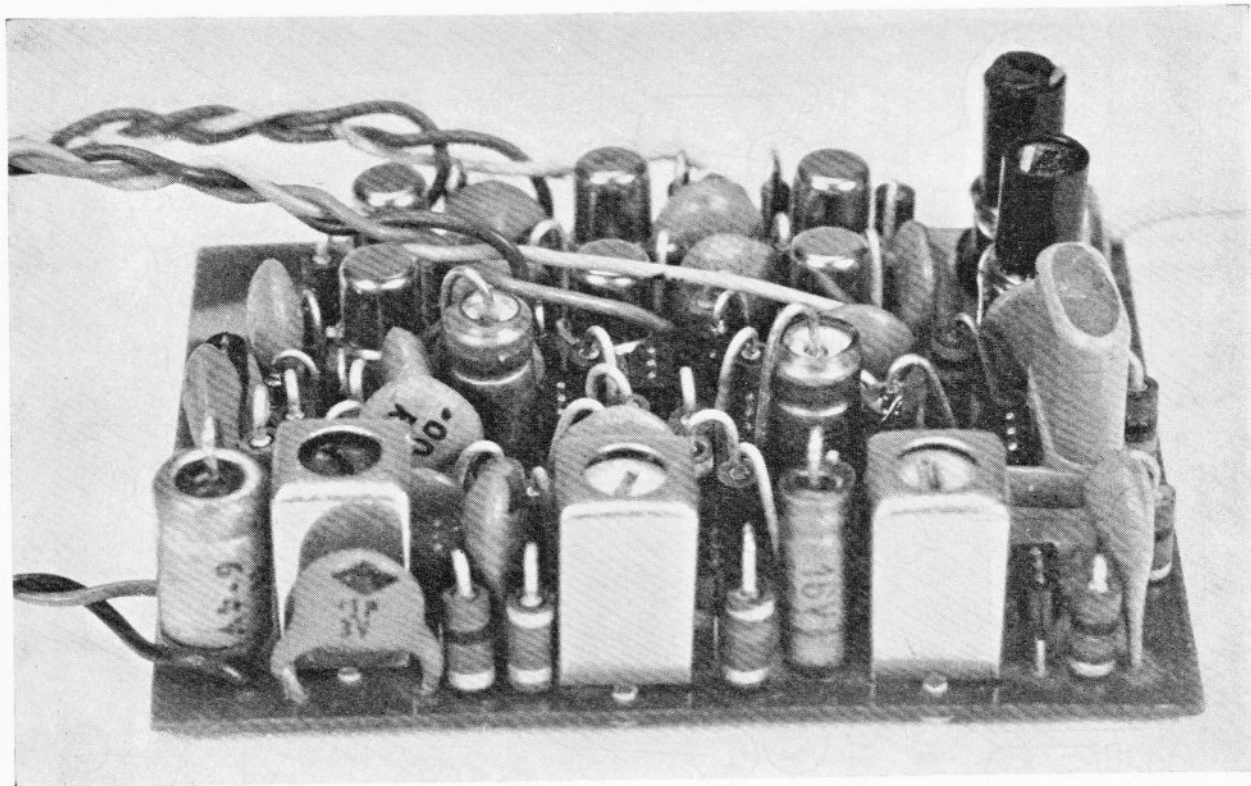


Fig. 18a. Printed circuit component placement. Study in conjunction with Fig. 18b. Note no plugs and sockets are intended to be used in connecting servos, since these are clip mounted. Note also polarities of components where stated; they refer to the upper wire end.



3/32in. be left at the top of R.7 since this provides a test point (the only one required) for RF tuning.

D. Be sure to note the polarity of all type D. and 'E' capacitors and diodes, check them as described on pages 21 and 6 respectively if necessary.

E. Make up two staples from component leg off-cuts of appropriate length to serve as links where shown on the printed circuit lay-out. These are fitted tight to the component side of the printed circuit board, during the early stages of construction.

F. In building decoder section, note that one leg of each SCS (silicon controlled switch) is removed

G. In decoder section do not allow wire ends of resistors to touch SCS cans. Remove identification tabs if necessary.

H. It will be noticed that there are some spare holes on the printed circuit adjacent to the positive and negative battery wires, also pad X is drilled, these holes are for wiring power supplies to servos in other ways than those described, pad X being for centre tap, but we strongly recommend that the constructor follows the wiring system given in these instructions.

Before commencing wiring, thoroughly check your work to ensure that there are no dry joints or bridged lands, and that all components are clear from each other.

Wiring up (First Stage)

Note there are two wire sizes used. Flea weight (finest) inside Rx case, and heavy for all wiring external to Rx case. Wiring up is carried out in two stages, one in order to check RF. alignment and two, to complete wiring the decoder section. A red and

black wire, flea weight, approximately 2in. long, is prepared and fitted into the positive and negative holes respectively. It is essential, after stripping the insulation from the wire, to twist the strands together and tin them before insertion into the printed circuit.

A wire of appropriate frequency colour about 39in. long is fitted to the Hole marked AE for the aerial (wire supplied with crystals).

Whilst this does not complete the wiring up, it is recommended that the RF. alignment is carried out at this stage.

RF. Alignment

Connect receiver to 4.8v. supply and, using a volt meter capable of giving a reasonable deflection on .75v., connect the negative probe to negative battery, and positive probe to the wire loop on top of R.7. The voltmeter should read approximately .5v. Bring transmitter near to receiver and switch Tx on, the voltmeter reading will fall to almost zero, position transmitter, with aerial collapsed, so that meter reads say .3v. the distance here will depend entirely upon location.

Tune as follows. Wind in L1 noting that the meter falls to a minimum then rises again. Wind out the slug of L1 and repeat tuning but stop turning at the minimum point. Repeat this procedure for tuning L2 also.

Turn the cores of the yellow, white and black IF's in that order back and forth gently until each produces the lowest reading on the meter. Repeat once or twice. As the tuning of these five coils

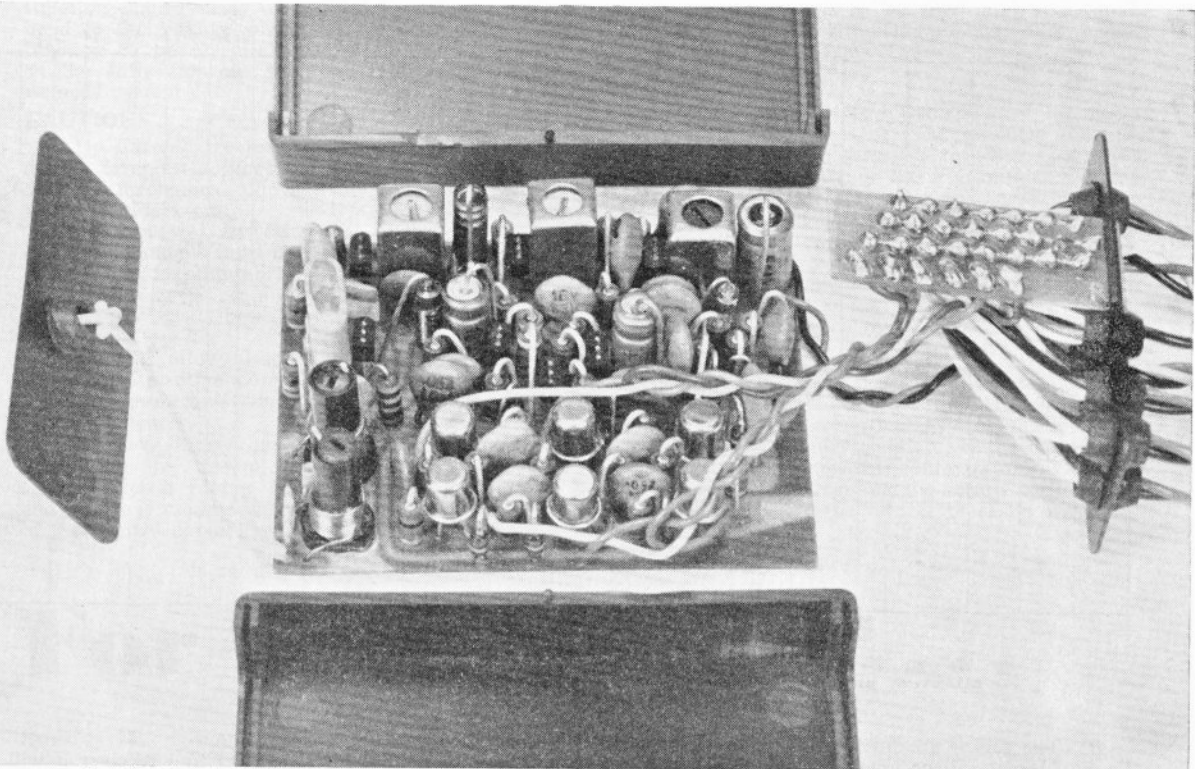


Fig. 17 (above). "Exploded" view of completed Rx. Note how sub p.c. is let into end panel (may be fixed with Araldite). Note also that Rx case is dowelled together. Note lead lengths of internal wiring. Tabs left on SCS for identification—should be removed.

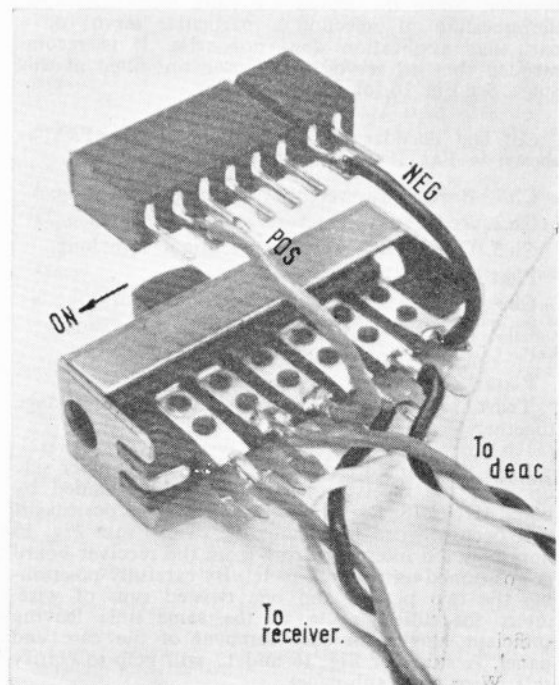
Fig. 20 (below). Wiring of charge socket and switch. In interests of uniformity please copy wiring exactly.

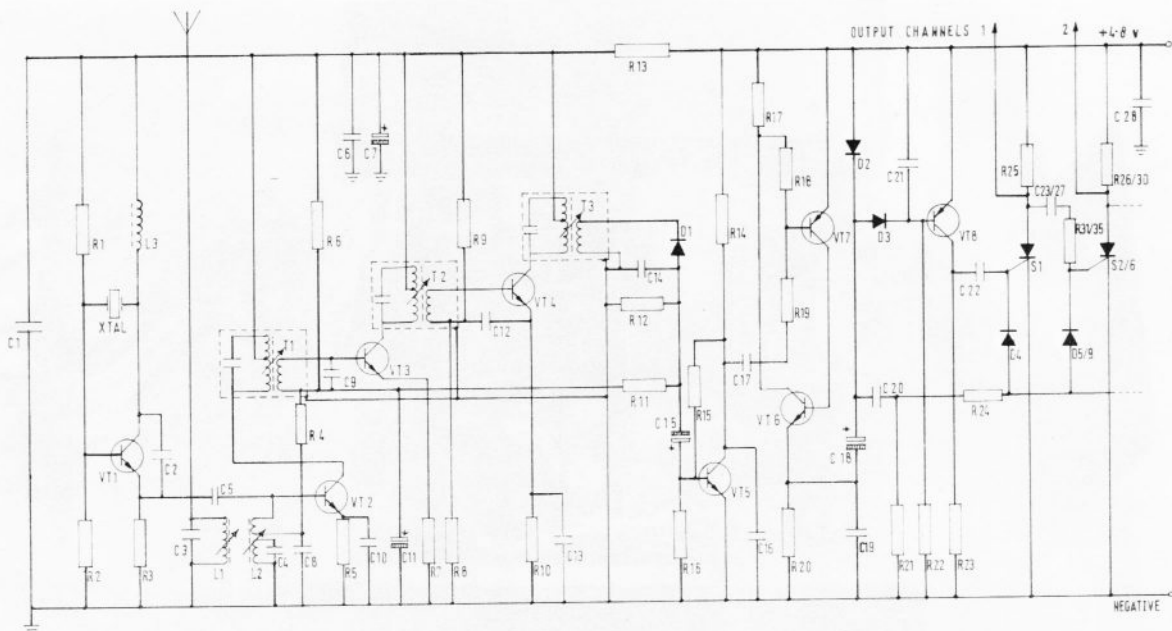
proceeds it may be necessary to take the transmitter further away after tuning L.1., and L.2. in order to have a reading on the meter to which to tune the three IFs. The IFs will not require more than ONE TURN to tune correctly.

Wiring up (Second Stage)

A. The main wiring of the sub-panel, i.e. battery wires, are now fitted. The length of these wires is dictated by your requirements; fit red, black and white wires (heavy gauge) for positive, negative and centre tap 4.8v. supply. Bring wires out through receiver case end panel, fit grommet and plait together, then insert through case of switch charge plug case grommet, and prepare ends for soldering to switch. Solder these three wires and three further wires as shown in Fig. 20 for Deac supply, bring the latter three through the same grommet, wire them to Deac in Deac case. The Deacs, 2 x 2.4v. 500DKZ, are series connected to give 4.8v. The link between positive and negative of the batteries is also the white, centre tap connection. Take two short wires and wire to Deac socket as shown in Fig. 20 Assemble switch charge plug case, it is a good idea to wire charge plug at this stage, so that polarities may be observed. Note that one pin from each end of the plug is removed.

N.B. It will be noticed that there are impressions in the various mouldings which serve as "knockouts" and these are easily removed by perforating with a scribe and finally pushing out when weakened, rectangular knockouts are best removed by carefully cutting with a sharp knife.





QUANTUM SIX MKII RECEIVER

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B. The servos are fitted in the positions indicated in Fig. 18b it will be noted that red, white and black wires pick up common battery supply, whilst the yellow wire is the signal input to the servo, and connects to the appropriate output channel from the decoder. Since the servos are fully interchangeable, the question of selecting a particular servo for a particular application does not arise. It is recommended that all servos to be used are fitted at this stage. See Fig. 16 for detail of wiring.

C. The decoder wiring is fitted to the P.C. as shown in Fig. 16 the colours being as follows:

- Ch.1. Brown flea weight wire about 3½ in. long.
- Ch.2. Red flea weight wire about 3½ in. long.
- Ch.3. Orange flea weight wire about 3½ in. long. Plait 1, 2 and 3 together.
- Ch.4. Yellow flea weight wire about 3½ in. long.
- Ch.5. Green flea weight wire about 3½ in. long.
- Ch.6. Blue flea weight wire about 3½ in. long. Plait 4, 5 and 6 together.

Twist red and black wires fitted in first stage together.

Hold the printed circuit sub-panel with copper side up over the receiver p.c. in the area bounded by black 1F., C 18, R5, 16 and 14. This is the position it will occupy when fitted into the case. From Fig. 16 note how the internal wiring from the receiver board is positioned on this sub-panel. By carefully positioning the two plaited and one twisted runs of wire, select the tidiest route, at the same time leaving sufficient length for easy removal of the case end panel. A study of Fig. 16 and 17 will help to clarify this. Wire up to sub-panel.

Final alignment.

Upon switching on transmitter and receiver it will probably be noticed that some servos may be slightly off centre, that is the cruciform of the centres of the holes in the output discs do not lie square with the axes of the servo case. To correct this the back of the transmitter is removed and the pre-set potentiometer for the channel to be centred is rotated. Ensure that the control stick trim control is set at centre.

It is recommended that the Deacs are charged up and the equipment given a field range check, before installing.

Rx. coil L1 tuning, should be checked in the location where the receiver is to be used.

Installation

Please remember that Quantum 6 is a precision proportional system, which will give resolution and accuracy as good as any system so far produced. Therefore, in order to achieve the benefits from this intrinsic value, installation and mechanical linkages must be of a similar high standard. Linkage arrangements must be such that they are free yet without backlash, hinges and other bearing points must be as frictionless as possible. Otherwise there will be a drag on the servo, against which the motor will be trying to balance, with the result that current is being drawn unnecessarily from the Deac. The main trouble spot here is engine control. Also, care should be taken that where a control terminates against a mechanical limit, e.g. engine control, arrangements are made so that the servo is not stalled when at the end of travel. Whilst no damage will be done to the electronics under these circumstances, the load imposed on the Deacs is greater than at any time during normal operation. This

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situation can so easily be avoided by forming a "U" bend in the linkage which will deflect to allow the function to be on mechanical stop, with the servo at the fully run out position, and drawing much reduced current.

CAUTIONS

1. Do not run the servo without either the output disc or lever fitted, since the servo could run past its designed mechanical stop and do irreparable damage to the feed back pot.

2. Do not wax or otherwise lock the cores of tuned components until the equipment has been field checked and preferably used initially, since if further tuning is required after locking, the components may easily be ruined in breaking the locking compound.

3. Do not allow decoder output wires to short out to any positive points on the receiver board as this will immediately write off the SCS and they cost 15/- each.

4. Do take every precaution in planning your installation to ensure that there is room for adequate foam rubber packing around the receiver and that it is mounted vertically with the copper side of the printed circuit facing the direction of travel.

5. If six servos are to be used and run simultaneously for any length of time, then it is recommended that Deac 1,000's be used.

Servicing

If constructors using Remcon's components wish to avail themselves of their servicing facilities please see that the equipment is returned adequately packed and, in the case of the transmitter, with the Deacs fully charged; for receiver and servos no Deac is to be sent. If you have fitted your own plugs and sockets and the suspect item is connected by these, then please remove them before returning the equipment. Please remember that, even in the U.K., parcels can take up to four days in each direction, thus a repair time of ten to fourteen days is normal.

Control stick configuration

As supplied the control sticks give a double self neutralising stick on the right with single self neutralising and positionable vertical axis on the left; this we consider an arbitrary standard. If the constructor desires, he can rearrange this configuration to suit his needs, simply by exchanging the return spring from one vertical axis for the ratchet piece on the other vertical axis.