RM

RADIO MODELLER

THE RADIO CONTROL MAGAZINE FOR EVERYDAY ENTHUSIASTS

MAKE IT — AND A HAPPY NEW YEAR — WITH REMCON

JAN. '69

3/6

From British Remcon — the DIGITAL PROPORTIONAL —

QUANTUM SIX

★ UNIQUE HI-SPEED CONSTRUCTION—BE FLYING IN 10 HOURS!

★ *Fully described in only TWO ISSUES !*

(receiver next month)

★ *No oscilloscope required*

Electronic design: Eric Hook
Mechanical design: Geoff Chapman

THE new Remcon Quantum-Six is, as the name implies, a six function digital proportional system, designed for easy home construction by any modeller of average ability. A full general specification appeared in the December 1968 RADIO MODELLER, so this month we can get straight on to the construction. However, just a word about the most vital contribution you can make to the success of this outfit—

Soldering

With good soldering your chances of first time success are virtually 100 per cent. Ninety-nine per cent of difficulties with electronic construction is due to soldering. Remcon use and recommend an Adamin 15 watt soldering iron with $\frac{3}{32}$in. bit. With the solder supplied in the kit (low melting temperature) it is easy to make a good joint every time. Remembering, the solder and the tip of the iron are both brought to the copper pad on the printed circuit simultaneously, and the solder allowed to run; the solder is then taken away and the iron held in position on the P.C. until the solder is seen to fillet with (wet) the leg of the component. A solder-test printed circuit is supplied and off cuts from component legs may be inserted in this so that the constructor may satisfy himself of the ability to solder before commencing actual construction. **Do not bend leads parallel to board.**

Construction of Transmitter

These instructions must be used at all times with close reference to the photographs and illustrations, the theoretical circuit is of academic interest only, and plays no part in the information required to build this equipment. Commence by identifying each component, noting carefully resistor type and colour codes, polarities of certain capacitors, and all diodes, also pin configuration of all transistors—see Fig. 2, 2a and 2b. Whilst at the time of writing the values of components and their markings are as stated, there may be small changes in value, size and method of marking of some components, particularly capacitors, due to manufacturer's changes which occur from time to time.

The first operation is to assemble all the electronic hardware to the printed circuit, this may be done in any order, but the following points are worthy of note.

A. It is most important that care is taken to ensure that the components which are shown standing vertically are fitted and soldered truly vertical, i.e. solder one leg first, then square up component if necessary, then solder other leg or legs. Do not attempt to straighten up after soldering all legs since this can lead to severe stressing of the solder joints and thereby potential intermittent failure.

B. The solder tags fitted to the coils, are connected to the printed circuit via un-insulated solid conductors. (Transistor leg off-cuts are ideal—see Fig. 2.)

C. The two multi-vibrator timing capacitors (C12 and C13) have lead-out wires which may be eccentric to their bodies, therefore, they should be rotated upon insertion in their respective holes, to ensure they do not foul each other, nor cover up other component holes adjacent to their bodies. The same applies to C14-C22. ·047mfd.

D. All transistor legs should be pushed through the board, so that the body of the transistor is positioned $\frac{3}{16}$in. above the board. Solder the base pin first (marked with a "b" on diagram) and check that the transistor is square to the printed circuit board, then solder the two remaining legs.

E. Fit C9 (large size .005 mfd) after fitting VT.1, and leave standing on legs of sufficient length to clear VT.1 and adjacent components. At this point it is appropriate to mention that all components which stand on the board, are inserted so that their bodies sit flush with the board; disc capacitors should be fitted so that their bodies are approximately $\frac{3}{16}$in. above the board.

F. Fit the charging transformer last, positioning so that the coil former sits evenly on the board. Solder the five connections, selecting the appropriate voltage tapping and connecting to its respective mains track on the printed circuit track. After soldering, it is a good plan to lightly fillet the laminations and the copper side of the printed circuit with Araldite, to add to the support of this weighty component. Note that the dropper resistor Rd is omitted and replaced by an insulated wire on the copper side of the p.c., when the charging circuit is being used for charging both receiver and transmitter batteries simultaneously (normal use). If charger is to be used for transmitter batteries only, then Rd becomes 120 ohms $\frac{1}{4}$ watt.

Wiring up

After inserting all the components, the board should be thoroughly checked for suspect solder joints and solder bridges between lands. It will be noted

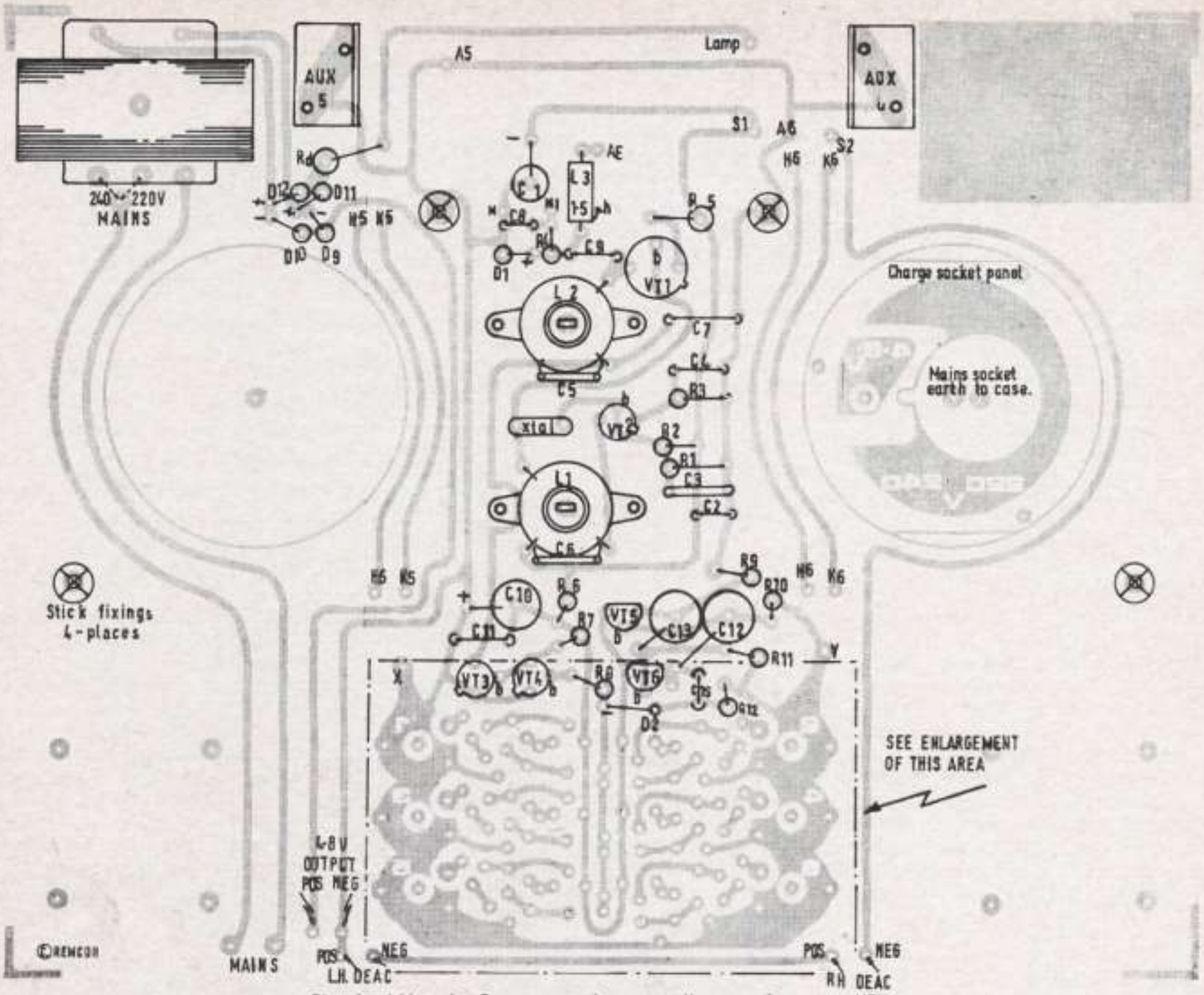
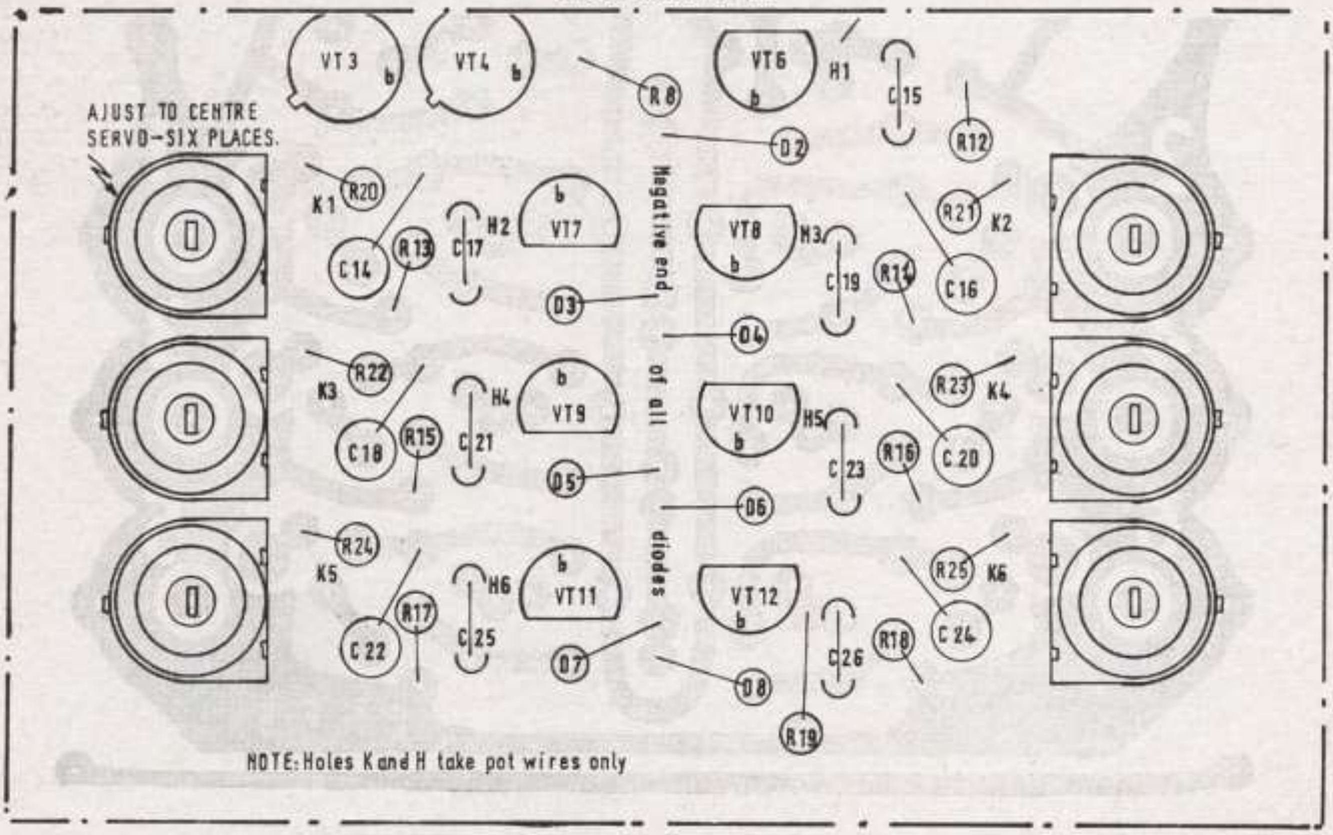


Fig. 1. (Above): Component placement diagram. See note "F" regarding Rd. Fig. 1a. (Below): Shows two times enlargement of encoder section of p.c.



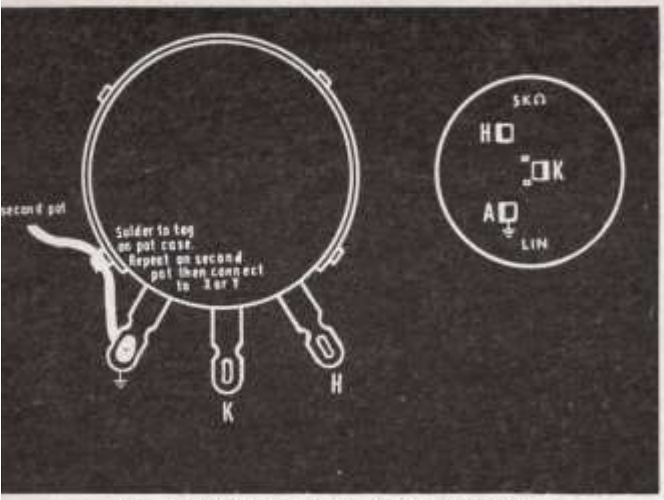
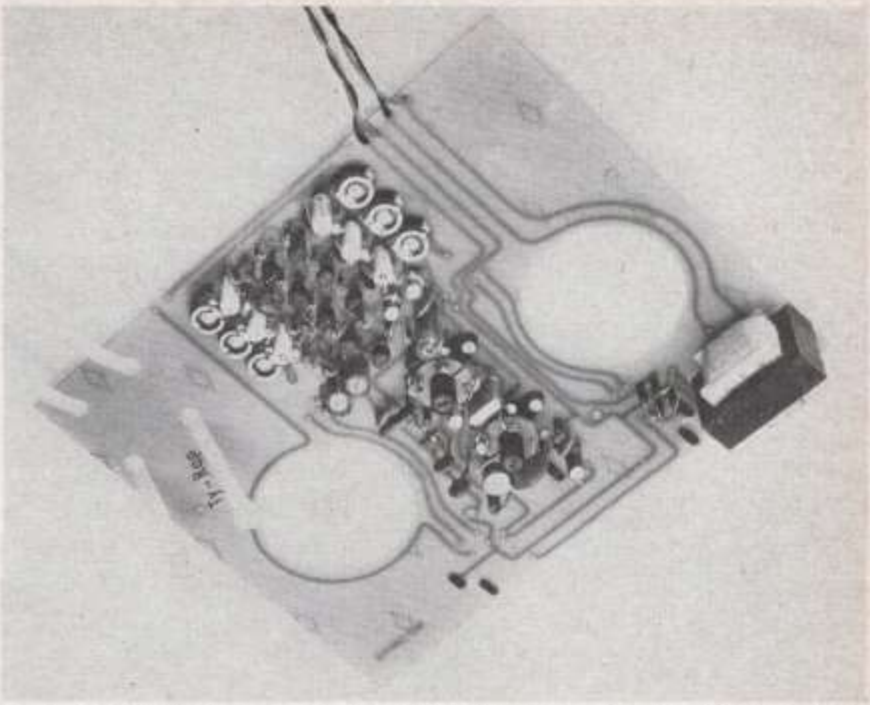


Fig. 3. (Above): Illustration of main control pot. wiring on left. That of auxiliary pot., wiring on right. See also Fig. 3a overleaf.



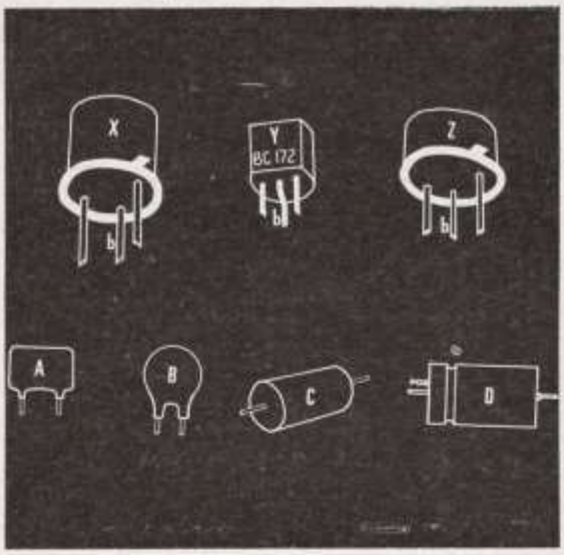
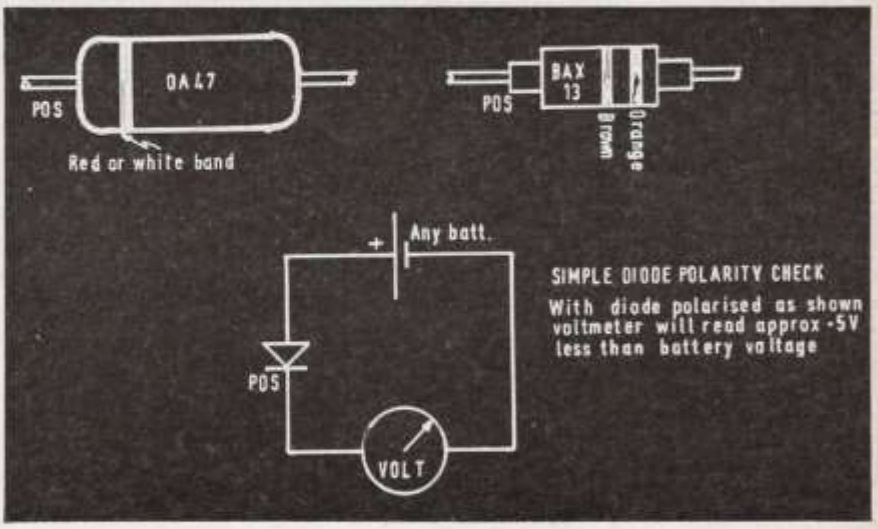


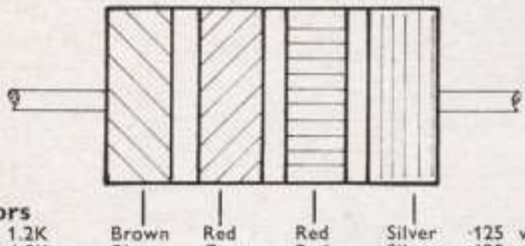
Fig. 2. (Above): Hardware fitted—note battery Ty-Raps shown for illustration only at this stage.

Fig. 2a. (Left): Sketches of transistors (VTs) and capacitor types with salient features exaggerated. Note positive end of type "D".

Fig. 2b. (Below): Diode polarites and check method using, say, 4.8v Deac.



Tx COMPONENT SCHEDULE



Resistors

R.1	1.2K	Brown	Red	Red	Silver	·125 watt
R.2	6·8K	Blue	Grey	Red	Silver	·125 watt
R.3	220 ohm	Red	Red	Brown	Silver	·125 watt
R.4	82K	Grey	Red	Orange	Silver	·125 watt
R.5	4·7 ohm	Yellow	Violet	Gold	Silver	·25 watt (large body)
R.6	220 ohm	Red	Red	Brown	Silver	·125 watt
R.7	2·2K	Red	Red	Red	Silver	·125 watt
R.8	33K	Orange	Orange	Orange	Silver	·125 watt
R.9	4·7K	Yellow	Violet	Red	Silver	·125 watt
R.10	150K	Brown	Green	Yellow	Gold	·25 watt
R.11	150K	Brown	Green	Yellow	Gold	·25 watt
R.12 R.13 R.14 R.15 R.16 R.17 R.18	33K	Orange	Orange	Orange	Silver	·125 watt
R.19	4·7K	Yellow	Violet	Red	Silver	·125 watt
R.20 R.21 R.22 R.23 R.24 R.25	150K	Brown	Green	Yellow	Gold	·25 watt

Rd. See Note 5
RV1-RV6 Stick Control Pots. 5K Pre-set Pots. 50K 6-off on p.c.

Capacitors

		Fig. 2A style
C1	10µf	D
C2	·01µf (10K)	B
C3	20pf	A
C4	·001µf	B
C5	33pf fitted to L1	A
C6	50pf fitted to L2	A
C7	·001µf	B
C8	·01 (10K)	B
C9	·005µf (large dia.)	B
C10	40 to 80µf	D
C11	·01µf (10K)	B
C12	·1µf±5%	C
C13	·1µf±5%	C
C14	·047µf± 5%	C
C16	"	C
C18	"	C
C20	"	C
C22	"	C
C24	"	C

C15	·005µf (M) close tol.	B
C17	"	B
C19	"	B
C21	"	B
C23	"	B
C25	"	B
C26	"	B

Semiconductors

VT1	2N2217		Z
VT2	BCY72		X
VT3	BCY72		X
VT4	BCY72		X
VT5	BC172		Y
to			
VT12	"	7-OFF	Y
D1	OA47		
D2 to D8	BAX13	7-OFF	
D9 to D12	ITT200	4-OFF	

Inductances
L1 fitted with 33 pf C5
L2 fitted with 50pf C6
L3 1·5µf choke (marked with value)

Xtal 3rd overtone on any of the six spots frequencies (highest value of pair)

Lamp 6v. ·06amp.

AE 48" long Telescopic

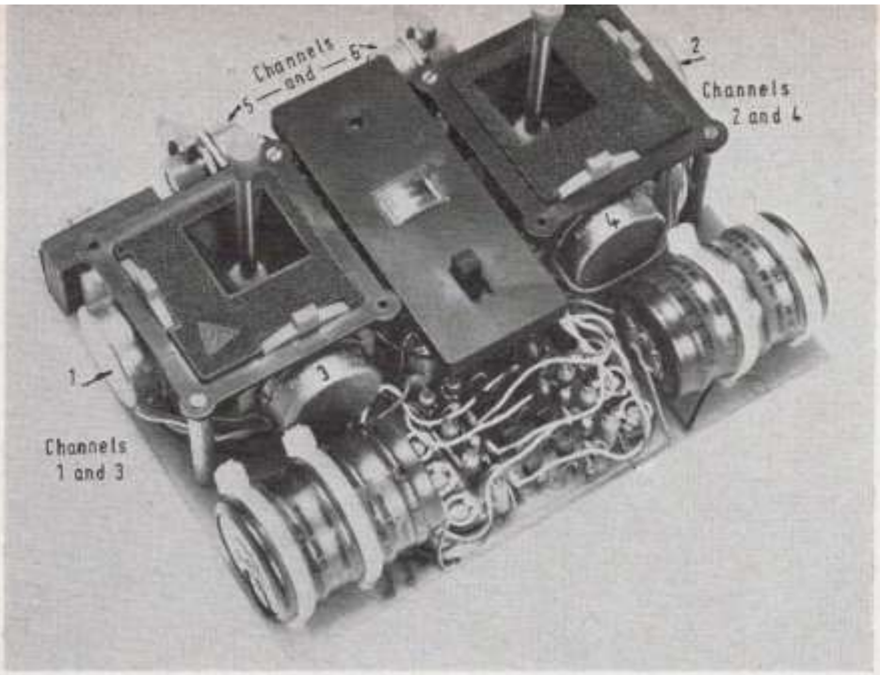


Fig. 3a. The completed uncased Tx. Note Channel numbers on pots. in picture.

Fig. 4. The L.A.M.S. panel showing wiring to p.c. panel. Note wiring from bulb casing to switch.

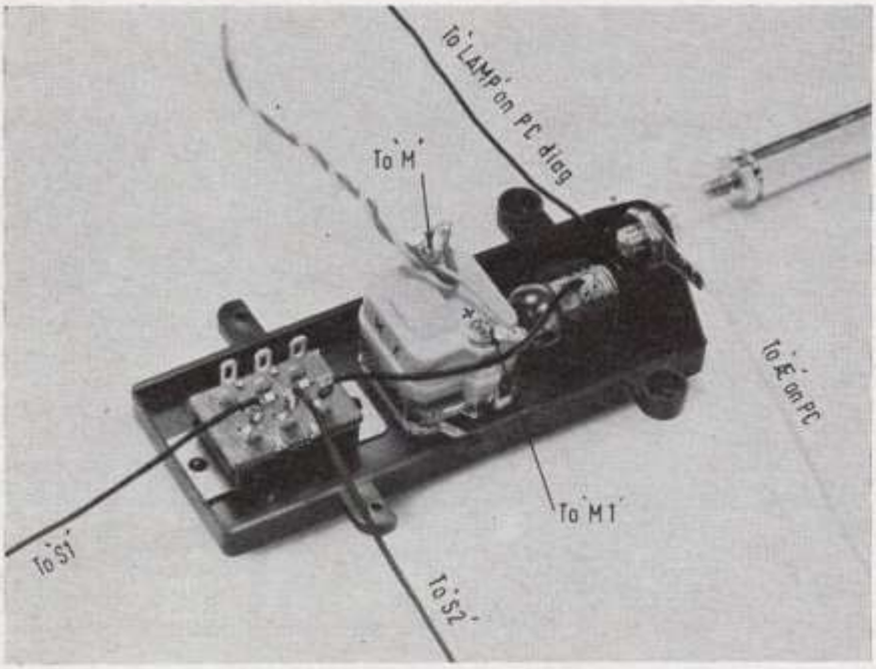
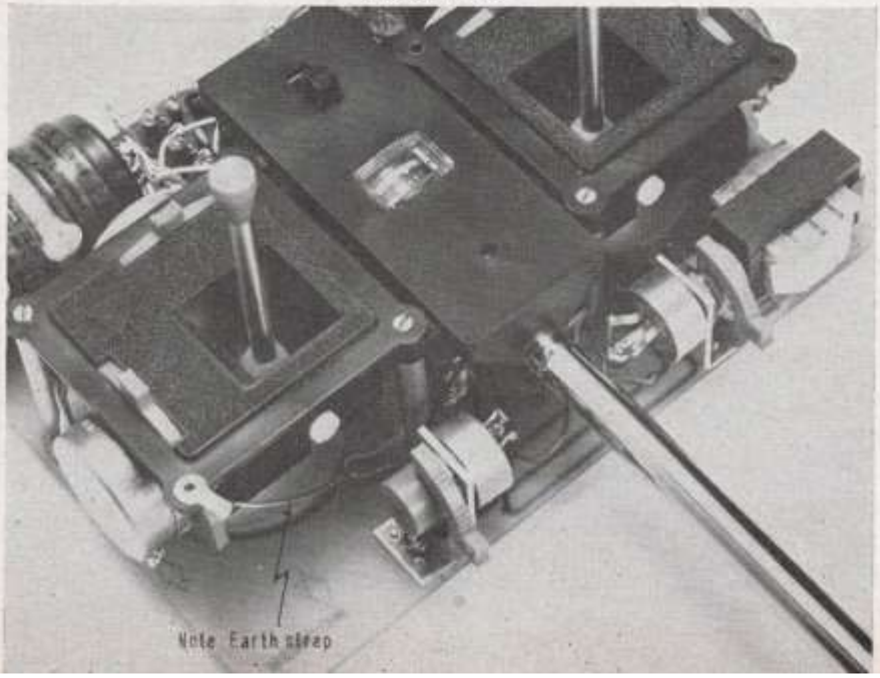


Fig. 5. View on top of Tx. Note R.F. earth strap and neutral positions of auxilliary control levers.



that a number of holes remain vacant; reference to the component placement diagram will identify each of these holes with a Code letter and this check should be carried out at this stage and all holes accounted for.

Whilst it does not make any theoretical difference which main control potentionometer controls which channel, for reasons of tidiness, the following system should be adhered to:—

Channels 2 and 4—Right hand stick.
Channels 1 and 3—Left hand stick.
Channel 5—Left hand auxilliary.
Channel 6—Right hand auxilliary.

Similarly the constructor is asked to make those main potentiometers whose spindles lie along the horizontal axis of the board, Channels 1 and 2 respectively—see Figs. 3 and 3a.

From the above it will be observed that the wiring of each pot. follows a similar pattern in that one tag goes to earth (sometimes via its adjacent pot.) the centre tag wire is colour coded for identification and goes to holes marked "K" on the printed circuit, whilst the other outer tag "H" always carries a white wire and goes to the hole on the p.c. marked "H", carrying the same suffix as hole "K". As an example, consider the left-hand main control pot. This operates Channel 1, its earth wire goes to the earth tag on the adjacent pot., on the same stick unit, its centre leg "K" is fitted with a brown wire and is twisted with a white wire from tag "H" and they go to holes "K.1." and "H.1." on the p.c. respectively. This pattern is repeated for all main control potentionometers, the two earth wires going to Hole "X" and "Y" for L.H. and R.H. sticks respectively. See Fig. 6. Similarly the auxilliary pots. are wired with colour coded wires but, in this instance, they are individually earthed to points A.5 and A.6 shown on the p.c., and their remaining two wires are taken to holes H. and K. adjacent to the pot. fixing. Further wires are fitted at the terminations of the tracks at their lower ends and wire jumpers taken to the "H" and "K" holes in the encoder section. L.H. aux to H.5. and K.5., R.H. aux to H.6. and K.6.

Colour Coding to be as follows:—

Channel 1. Brown. Fix to hole K.1.—Twist with white wire from hole H.1.
Channel 2. Red. Fix to hole K.2.—

Twist with white wire from hole H.2
Channel 3 Orange. Fix to hole K.3.—
Twist with white wire from hole H.3.
Channel 4. Yellow. Fix to hole K.4.—
Twist with white wire from hole H.4.
Channel 5. Green. Fix to hole K.5.—
Twist with white wire from hole H.5.
Channel 6. Blue. Fix to hole K.6.—
Twist with white wire from hole H.6.

Whilst we have described routes of wires from pots. to p.c. board, we do, in fact wire the printed circuit board first, twisting together the appropriate pairs of wires about 6in. long and labelling them to give their final destination after they have been carefully routed across the printed circuit, reference to Fig. 3a clarifies this.

Wiring of the switch, meter, and battery charging circuitry is as follows:—

Insert two wires of different colours in holes S.1. and S.2. on the printed circuit, twist together and label, wire about 6in. long.

Insert two wires of different colours into holes M. and M.1. on the printed circuit, twist together and label. Wire about 4in. long.

Insert a black wire into the hole marked "Lamp" on the printed circuit. Wire about 3in. long.

Insert a wire of any colour into hole marked A.E. wire 2in. maximum.

Fitting sub-assemblies

Fit to the LAMS (L amp, A erial, M eter, S witch) Panel, the switch, meter, bulb and aerial socket, see Fig. 4. The first two items are pushed over their pins, and a light touch of the soldering iron rivets the plastic over the component, check that the meter is the right way up. Solder a wire from the body of the bulb to the nearest switch tag—see Fig. 4. Screw 4—¼in. dia. stand-offs to printed circuit, into positions shown in various illustrations, noting that the longer pair go to the outer holes on the p.c. Make up an earth strap from two solder tags connected by a piece of uninsulated tinned copper wire 2¼in. long. Fix one tag under the stand-off supporting the LAMS panel, and bring the other to line up with hole on the corner of the stick casing—see Fig. 5. Then connect wires previously labelled to their respective tags on the items fitted to the LAMS panel, making sure that all the wires are as short as possible, at the same time allowing the components to be worked on comfortably. The LAMS panel is now pushed over the two centre stand-offs.

Fit earth wires to control stick pots. see—Fig. 6. The two main control sticks are positioned as shown in the photographs and held in position by two countersunk screws in their opposite corners. The wires going to tags "K" and "H" are now soldered into position, having been previously trimmed to a tidy, but not tight length.

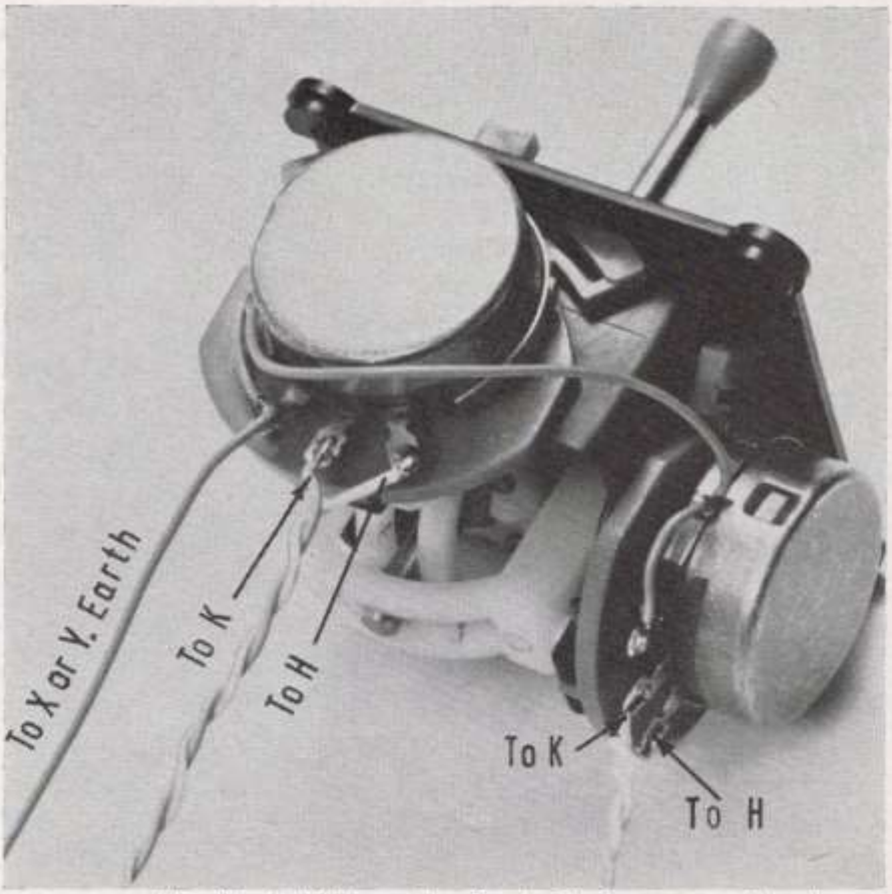


Fig. 6. The factory set stick unit—note "H" & "K" wiring included here for illustration purposes only.

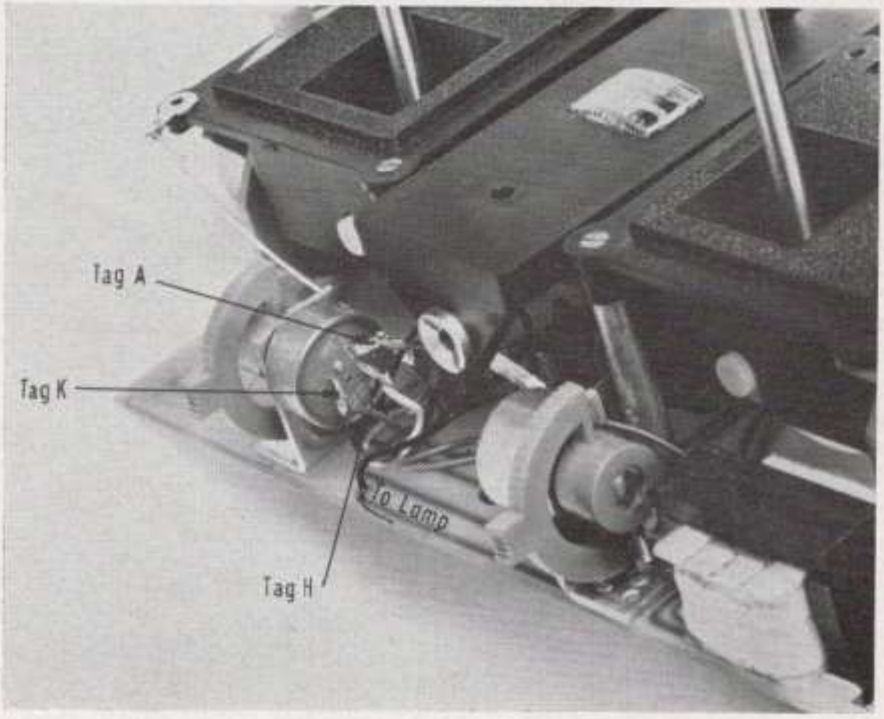


Fig. 7. Close up view of auxilliary control pot. wiring and fixing. Note neutral position of pot. levers.

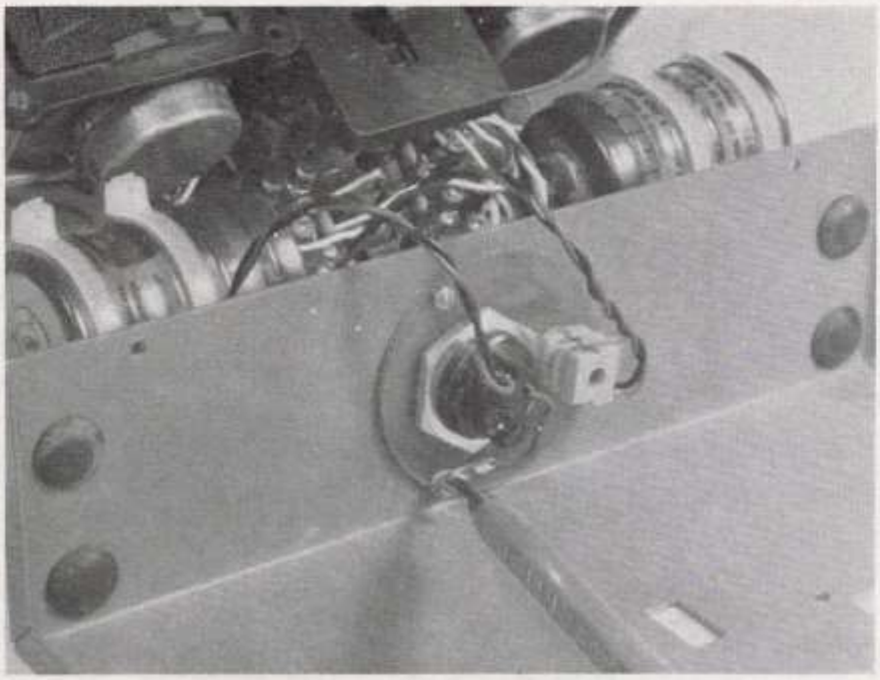


Fig. 9. The charge plug panel fitted to case. Pencil points to earth tag which must be fitted.

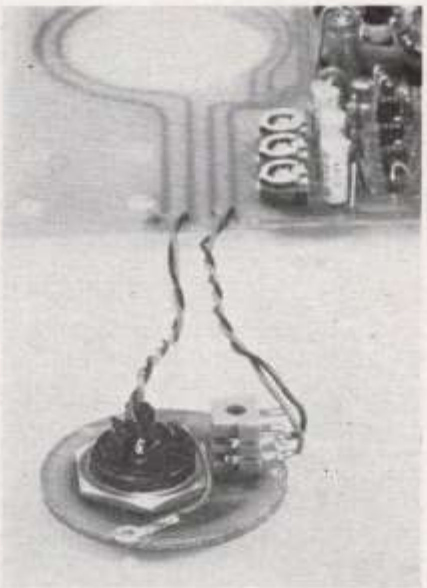


Fig. 8. (Above): Close-up of charge socket panel. Note mains earth strap—be sure to fit. Also note polarity of 4.8v output wiring.

The two auxiliary potentiometer brackets are fitted to the p.c. with self tapping screws, through the four slots provided, noting that these two units are handed and that, as supplied, the potentiometers give centre servo position when the control levers are in the position shown in the photographs. The self tapping screws should not be fully tightened at this stage, since the "feel" of the lever can be adjusted when the p.c. is finally fitted to the case.

Completion of wiring

The next operation is to wire the 2 x 6v. Deacs and since 12v. are required for the operation of the transmitter, the batteries are series connected, i.e. the positive and negative of each battery is wired to the points shown, after fitting the Tyrap fixing straps as shown in Figs. 2 and 3a. The relevant battery wires are taken inside the Tyrap, which is then buckled up tight with the clasps being approx. in the position shown. *Do not insert tongue of Tyrap into buckle until required, since it cannot be removed—they cost 2s. 6d. each.*

Switching On and Aligning

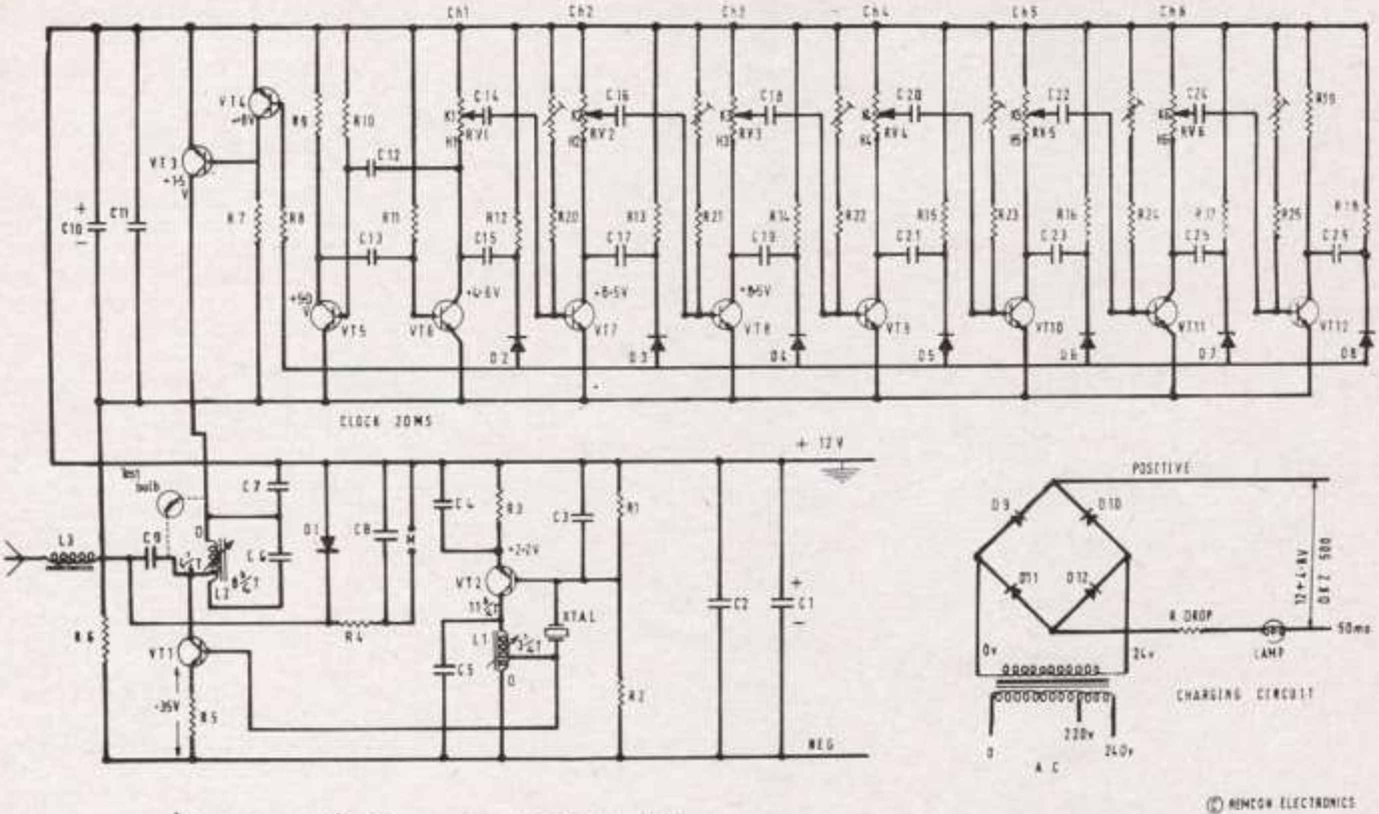
Insert the telescopic aerial, fully extend and switch on. Check that auxiliary pot. levers are in neutral position. With the coils supplied the meter should show a reading, since the coils are approximately tuned.

Working from the copper side of the printed circuit, a screwdriver, made of insulated material, is inserted into the slug of L.1., which is screwed out of its former (clockwise) until the meter reading falls to zero. The slug is now wound back anti-clockwise into the windings until the meter reads, after which the slug is then given a further ¼ turn (anti-clock). The screwdriver is now inserted into slug L.2., which is wound back and forth until the meter reading is at maximum, the tuning on L.2. is much flatter than L.1.

Second Tuning Method

It so happens that the lamp used for controlling the charging current of the Deacs is the correct

Fig. 10. The assembly of the Tx p.c. to case, not how auxiliary control levers are engaged first. After fitting, all that remains is a final check on the tuning of L.1 and L.2.



'Quantum 6' Channel Digital Tx.

lamp to use for setting up the transmitter. The use of the lamp does give greater accuracy of tuning, but the added complication of fitting hardly justifies recommending this method, the system using the meter being adequate. If you do use the lamp then the aerial is not fitted. The position of the lamp, which is tuned to maximum brightness, is as in circuit above.

The six main control pots are factory set and should not be disturbed in any event. The only servo centring adjustments possible on the transmitter, are the six control pre-set potentiometers which take up component tolerances in the encoder. Each pre-set pot controls one servo—i.e. pre-set 1 controls servo connected to output 1 on the decoder and so on. The maximum servo swing available on the pre-sets is 20% of servo travel, and there is no fear of harming the servos regardless of the pot. settings.

Fitting to Case and Wiring of Charge Plug Panel

The two sockets are fitted to the charge plug panel and wired as shown in Fig. 8. Do not forget to fit the earth tag to the mains socket, also make sure that you copy the polarity of the 4.8v. output socket on to the jack plug. Note carefully also, the polarity of wiring from the p.c. to the jack socket—series charging.

With the transmitter printed circuit panel lying copper side down, the p.c. charge plug panel is fitted over the large hole inside the case—Fig. 9. Scrape away a little of the paint around the bolt head which goes through the mains earthing tag. The printed circuit is now picked up as shown in Fig. 10 and, by careful manoeuvring, pushed home into the case, checking that auxilliary levers are through their slots. Four large self tapping screws are carefully fitted through the case into the stick housings. Again ensure that the paint is removed around the hole which carries the R.F. earth strap fitted across the right hand stick housing. It is advisable to fit the rubber feet before commencing this operation.

All that remains now is to insert the aerial into the transmitter. Slip the moulded conical shaped sleeve over the aerial and Araldite in position, checking that the aerial rises vertically in all directions from the transmitter. Check tuning on L.1. and L.2. with Tx fitted into case, and with an assistant holding the case ensuring the aerial is clear of both human and other bodies. Fit rear cover, drill four No. 50 holes and insert self tapping screws.

Battery Charging

Do not connect mains to transmitter with rear cover removed.

Battery charging can only take place when the receiver/servo 4.8v. battery is connected by the jack plug, also the transmitter on/off switch is in the off position. Initially it will be observed the lamp glows brightly and the charging current will be approx. 50 m.a. (not shown on meter). As the batteries accept their charge, the current automatically falls and the brightness of the lamp falls also. It is realised that it is unlikely the Tx. battery will discharge at the same rate as the 4.8v. battery under normal circumstances, but it is quite in order to charge both together at all times, the duration being decided by the amount of use, but if in doubt charge for at least ten hours (fourteen hours for a completely discharged set of batteries).

Theoretical circuit

This is given only for the constructor who feels he must know "why it works". The voltages quoted were measured with an Avo Model 8, 20,000ohms/volt when the d.c. supply was 13.1 volts —the voltages quoted must only be regarded as typical. All controls at centre.

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THE RADIO CONTROL MAGAZINE FOR EVERYDAY ENTHUSIASTS

FEB. '69

3/6

Completing the

QUANTUM SIX

Building the receiver and decoder—and wiring to the servos

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.

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. It will be noticed there is a coloured plastic band at the base of the crystal; this serves two purposes, one identification of frequency, and two, to insulate the crystal can from the can of VT.1.

After fitting these four components, VT.1, 2 and 3 are next fitted, and it will be noted that these transistors have four legs, one of which is removed (screen). We have found it necessary also to remove the identification tab from the transistor can of these three transistors, to prevent any chance of their making intermittent contact with crystal or IFs. This tab is to be removed only after the constructor is certain that he has positioned the transistor correctly.

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. Diode D.1 is the only horizontal component and should be fitted so that the under side of its body is $\frac{1}{16}$in. above the board.

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

3/32in. be left at the top of R.8, since this provides a test point (the only one required) for RF tuning. Ensure adequate clearance between wire of R.8 and can of VT.2. this applies also to wire end of R.10 and can of VT.3.

D. Be sure to note the polarity of all type D. capacitors and diodes, check the latter as described in Fig. 2B. of transmitter section if necessary.

E. VT.6 and 7 have their pins in a straight line, triangulate by gently bending centre base pin towards flat on transistor body.

F. In building decoder section, note that one leg of each SCS (silicon controlled switch) is removed (not to be confused with VTs 1, 2 and 3).

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

H. Insert D.6 and R.27 together.

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. It will be noticed that there are three links shown on the printed circuit diagram Fig. 18a and these are made up from three pieces of insulated flea weight wire, cut accurately to length, and now located so that the wires run in the valleys created by the solder, in each case they run between two copper pads which are undrilled, and these should be tinned first to prevent melting the insulation when the wires are attached. A red and black wire, flea weight, approxmately 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 any colour, about 30in. long, is fitted to the hole marked "AE" for the aerial.

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.13. The voltmeter should read approximately .5v. Bring transmitter near to receiver and switch Tx on, the volt meter 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 L.1., noting that the meter falls to a minimum, rises partially then falls again, but not quite so low this time, wind out slug of L.1. and repeat turning, but stop turning at the first dip.

Turn the cores of the yellow, white and black IF's. back and forth gently until each produces the lowest reading on the meter. Repeat once or twice and complete tuning by turning black, white and yellow cores in this order. In the unlikely event of the tuning of these four items being well out as

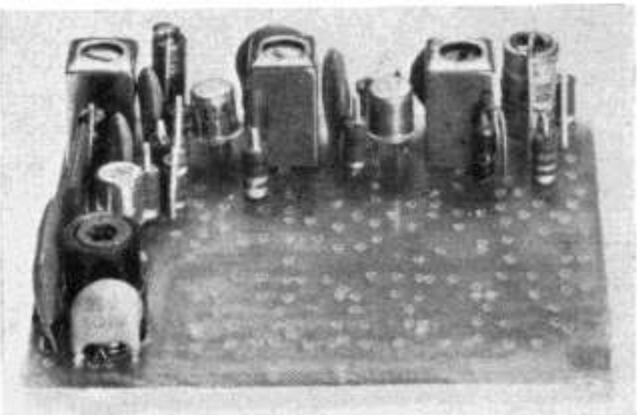


Fig. 12. The completed R.F. section. Note how components are seated on the printed circuit, wire lengths, tabs removed from V.T's, etc.

Fig. 13. Partially complete to V.T.7.

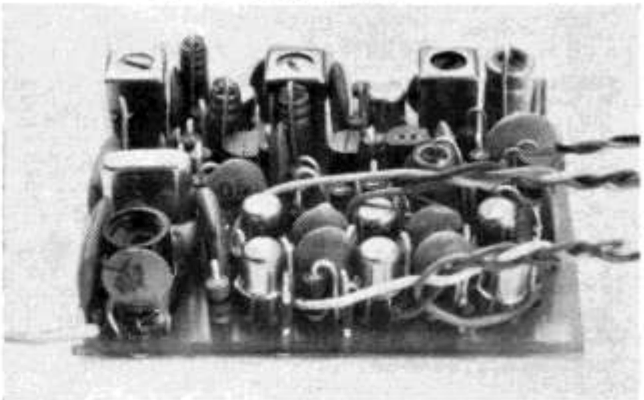
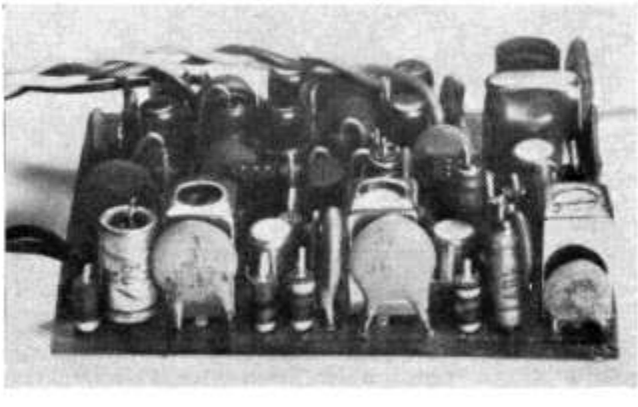


Fig. 14 (above) and 15 (below) show both sides of the completed receiver. Wiring complete at this stage for illustration purposes only.



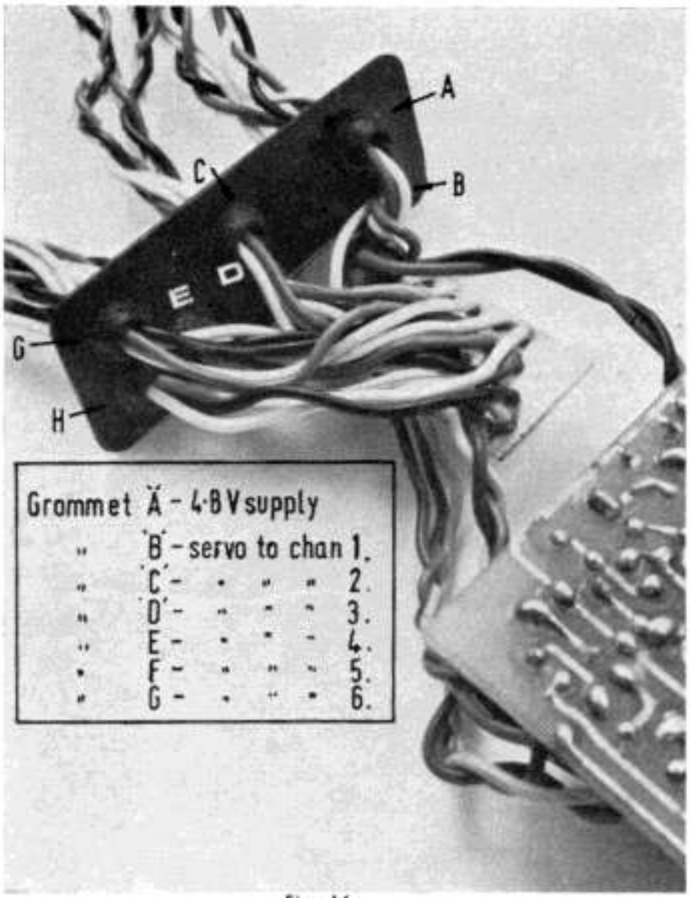


Fig. 16

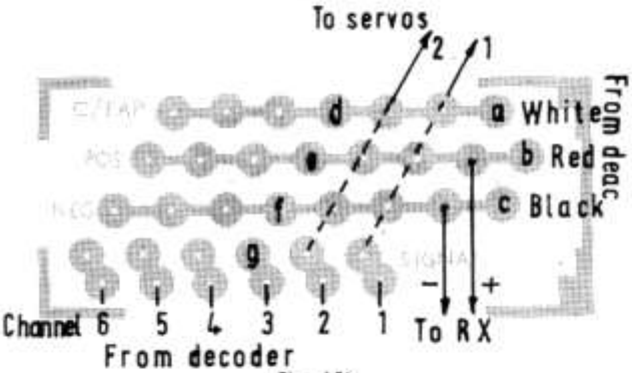


Fig. 18b

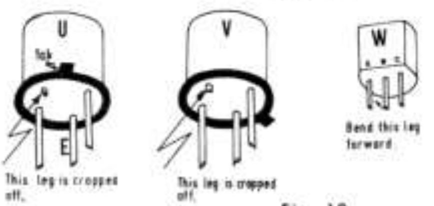


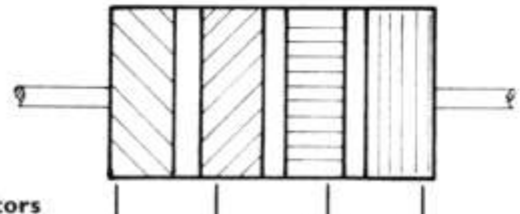
Fig. 19

Fig. 16 (top). 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 (centre). 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.

Fig. 19 (above). can outlines of transistors "special" to Rx. See Fig. 2b in Tx section for others. Type V is the SCS.

Rx COMPONENT SCHEDULE



Resistors

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

Capacitors		Type
C.1	20pf	A
C.2	·01µf (10K)	B
C.3	·033µf (33K)	B
C.4	33PF	A
C.5	·01µf	B
C.6	·01µf	B
C.8	2·5Mfd	D
C.9	·1µf	B
C.10	·1µf	B
C.11	·1µf	B
C.12	2·5µf	D
C.13	50µf	D
C.14	033µf	B
C.15	2·5µf	D
C.16	·01µf	B
C.17	·047 or ·05µf	B
C.18	·001µf	B
C.19	.033µf	B
C.20	10µf	D
C.21	·005µf or (4·7K)	B
C.22	·1µf	B
C.23 to C.28	·01µf	B

Semiconductors		
VT.1 to VT.3	BF.115	U
VT.4 & 5	BC172	Y in Tx section
VT.6 & 7	2N4126	W
SCS (6 off)	BRY39	V
D.1 & D.2	OA47	See Note 2B in Tx section
D.3 to D.10	BAX13	

Inductances	
T.1	Yellow IF
T.2	White IF
T.3	Black IF
L.1	11 turns tapped at 5 turns
RFC	6·8µH (marked with value)
Xtal	Lower Frequency of pair colour banded for identification
Aerial	30 in. of insulated stranded conductor

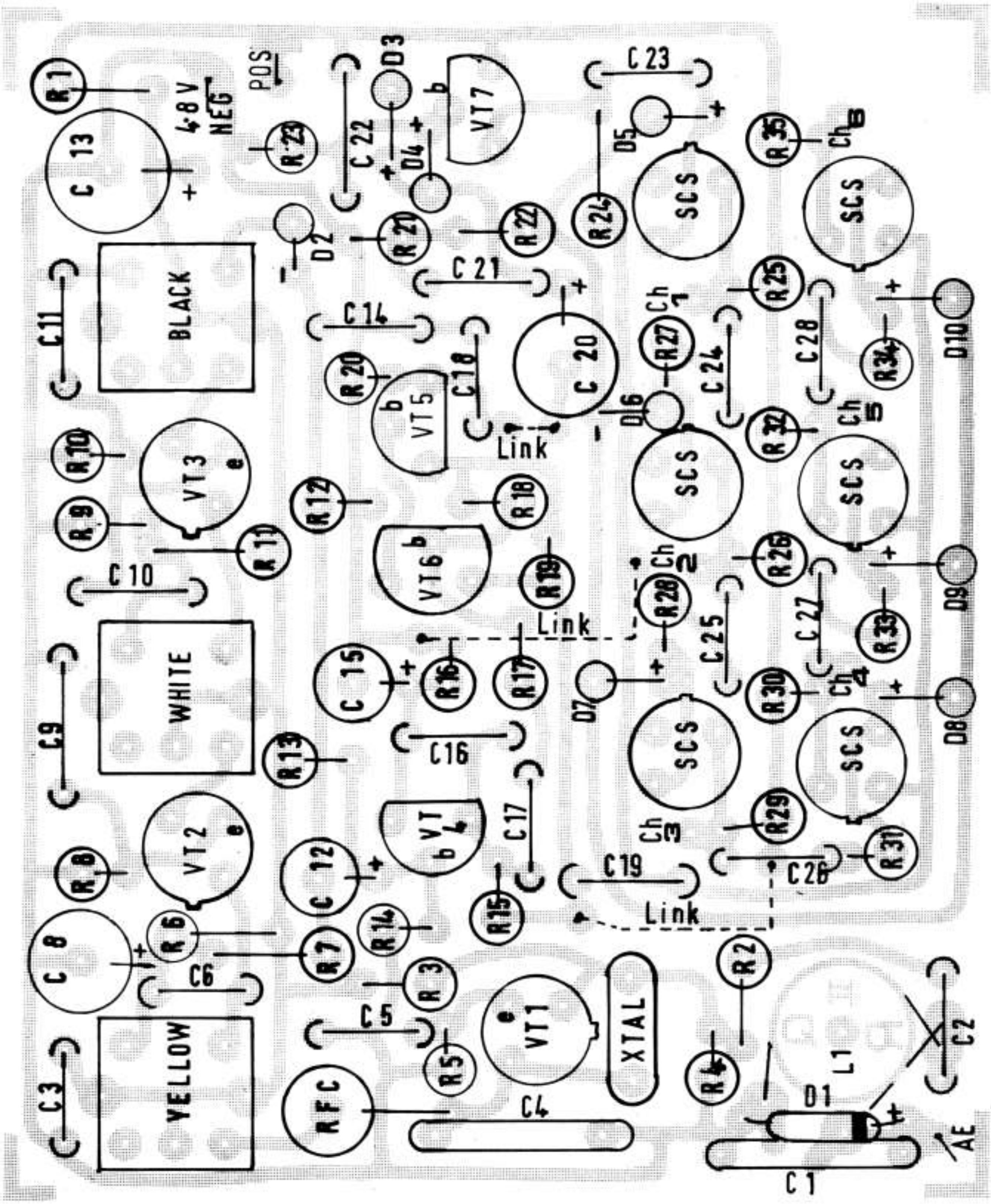


Fig. 18a. Printed circuit component placement. Study in conjunction with Fig. 18b. Note no plugs and sockets are intended to be used in connecting servos, since these are clip mounted. Note also polarities of components where stated; they refer to the upper wire end.

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Fig. 1. C5 and C6 are shown transposed, i.e., L1 is fitted with C5 and L2 with C6. On page 35; Rd—see note 5, should read, see note F.

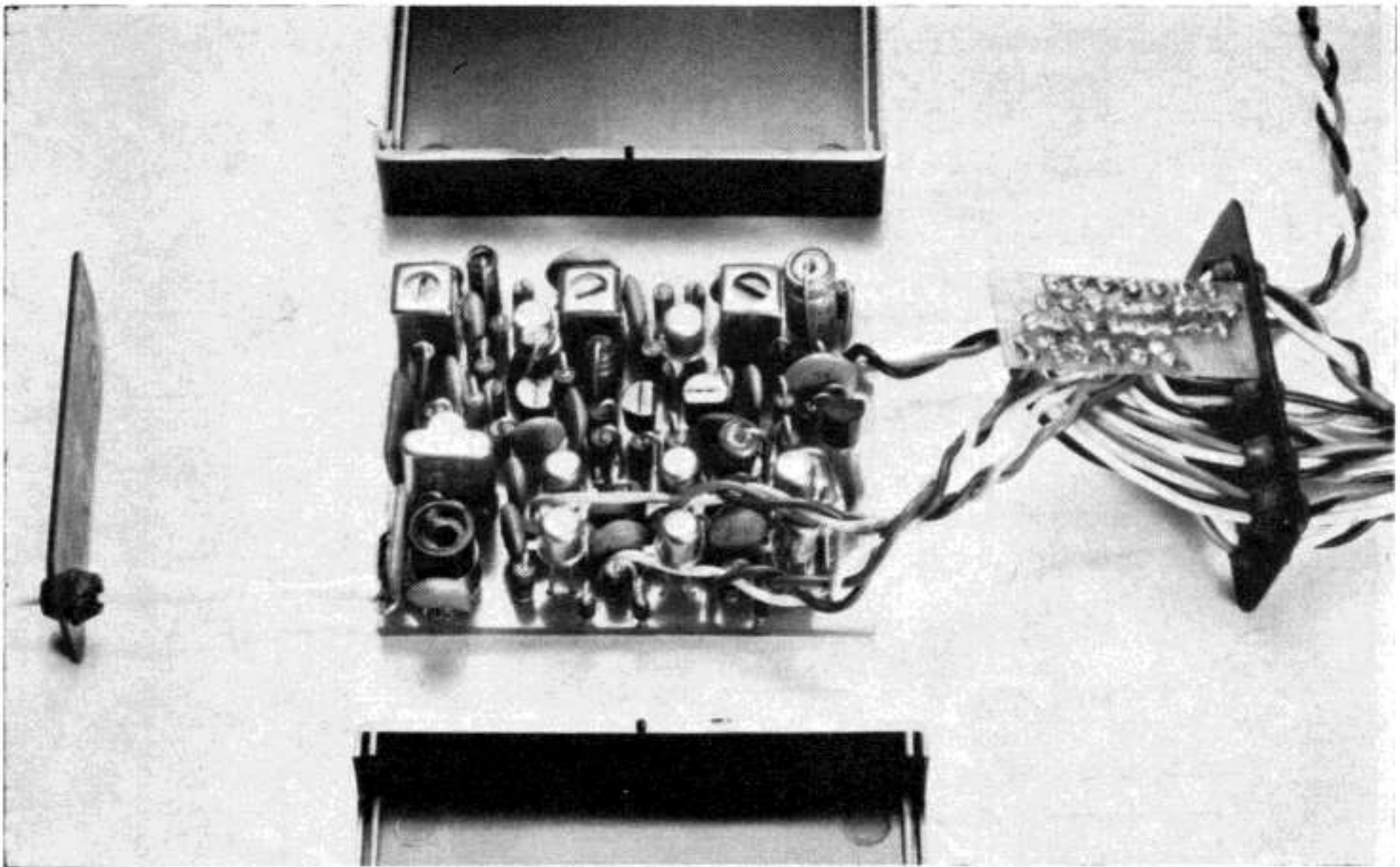
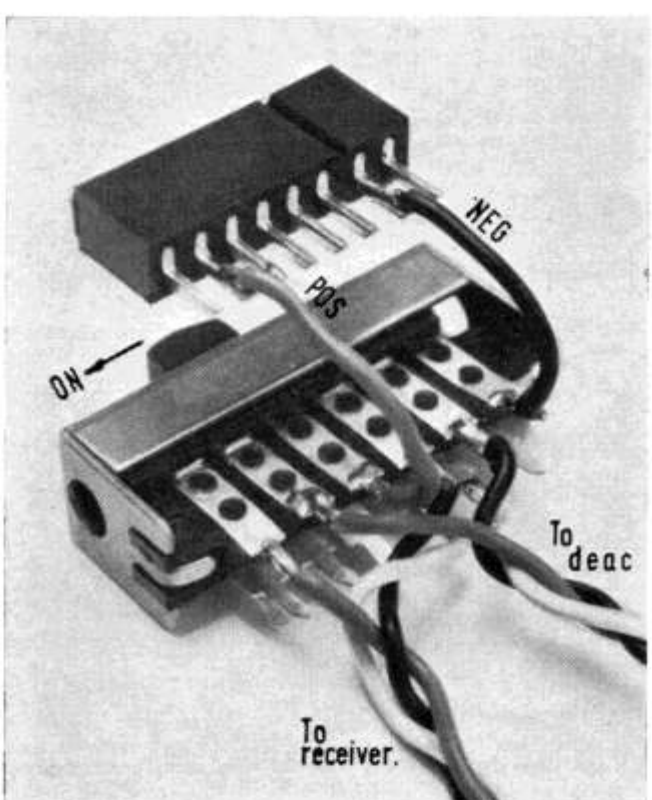


Fig. 17 (above). "Exploded" view of completed Rx. Note how sub p.c. is let into end panel (may be fixed with Araldite). Note also that Rx case is dowelled together. Note lead lengths of internal wiring. Tabs left on SCS for identification—should be removed.

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



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

Wiring up (Second Stage)

A. The main wiring to 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 scriber and finally pushing out when weakened, rectangular knockouts are best removed by carefully cutting with a balsa knife.

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 3½in. long.
Ch.2. Red flea weight wire about 3½in. long.
Ch.3. Orange flea weight wire about 3½in long.
Plait 1, 2 and 3 together.
Ch.4. Yellow flea weight wire about 3½in. long.
Ch.5. Green flea weight wire about 3½in. long.
Ch.6. Blue flea weight wire about 3½in. 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 IF., C.20, Rs. 16 and 17. 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.

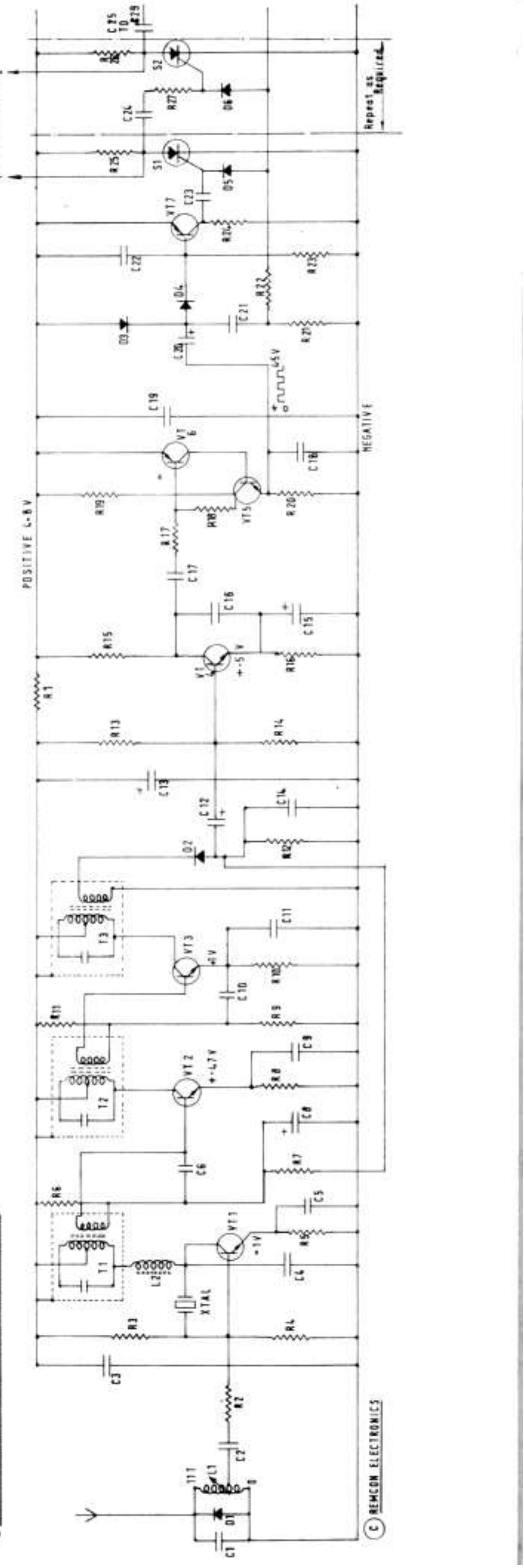
Upon switching on transmitter and receiver it will probably be noticed that some servos may be slightly off centre, that is the cruciform of the centres of the holes in the output discs do not lie square with the axes of the servo case. To correct this the back of the transmitter is removed and the pre-set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

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 spots here are engine control, steerable nosewheel, and retracting undercarriage. 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

continued on page 48



QUANTUM SIX receiver & decoder.