Assembly Manual for the

Dick Smith Commander VHF AMATEUR TRANSCEIVER

PLEASE READ DISCLAIMER CARE-FULLY AS WE CAN ONLY GUARAN-TEE PARTS AND NOT THE LABOUR

K-6308

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By any standard, the UHF transceiver described in the September, October and November 1983 issues of EA has been an outstanding success. Many hundreds have been successfully built and the kit supplier responsible, Dick Smith Electronics, has not been able to keep up with the demand.

As the reputation of the UHF transceiver has grown, more and more amateurs have decided to have a go at building a really worthwhile piece of gear for themselves. At the same time, they can save a substantial amount of money over the price of an equivalent commercial unit.

We're very glad to be able to report this development because it signals a resurgence in the construction of gear amongst amateurs who, for a long time, have been content to buy rather than build.

In fact, the UHF transceiver kit has been hailed both here and overseas as being perhaps the most significant amateur radio construction project to be published anywhere for a long time!

Just as night follows day, there was bound to be a call for a two-metre version of the transceiver. We ourselves remarked that the VHF version was just crying out to be produced.

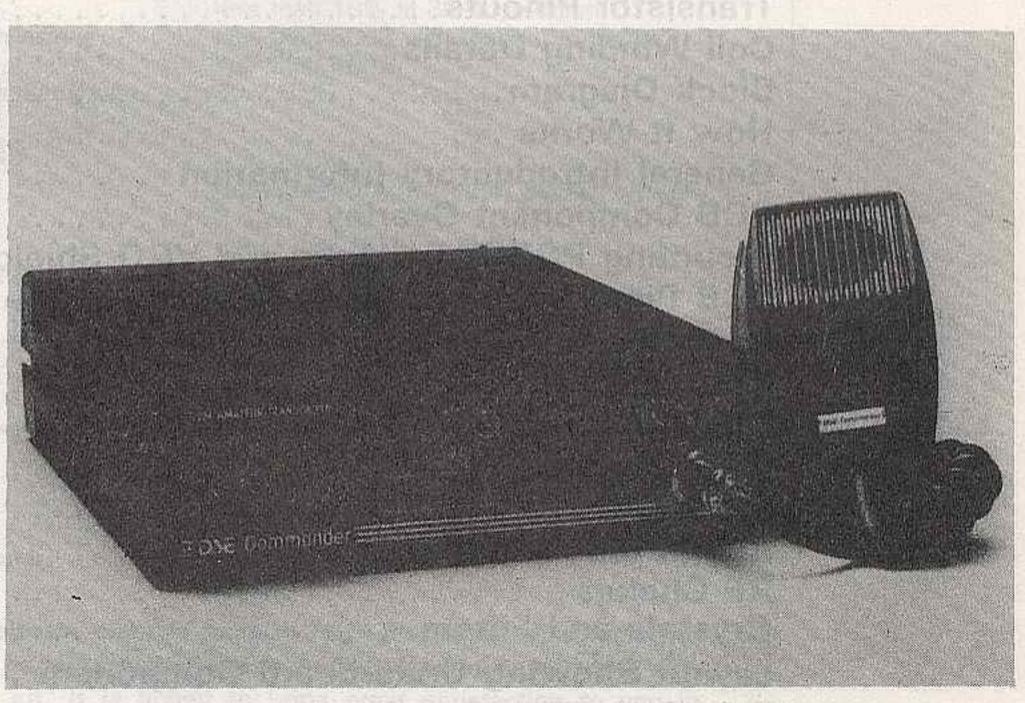
Well now it has happened. The same team that produced the UHF kit, Garry Crapp VK2YBX/T, and Gill McPherson, VK2ZGE, have put their thinking caps on and produced a two-metre transceiver that will certainly set any keen amateur longing.

Features

As the accompanying spec panel shows, this new two-metre transceiver from Dick Smith Electronics has very good performance which is matched by the features that most amateur radio operators want. Note also that there are very few options available because they are all built in to the basic price.

Topping the list of features is, of course, the price. One hundred and

Are you an amateur wanting to upgrade your two-metre gear? Then here's your chance to do it by putting together this up-to-the-minute transceiver which has all the most wanted features.



ninety-nine dollars buys you a complete transceiver with all the features pictured, including the press-to-talk dynamic microphone. That has to be a really good deal.

And Dick Smith Electronics has gone one step further in providing a basic antenna kit so that there will be no temptation to switch on the transmitter with no load as soon as it is completed. The antenna kit comprises a quarter-wave vertical radiator, gutter-grip mounting base and feed, a PL-259 connector and three metres of good quality coax cable, all for \$24.95.

For those amateurs not in a club and not sure of their ability to complete the transceiver successfully, DSE have their "Sorry Dick, it doesn't work" service coupon. This costs an additional \$50 and may take up to three weeks service time if the constructor decides to take advantage of the offer but at least it is a sure way of getting an operational unit, if all else fails.

Operating facilities on the new transceiver are all that most amateurs would want without all the "bells and whistles" of some of the fancy imported models. There are none of those hard-to-remember-how-to-use memories and the frequency readout and selection is via no-nonsense push-button type "thumbwheel" switches.

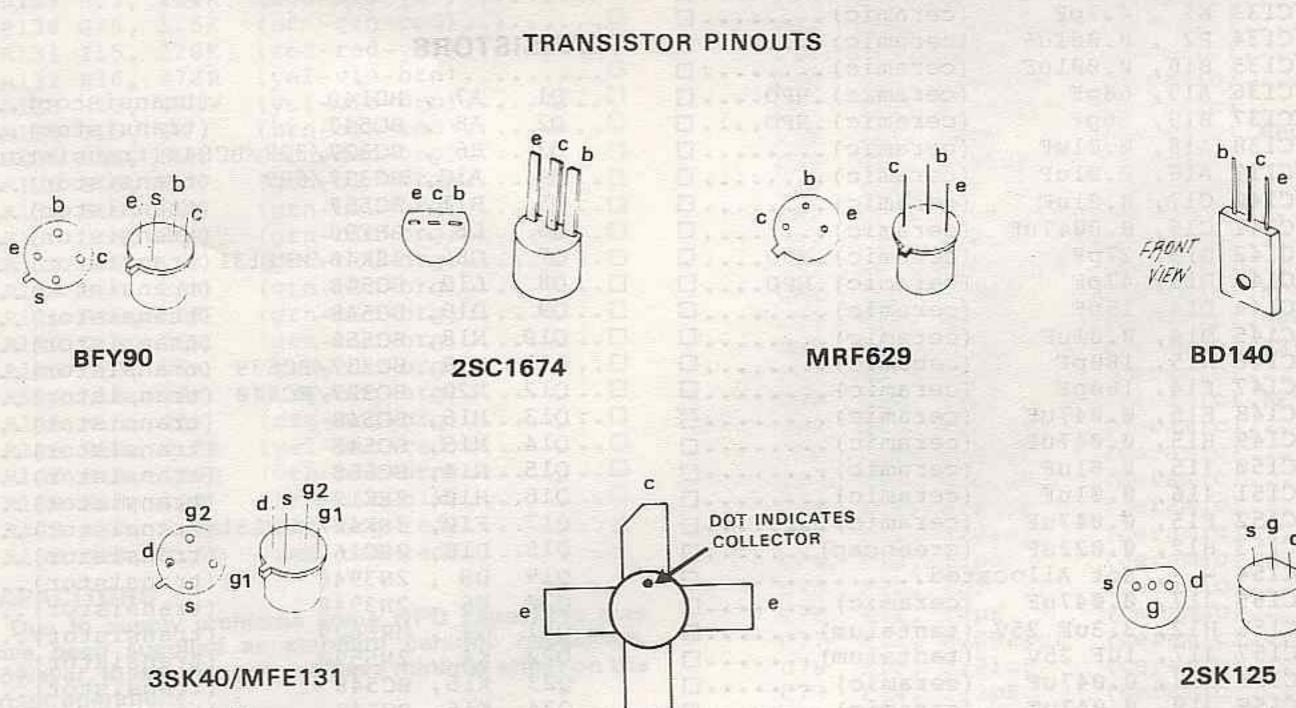
As is usual practice with two-metre amateur transceivers, the two most significant digits of the frequency section are omitted which means that there is an assumed decimal point between the first and second digits of the three-digit

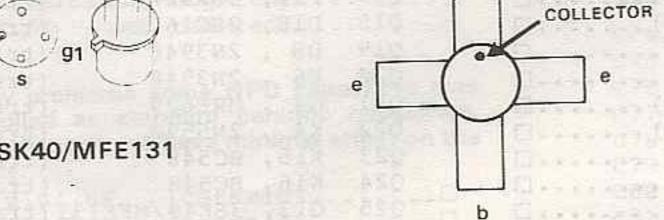
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R	109	P2 ,	15K	(brn-	grn-org		🗆		C33	LANCES STATE OF		(greencap)
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R	121	C14,			red-red				C45	Christian Christian III		(greencap)
R.	122	D16,	4.7K	(yel-	vio-red)	•••□		C46			(electro)
R.	123	E15,	1.2K	(brn-	red-red)			C47	Contract Con		(electro)
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		D13,	77.00	60mm 825	red-red		garage.		C49	19900000000000000000000000000000000000	The second state of the second	(tantalum)□
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R.	137	E16,	56K ((grn-	blu-org)				C61	ACTUAL PROPERTY AND A SECOND	47uF 16V	(electro)
R.	138	D16,	56K ((grn-	blu-org)				C62	SERVEY I	Control Contro	(ceramic)
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D	ue to	supp	ly proble	ms so	me NPO	capacito	rs may		C76			(ceramic)
have	e he	en sur	plied as	stan	dard cera	mic cap	acitors.		C77			(ceramic)
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	:9	Charles and property of	Ø.ØluF		(ceramic	Self-Addition by A. Stewarts and Self-St. State Co.	CHECKEDOCI /		C88			(ceramic)
	:10	Service Control Control	0.00lu		(ceramic	1.74			C89			(ceramic)
100	11	The second second	470pF		(ceramic				C90			(tantalum)
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C	13	К6,	12pF		(ceramic			事持	C92		0.0luF	(ceramic)□
C	14	K7 ,	Ø.ØluF		(ceramic)			C93	D7 ,	18pF	(ceramic)□
C	15	M7 ,	Ø.ØluF		(ceramic)			C94	E7 ,		(ceramic)□
		PERMIT	1pF		(ceramic				C95	D7 ,		(ceramic)□
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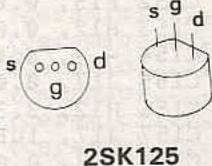
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FINCE			39pF	(ceramic)□	D2	ACADE I	5.6V 400mW	(zener)□
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		200119	0.001uF	(ceramic) □	D16	K16,	IN914	(diode)□
1 31	C115	M2 ,	0.00luF	(ceramic)□	D17		IN914	(diode)□
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			12pF	(ceramic)	D30			
		V5000000	15pF	(ceramic)	D31			(diode)□
7100	C130	P3 ,	4.7pF	(ceramic)□	D32	- PERCHANTAGE	0A95/1N60	(diode)□
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			68pF	(ceramic).NPO□	Q1	A7 ,	BD140 (transistor)
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	C139 C140 C141 C142 C143 C144 C145 C146 C147 C148 C149	A16, C17, C15, D15, D15, D14, H15, F14, F15, H15,	0.01uF 0.01uF 0.0047uF 27pF 47pF 15pF 0.01uF 180pF 180pF	(ceramic)	Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12	B6, A10, B11, L6, G8, L12, O19, N18, N18, N20, N16, N15,	BC327/328/BC6 BC337/639 (BC557 (BFY90 (3SK40/MFE131 (BC548 (BC548 (BC558 (BC337/BC639 (BC327/BC640 (BC548 (BC548 (40(transistor) transistor) transistor) transistor) transistor) transistor) transistor) transistor) transistor) transistor)
	C139 C140 C141 C142 C143 C144 C145 C146 C147 C148 C149 C150	A16, C17, C15, D15, D15, D14, H15, F14, F15, H15, I15,	0.01uF 0.01uF 0.0047uF 27pF 47pF 15pF 0.01uF 180pF 180pF 0.047uF 0.047uF	(ceramic)	Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14	B6, A10, B11, L6, G8, L12, O19, N18, N18, N20, N16, N15, N14, H10,	BC327/328/BC6 BC337/639 (BC557 (BFY90 (3SK40/MFE131 (BC548 (BC548 (BC558 (BC337/BC639 (BC327/BC640 (BC548 (BC548 (BC548 (BC548 (BC548 (BC558 (BC588 (BC558 (BC588 (BC558 (BC588 (BC588 (BC558 (BC588 (B)) (BC588 (BC588 (BC588 (BC588 (BC588 (BC588 (BC588 (BC588 (B)	40(transistor) transistor)
	C139 C140 C141 C142 C143 C144 C145 C146 C147 C148 C149 C150 C151 C152	A16, C17, C15, D15, D15, D14, D14, F14, F15, H15, I16, F15,	0.01uF 0.01uF 0.0047uF 27pF 47pF 15pF 0.01uF 180pF 0.047uF 0.047uF 0.01uF 0.01uF 0.01uF	(ceramic)	Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17	B6, A10, B11, L6, G8, L12, O19, N18, N20, N16, N15, N14, H10, F10,	BC327/328/BC6 BC337/639 (BC557 (BFY90 (3SK40/MFE131 (BC548 (BC548 (BC337/BC639 (BC327/BC640 (BC548 BC548 (BC548 BC548 (BC548 BC558 (BC548 BC558 (BC548 BC558 (BC548 BC558 (BC558 (BC558 BC558 (BC558 (BC558 BC558 BC558 (BC558 BC558 BC558 BC558 (BC558 BC558 BC558 BC558 BC558 BC558 BC558 (BC558 BC558 BC58 BC	<pre>40(transistor) transistor) transistor)</pre>
	C139 C140 C141 C142 C143 C144 C145 C146 C147 C148 C149 C150 C151 C152 C153	A16, C17, C15, D15, D15, D14, D14, F14, F15, H15, I16, F15, H12,	0.01uF 0.01uF 0.0047uF 27pF 47pF 15pF 0.01uF 180pF 0.047uF 0.047uF 0.01uF 0.01uF 0.01uF 0.01uF	(ceramic) (ceramic) <td< td=""><td>Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18</td><td>B6, A10, B11, L6, G8, L12, O19, N18, N20, N16, N15, N14, H10, F10, D10,</td><td>BC327/328/BC6 BC337/639 (BC557 (BFY90 (3SK40/MFE131 (BC548 (BC548 (BC558 (BC327/BC640 (BC548 (BC558 (SK40/MFE131 (2SC1674 (C2SC1674 (C2SC1674 (C2SC1674 (C2SC1674 (C3SC1674 (</td><td><pre>40(transistor) transistor) transistor)</pre></td></td<>	Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18	B6, A10, B11, L6, G8, L12, O19, N18, N20, N16, N15, N14, H10, F10, D10,	BC327/328/BC6 BC337/639 (BC557 (BFY90 (3SK40/MFE131 (BC548 (BC548 (BC558 (BC327/BC640 (BC548 (BC558 (SK40/MFE131 (2SC1674 (C2SC1674 (C2SC1674 (C2SC1674 (C2SC1674 (C3SC1674 (<pre>40(transistor) transistor) transistor)</pre>
	C139 C140 C141 C142 C143 C144 C145 C146 C147 C148 C149 C150 C151 C152 C153 C154	A16, C17, C15, D15, D15, D14, F14, F15, H15, I16, F15, H12,	0.01uF 0.01uF 0.0047uF 27pF 47pF 15pF 0.01uF 180pF 0.047uF 0.047uF 0.01uF 0.01uF 0.01uF 0.01uF 0.022uF Not Alloca	(ceramic) (ceramic) <td< td=""><td>Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18 Q19</td><td>B6, A10, B11, L6, G8, L12, O19, N18, N20, N16, N15, N14, H10, F10, D10,</td><td>BC327/328/BC6 BC337/639 (BC557 (BFY90 (3SK40/MFE131 (BC548 (BC548 (BC558 (BC327/BC640 (BC548 (BC558 (B5558 (BC558 (B)) (BC558 (BC58 (BC558 (B)</td><td><pre>40(transistor) transistor) transistor)</pre></td></td<>	Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18 Q19	B6, A10, B11, L6, G8, L12, O19, N18, N20, N16, N15, N14, H10, F10, D10,	BC327/328/BC6 BC337/639 (BC557 (BFY90 (3SK40/MFE131 (BC548 (BC548 (BC558 (BC327/BC640 (BC548 (BC558 (B5558 (BC558 (B)) (BC558 (BC58 (BC558 (B)	<pre>40(transistor) transistor) transistor)</pre>
	C139 C140 C141 C142 C143 C144 C145 C146 C147 C148 C149 C150 C151 C152 C153 C154 C155	A16, C17, C15, D15, D15, D14, H15, F14, F15, H15, I16, F15, H12, J17,	0.01uF 0.01uF 0.0047uF 27pF 47pF 15pF 0.01uF 180pF 0.047uF 0.047uF 0.047uF 0.01uF 0.01uF 0.01uF 0.047uF 0.022uF Not Alloca 0.047uF	(ceramic) (ceramic) <td< td=""><td>Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18 Q19 Q20</td><td>B6, A10, B11, L6, G8, L12, O19, N18, N20, N16, N15, N14, H10, F10, D10, D8, E6,</td><td>BC327/328/BC6 BC337/639 (BC557 (BFY90 (3SK40/MFE131 (BC548 (BC548 (BC558 (BC337/BC639 (BC327/BC640 (BC548 (BC548 (BC548 (BC548 (BC548 (BC548 (BC558 (SSK40/MFE131 (2SC1674 (2N3948 (2N3948 (SSK125 (SSK125 (SSK40/MFE131 (2SC1674 (SSK125 (SSK</td><td><pre>40(transistor) transistor) transistor)</pre></td></td<>	Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18 Q19 Q20	B6, A10, B11, L6, G8, L12, O19, N18, N20, N16, N15, N14, H10, F10, D10, D8, E6,	BC327/328/BC6 BC337/639 (BC557 (BFY90 (3SK40/MFE131 (BC548 (BC548 (BC558 (BC337/BC639 (BC327/BC640 (BC548 (BC548 (BC548 (BC548 (BC548 (BC548 (BC558 (SSK40/MFE131 (2SC1674 (2N3948 (2N3948 (SSK125 (SSK125 (SSK40/MFE131 (2SC1674 (SSK125 (SSK	<pre>40(transistor) transistor) transistor)</pre>
	C139 C140 C141 C142 C143 C144 C145 C146 C147 C148 C149 C150 C151 C152 C153 C154 C155 C156	A16, C17, C15, D15, D15, D14, H15, F14, F15, H15, I16, F15, H12, J17, H12,	0.01uF 0.01uF 0.0047uF 27pF 47pF 15pF 0.01uF 180pF 180pF 0.047uF 0.047uF 0.01uF 0.01uF 0.01uF 0.022uF Not Alloca 0.047uF 3.3uF 25V	(ceramic) (ceramic) <td< td=""><td>Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18 Q19</td><td>B6, A10, B11, L6, G8, L12, O19, N18, N20, N16, N15, N14, H10, F10, D10, D8, G4,</td><td>BC327/328/BC6 BC337/639 (BC557 (BFY90 (3SK40/MFE131 (BC548 (BC548 (BC558 (BC337/BC639 (BC327/BC640 (BC548 (BC548 (BC548 (BC548 (BC548 (BC548 (BC558 (B5558 (B558 (B5558 (B5588 (B5558 (B5558 (B5558 (B5558 (B5558 (B5558 (B5558 (B5558 (B558 (B5558 (B5</td><td><pre>40(transistor) transistor) </pre></td></td<>	Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18 Q19	B6, A10, B11, L6, G8, L12, O19, N18, N20, N16, N15, N14, H10, F10, D10, D8, G4,	BC327/328/BC6 BC337/639 (BC557 (BFY90 (3SK40/MFE131 (BC548 (BC548 (BC558 (BC337/BC639 (BC327/BC640 (BC548 (BC548 (BC548 (BC548 (BC548 (BC548 (BC558 (B5558 (B558 (B5558 (B5588 (B5558 (B5558 (B5558 (B5558 (B5558 (B5558 (B5558 (B5558 (B558 (B5558 (B5	<pre>40(transistor) transistor) </pre>
	C139 C140 C141 C142 C143 C144 C145 C146 C147 C148 C149 C150 C151 C152 C153 C154 C155 C156 C157	A16, C17, C15, D15, D15, D14, H15, F14, F15, H15, I16, F15, H12, J17, H12, J17,	0.01uF 0.0047uF 27pF 47pF 15pF 0.01uF 180pF 0.047uF 0.047uF 0.047uF 0.01uF 0.01uF 0.01uF 0.022uF Not Alloca 0.047uF 3.3uF 25V 1uF 25V	(ceramic) (ceramic) <td< td=""><td>Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18 Q19 Q20 Q21</td><td>B6, A10, B11, L6, G8, L12, O19, N18, N20, N16, N15, N14, H10, F10, D10, D8, G4, K4,</td><td>BC327/328/BC6 BC337/639 (BC557 (BFY90 (3SK40/MFE131 (BC548 (BC548 (BC558 (BC337/BC639 (BC327/BC640 (BC548 (BC548 (BC548 (BC548 (BC558 (B5558 (B5558 (B5558 (B5558 (B5558 (B5558 (B5558 (B5558 (B55590 (B</td><td><pre>40(transistor) transistor) </pre></td></td<>	Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18 Q19 Q20 Q21	B6, A10, B11, L6, G8, L12, O19, N18, N20, N16, N15, N14, H10, F10, D10, D8, G4, K4,	BC327/328/BC6 BC337/639 (BC557 (BFY90 (3SK40/MFE131 (BC548 (BC548 (BC558 (BC337/BC639 (BC327/BC640 (BC548 (BC548 (BC548 (BC548 (BC558 (B5558 (B5558 (B5558 (B5558 (B5558 (B5558 (B5558 (B5558 (B55590 (B	<pre>40(transistor) transistor) </pre>
	C139 C140 C141 C142 C143 C144 C145 C146 C147 C148 C149 C150 C151 C152 C153 C154 C155 C156 C157 C158 C159	A16, C17, C15, D15, D14, D14, H15, F14, F15, H15, I16, F15, H12, J17, J17, J17, J18, J19,	0.01uF 0.0047uF 27pF 47pF 15pF 0.01uF 180pF 0.047uF 0.047uF 0.047uF 0.01uF 0.01uF 0.01uF 0.022uF Not Alloca 0.047uF 3.3uF 25V 1uF 25V 0.047uF 0.047uF	(ceramic) (tantalum) (ceramic) (ceramic) <t< td=""><td>Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18 Q19 Q20 Q21 Q22 Q23 Q24</td><td>B6, A10, B11, L6, G8, L12, O19, N18, N18, N16, N15, N14, H10, F10, D10, D8, G4, K15, K16,</td><td>BC327/328/BC6 BC337/639 (BC557 (BFY90 (3SK40/MFE131 (BC548 (BC548 (BC337/BC639 (BC327/BC640 (BC548 (BC548 (BC548 (BC558 (2SK125 (3SK40/MFE131 (2SC1674 (2N3948 (2N3948 (MRF629 (2N5590 (BC548 (BC548 (BC548 (BC548 (C548 (C548</td><td><pre>40(transistor) transistor) transistor)</pre></td></t<>	Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18 Q19 Q20 Q21 Q22 Q23 Q24	B6, A10, B11, L6, G8, L12, O19, N18, N18, N16, N15, N14, H10, F10, D10, D8, G4, K15, K16,	BC327/328/BC6 BC337/639 (BC557 (BFY90 (3SK40/MFE131 (BC548 (BC548 (BC337/BC639 (BC327/BC640 (BC548 (BC548 (BC548 (BC558 (2SK125 (3SK40/MFE131 (2SC1674 (2N3948 (2N3948 (MRF629 (2N5590 (BC548 (BC548 (BC548 (BC548 (C548	<pre>40(transistor) transistor) transistor)</pre>
	C139 C140 C141 C142 C143 C144 C145 C146 C147 C148 C149 C150 C151 C152 C153 C154 C155 C156 C157 C158 C159 C160	A16, C17, C15, D15, D14, D14, H15, F14, F15, H15, I16, F15, H12, J17, J17, J18, J19, J20,	0.01uF 0.0047uF 27pF 47pF 15pF 0.01uF 180pF 0.047uF 0.047uF 0.047uF 0.01uF 0.047uF 0.022uF Not Alloca 0.047uF 3.3uF 25V 1uF 25V 0.047uF 3.3uF 25V 1uF 25V 0.047uF 0.047uF	(ceramic) (tantalum) (ceramic)	Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18 Q19 Q20 Q21 Q22 Q23 Q24 Q25	B6, A10, B11, L6, G8, L12, O19, N18, N20, N16, N15, N14, H10, F10, D10, D8, G4, K15, K16, G13,	BC327/328/BC6 BC337/639 (BC557 (BFY90 (3SK40/MFE131 (BC548 (BC548 (BC337/BC639 (BC327/BC640 (BC548 (BC548 (BC548 (BC558 (2SK125 (3SK40/MFE131 (2SC1674 (2N3948 (2N3948 (MRF629 (2N5590 (BC548 (BC5	<pre>40(transistor) transistor) </pre>
	C139 C140 C141 C142 C143 C144 C145 C146 C147 C148 C149 C150 C151 C152 C153 C154 C155 C156 C157 C158 C157 C158 C159 C160 C161	A16, C17, C15, D15, D14, D14, F15, H15, I16, F15, H12, J17, J17, J18, J20, K20,	0.01uF 0.0047uF 27pF 47pF 15pF 0.01uF 180pF 0.047uF 0.047uF 0.01uF 0.01uF 0.047uF 0.022uF Not Alloca 0.047uF 3.3uF 25V 1uF 25V 0.047uF 3.3uF 25V 1uF 25V 0.047uF 3.3pF 56pF	(ceramic)	Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18 Q19 Q20 Q21 Q22 Q23 Q24 Q25 Q26	B6, A10, B11, L6, G8, L12, O19, N18, N18, N16, N15, N14, H10, F10, D10, D8, G4, K15, K16, G13, D15,	BC327/328/BC6 BC337/639 (BC557 (BFY90 (3SK40/MFE131 (BC548 (BC548 (BC558 (BC327/BC640 (BC548 (BC548 (BC548 (BC548 (BC548 (BC558 (2SK125 (3SK40/MFE131 (2SC1674 (2N3948 (MRF629 (2N5590 (BC548 (BC548 (BC548 (BC548 (SSK40/MFE131 (2SC1674 (2N3948 (MRF629 (SSK40/MFE131 (SSK40/MFE131 (SSK40/MFE131 (SSK40/MFE131 (SSK40/MFE131 (SSK40/MFE131 (SSC1674 (<pre>40(transistor) transistor) transistor)</pre>
	C139 C140 C141 C142 C143 C144 C145 C146 C147 C148 C149 C150 C151 C152 C153 C154 C155 C156 C157 C158 C156 C157 C158 C160 C161 C162	A16, C17, C15, D15, D14, H15, F14, F15, H15, H15, H12, J17, J17, J17, J18, J20, K11,	0.01uF 0.0047uF 27pF 47pF 15pF 0.01uF 180pF 0.047uF 0.047uF 0.01uF 0.01uF 0.047uF 0.022uF Not Alloca 0.047uF 3.3uF 25V 1uF 25V 0.047uF 3.3uF 25V 1uF 25V 0.047uF 3.3pF 56pF 220pF	(ceramic)	Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18 Q19 Q20 Q21 Q22 Q23 Q24 Q25 Q26 Q27	B6, A10, B11, L6, G8, L12, O19, N18, N18, N16, N15, N14, H10, F10, D10, D8, G4, K15, K16, G13, F14,	BC327/328/BC6 BC337/639 (BC557 (BFY90 (35K40/MFE131 (BC548 (BC548 (BC558 (BC337/BC639 (BC548 (BC548 (BC548 (BC548 (BC548 (BC558 (25K125 (35K40/MFE131 (25C1674 (2N3948 (NRF629 (2N5590 (BC548 (BC548 (BC548 (35K40/MFE131 (25C1674 (2SC1674 (2SC	40 (transistor) transistor)
	C139 C140 C141 C142 C143 C144 C145 C146 C147 C148 C149 C150 C151 C152 C153 C154 C155 C156 C157 C158 C157 C158 C160 C161 C162 C163	A16, C17, C15, D15, D14, D14, F15, H15, H15, H15, H12, J17, J17, J18, J19, K20, K11, J12,	0.01uF 0.0047uF 27pF 47pF 15pF 0.01uF 180pF 0.047uF 0.047uF 0.01uF 0.01uF 0.022uF Not Alloca 0.047uF 3.3uF 25V 1uF 25V 1uF 25V 0.047uF 3.3uF 25V 1uF 25V 0.047uF 3.3pF 56pF 220pF 5.6pF	(ceramic)	Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18 Q19 Q20 Q21 Q22 Q23 Q24 Q25 Q26	B6, A10, B11, L6, G8, L12, O19, N18, N18, N16, N15, N14, H10, F10, D10, G4, K15, K16, G13, D15, F14, H15,	BC327/328/BC6 BC337/639 (BC557 (BFY90 (3SK40/MFE131 (BC548 (BC548 (BC558 (BC337/BC639 (BC548 (BC548 (BC548 (BC558 (BC548 (BC558 (2SK125 (3SK40/MFE131 (2SC1674 (2N3948 (2N3948 (MRF629 (2N5590 (BC548 (B	<pre>40(transistor) transistor) </pre>
	C139 C140 C141 C142 C143 C144 C145 C146 C147 C148 C149 C150 C151 C152 C153 C154 C155 C156 C157 C158 C157 C158 C160 C161 C162 C163 C164	A16, C17, C15, D15, D14, H15, H15, H15, H15, H12, J17, J18, J19, K11, K12, K12, K12,	0.01uF 0.0047uF 27pF 47pF 15pF 0.01uF 180pF 0.047uF 0.047uF 0.01uF 0.047uF 0.022uF Not Alloca 0.047uF 3.3uF 25V 1uF 25V 0.047uF 3.3uF 25V 1uF 25V 0.047uF 3.3pF 56pF 220pF 5.6pF 0.047uF	(ceramic)	Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18 Q19 Q20 Q21 Q22 Q23 Q24 Q25 Q26 Q27 Q28	B6, A10, B11, L6, G8, L12, O19, N18, N10, N15, N14, H10, F10, D10, D8, G4, K15, K16, G13, F14, H15, I15,	BC327/328/BC6 BC337/639 (BC557 (BFY90 (3SK40/MFE131 (BC548 (BC548 (BC558 (BC327/BC640 (BC548 (BC548 (BC548 (BC558 (2SK125 (3SK40/MFE131 (2SC1674 (2N3948 (2N3948 (MRF629 (2N5590 (BC548 (B	40 (transistor) transistor)
	C139 C140 C141 C142 C143 C144 C145 C146 C147 C148 C149 C150 C151 C152 C153 C154 C155 C156 C157 C158 C156 C157 C160 C161 C162 C163 C164 C165 C165 C165	A16, C17, C15, D15, D14, D14, H15, H15, H15, H15, H12, J17, J17, J18, J19, K20, K11, K13, K13,	0.01uF 0.0047uF 27pF 47pF 15pF 0.01uF 180pF 0.047uF 0.047uF 0.047uF 0.022uF Not Alloca 0.047uF 3.3uF 25V 1uF 25V 0.047uF 3.3uF 25V 1uF 25V 0.047uF 0.047uF 3.3pF 56pF 220pF 5.6pF 0.047uF 0.047uF	(ceramic) (ceramic) <td< td=""><td>Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18 Q19 Q20 Q21 Q22 Q23 Q24 Q25 Q26 Q27 Q28 Q29</td><td>B6, A10, B11, L6, G8, L12, O19, N18, N10, N15, N14, H10, F10, D10, D8, G4, K15, K16, G13, F14, H15, I15,</td><td>BC327/328/BC6 BC337/639 (BC557 (BFY90 (3SK40/MFE131 (BC548 (BC548 (BC558 (BC327/BC640 (BC548 (BC548 (BC548 (BC558 (2SK125 (3SK40/MFE131 (2SC1674 (2N3948 (2N3948 (MRF629 (2N5590 (BC548 (B</td><td><pre>40(transistor) transistor) </pre></td></td<>	Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18 Q19 Q20 Q21 Q22 Q23 Q24 Q25 Q26 Q27 Q28 Q29	B6, A10, B11, L6, G8, L12, O19, N18, N10, N15, N14, H10, F10, D10, D8, G4, K15, K16, G13, F14, H15, I15,	BC327/328/BC6 BC337/639 (BC557 (BFY90 (3SK40/MFE131 (BC548 (BC548 (BC558 (BC327/BC640 (BC548 (BC548 (BC548 (BC558 (2SK125 (3SK40/MFE131 (2SC1674 (2N3948 (2N3948 (MRF629 (2N5590 (BC548 (B	<pre>40(transistor) transistor) </pre>
	C139 C140 C141 C142 C143 C144 C145 C146 C147 C148 C149 C150 C151 C152 C153 C154 C155 C156 C157 C156 C157 C158 C160 C161 C162 C163 C164 C165 C165 C166 C167	A16, C17, C15, D15, D14, D14, H15, H15, H15, H15, H12, J17, J17, J18, J19, K20, K11, K12, K12, K13, K13, K13,	0.01uF 0.0047uF 27pF 47pF 15pF 0.01uF 180pF 0.047uF 0.047uF 0.01uF 0.047uF 0.022uF Not Alloca 0.047uF 3.3uF 25V 1uF 25V 1uF 25V 0.047uF 3.3pF 56pF 220pF 5.6pF 220pF 5.6pF 0.047uF 0.0	(ceramic) (ceramic) <td< td=""><td>Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18 Q19 Q20 Q21 Q22 Q23 Q24 Q25 Q26 Q27 Q28 Q29</td><td>B6, A10, B11, L6, G8, L12, O19, N18, N10, N15, N14, H10, F10, D10, D8, G4, K15, K16, G13, F14, H15, I15,</td><td>BC327/328/BC6 BC337/639 (BC557 (BFY90 (3SK40/MFE131 (BC548 (BC548 (BC558 (BC327/BC640 (BC548 (BC548 (BC548 (BC558 (2SK125 (3SK40/MFE131 (2SC1674 (2N3948 (2N3948 (MRF629 (2N5590 (BC548 (B</td><td><pre>40(transistor) transistor) </pre></td></td<>	Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18 Q19 Q20 Q21 Q22 Q23 Q24 Q25 Q26 Q27 Q28 Q29	B6, A10, B11, L6, G8, L12, O19, N18, N10, N15, N14, H10, F10, D10, D8, G4, K15, K16, G13, F14, H15, I15,	BC327/328/BC6 BC337/639 (BC557 (BFY90 (3SK40/MFE131 (BC548 (BC548 (BC558 (BC327/BC640 (BC548 (BC548 (BC548 (BC558 (2SK125 (3SK40/MFE131 (2SC1674 (2N3948 (2N3948 (MRF629 (2N5590 (BC548 (B	<pre>40(transistor) transistor) </pre>
	C139 C140 C141 C142 C143 C144 C145 C146 C147 C148 C149 C150 C151 C152 C153 C154 C155 C156 C157 C158 C156 C161 C162 C163 C164 C165 C166 C167 C168	A16, C17, C15, D15, D14, H15, H15, H15, H15, H12, J17, J18, J19, K12, K11, J12, K12, K12, K12, K12, K12, K12, K12, K	0.01uF 0.0047uF 27pF 47pF 15pF 0.01uF 180pF 180pF 0.047uF 0.047uF 0.01uF 0.047uF 0.022uF Not Alloca 0.047uF 3.3uF 25V 1uF 25V 1uF 25V 0.047uF 0.047uF 3.3pF 56pF 220pF 5.6pF 220pF 5.6pF 0.047uF 0.040f 0.047uF 0.040f 0.040	(ceramic) (ceramic) <td< td=""><td>Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18 Q19 Q20 Q21 Q22 Q23 Q24 Q25 Q26 Q27 Q28 Q29 Q30</td><td>B6, A10, B11, C6, G8, L12, O19, N18, N18, N16, N15, N14, H10, D10, D8, G4, K15, K16, G13, D15, F14, H15, J17,</td><td>BC327/328/BC6 BC337/639 (BC557 (BFY90 (3SK40/MFE131 (BC548 (BC548 (BC558 (BC327/BC640 (BC548 (BC548 (BC548 (BC558 (2SK125 (3SK40/MFE131 (2SC1674 (2N3948 (2N3948 (MRF629 (2N5590 (BC548 (B</td><td><pre>40(transistor) transistor) </pre></td></td<>	Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18 Q19 Q20 Q21 Q22 Q23 Q24 Q25 Q26 Q27 Q28 Q29 Q30	B6, A10, B11, C6, G8, L12, O19, N18, N18, N16, N15, N14, H10, D10, D8, G4, K15, K16, G13, D15, F14, H15, J17,	BC327/328/BC6 BC337/639 (BC557 (BFY90 (3SK40/MFE131 (BC548 (BC548 (BC558 (BC327/BC640 (BC548 (BC548 (BC548 (BC558 (2SK125 (3SK40/MFE131 (2SC1674 (2N3948 (2N3948 (MRF629 (2N5590 (BC548 (B	<pre>40(transistor) transistor) </pre>
	C139 C140 C141 C142 C143 C144 C145 C146 C147 C148 C149 C150 C151 C152 C153 C154 C155 C156 C157 C158 C156 C167 C162 C163 C164 C165 C166 C167 C168 C169	A16, C17, C15, D15, D14, H15, H15, H15, H15, H12, J17, J18, J19, K11, K12, K12, K12, K12, K12, K12, K12	0.01uF 0.0047uF 27pF 47pF 15pF 0.01uF 180pF 180pF 0.047uF 0.047uF 0.047uF 0.022uF Not Alloca 0.047uF 3.3uF 25V 1uF 25V 1uF 25V 0.047uF 3.3pF 56pF 220pF 5.6pF 220pF 5.6pF 0.047uF 0.04	(ceramic) (ceramic) <td< td=""><td>Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18 Q19 Q20 Q21 Q22 Q23 Q24 Q25 Q26 Q27 Q28 Q29</td><td>B6, A10, B11, C6, G8, L12, O19, N18, N18, N16, N15, N14, H10, D10, D8, G4, K15, K16, G13, D15, F14, H15, J17,</td><td>BC327/328/BC6 BC337/639 (BC557 (BFY90 (3SK40/MFE131 (BC548 (BC548 (BC558 (BC327/BC640 (BC548 (BC548 (BC548 (BC558 (2SK125 (3SK40/MFE131 (2SC1674 (2N3948 (2N3948 (MRF629 (2N5590 (BC548 (B</td><td><pre>40(transistor) transistor) </pre></td></td<>	Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18 Q19 Q20 Q21 Q22 Q23 Q24 Q25 Q26 Q27 Q28 Q29	B6, A10, B11, C6, G8, L12, O19, N18, N18, N16, N15, N14, H10, D10, D8, G4, K15, K16, G13, D15, F14, H15, J17,	BC327/328/BC6 BC337/639 (BC557 (BFY90 (3SK40/MFE131 (BC548 (BC548 (BC558 (BC327/BC640 (BC548 (BC548 (BC548 (BC558 (2SK125 (3SK40/MFE131 (2SC1674 (2N3948 (2N3948 (MRF629 (2N5590 (BC548 (B	<pre>40(transistor) transistor) </pre>
	C139 C140 C141 C142 C143 C144 C145 C146 C147 C148 C149 C150 C151 C152 C153 C154 C155 C156 C157 C158 C157 C160 C161 C162 C163 C164 C165 C166 C167 C168 C169 C170	A16, C17, C15, D15, D14, H15, H15, H15, H15, H12, J17, J18, J19, K111, K12, K111, K11, K11, K11, K11, K11, K11, K11, K11, K11, K11, K11, K11, K11, K11, K11, K11,	0.01uF 0.0047uF 27pF 47pF 15pF 0.01uF 180pF 180pF 0.047uF 0.047uF 0.01uF 0.047uF 0.022uF Not Alloca 0.047uF 3.3uF 25V 1uF 25V 1uF 25V 0.047uF 3.3pF 56pF 220pF 5.6pF 220pF 5.6pF 220pF 5.6pF 0.047uF	(ceramic) (ceramic) <td< td=""><td>Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18 Q19 Q20 Q21 Q22 Q23 Q24 Q25 Q26 Q27 Q28 Q29 Q30</td><td>B6, A10, B11, C6, G8, L12, O19, N18, N18, N16, N15, N14, H10, D10, D8, G4, K15, K16, G13, D15, F14, H15, J17,</td><td>BC327/328/BC6 BC337/639 (BC557 (BFY90 (3SK40/MFE131 (BC548 (BC548 (BC558 (BC327/BC640 (BC548 (BC548 (BC548 (BC558 (2SK125 (3SK40/MFE131 (2SC1674 (2N3948 (2N3948 (MRF629 (2N5590 (BC548 (B</td><td><pre>40(transistor) transistor) </pre></td></td<>	Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18 Q19 Q20 Q21 Q22 Q23 Q24 Q25 Q26 Q27 Q28 Q29 Q30	B6, A10, B11, C6, G8, L12, O19, N18, N18, N16, N15, N14, H10, D10, D8, G4, K15, K16, G13, D15, F14, H15, J17,	BC327/328/BC6 BC337/639 (BC557 (BFY90 (3SK40/MFE131 (BC548 (BC548 (BC558 (BC327/BC640 (BC548 (BC548 (BC548 (BC558 (2SK125 (3SK40/MFE131 (2SC1674 (2N3948 (2N3948 (MRF629 (2N5590 (BC548 (B	<pre>40(transistor) transistor) </pre>
	C139 C140 C141 C142 C143 C144 C145 C146 C147 C148 C150 C151 C152 C153 C154 C155 C156 C157 C158 C157 C160 C161 C162 C163 C164 C165 C166 C167 C168 C170 C171	A16, C17, C15, D15, D14, H15, H15, H15, H15, H12, J17, J18, J19, K112, K113, K12, K113, K12, K12, K13, K13, K13, K13,	0.01uF 0.0047uF 27pF 47pF 15pF 0.01uF 180pF 0.047uF 0.047uF 0.047uF 0.022uF Not Alloca 0.047uF 0.022uF Not Alloca 0.047uF 3.3uF 25V 1uF 25V 0.047uF	(ceramic) (ceramic) <td< td=""><td>Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18 Q19 Q20 Q21 Q22 Q23 Q24 Q25 Q26 Q27 Q28 Q29 Q30</td><td>B6, A10, B11, L6, G8, L12, O19, N18, N18, N16, N15, N14, H10, E6, G4, K15, K16, G13, D15, F14, H15, J17,</td><td>BC327/328/BC6 BC337/639 (BC557 (BFY90 (3SK40/MFE131 (BC548 (BC548 (BC558 (BC337/BC639 (BC327/BC640 (BC548 (BC548 (BC548 (BC558 (2SK125 (3SK40/MFE131 (2SC1674 (2N3948 (2N3948 (2N3948 (MRF629 (2N5590 (BC548 (BC</td><td>40 (transistor) </td></td<>	Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18 Q19 Q20 Q21 Q22 Q23 Q24 Q25 Q26 Q27 Q28 Q29 Q30	B6, A10, B11, L6, G8, L12, O19, N18, N18, N16, N15, N14, H10, E6, G4, K15, K16, G13, D15, F14, H15, J17,	BC327/328/BC6 BC337/639 (BC557 (BFY90 (3SK40/MFE131 (BC548 (BC548 (BC558 (BC337/BC639 (BC327/BC640 (BC548 (BC548 (BC548 (BC558 (2SK125 (3SK40/MFE131 (2SC1674 (2N3948 (2N3948 (2N3948 (MRF629 (2N5590 (BC548 (BC	40 (transistor)
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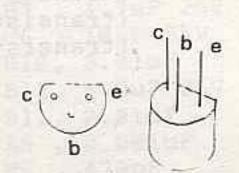
	The state of the s	LIVER VALUE INTERESTED IN THE PROPERTY OF THE
L5 L6 L7 L8 L9	G6 , Can 10GP004S	IC3 F19, 4560B/14560BC
L10 L11	C9 , Can 10GP004S	RF CHOKES
L12 L13 L14 L15 L16 L17 L18 L19	F13, Choke 2.5mH	RFC1, Not Allocated
L20 L21 L22 L23	D5 , Air Coil 2.5T 18B&S En/Cu E5 , Hair Pin Link 25B&S Tin/Cu F4 , Air Coil 1T 18B&S En/Cu H3 , Air Coil 1.5T 18B&S En/Cu	CRYSTALS
L28	<pre>14 , Hair Pin Link 18B&S En/Cu M3 , Air Coil 1.5T 18B&S En/Cu M4 , Air Coil 1T 18B&S En/Cu 04 , Air Coil 2.5T 18B&S En/Cu 07 , Air Coil 2.5T 18B&S En/Cu 03 , Air Coil 2.5T 18B&S En/Cu</pre>	X1 L9 , 10.245 or 11.155MHz(xtal) X2 K20, 10.240 MHZ (xtal)
L29 L30 L31	N2 , Air Coil 2.5T 18B&S En/Cu	FILTERS
	N10, MC3357	FL1 J8 , 10.7 MHZ 2 Pole Filter FL2, NOT ALLOCATED FL3 L11, 455 KHZ Filter

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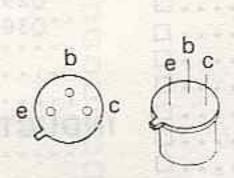






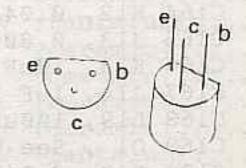


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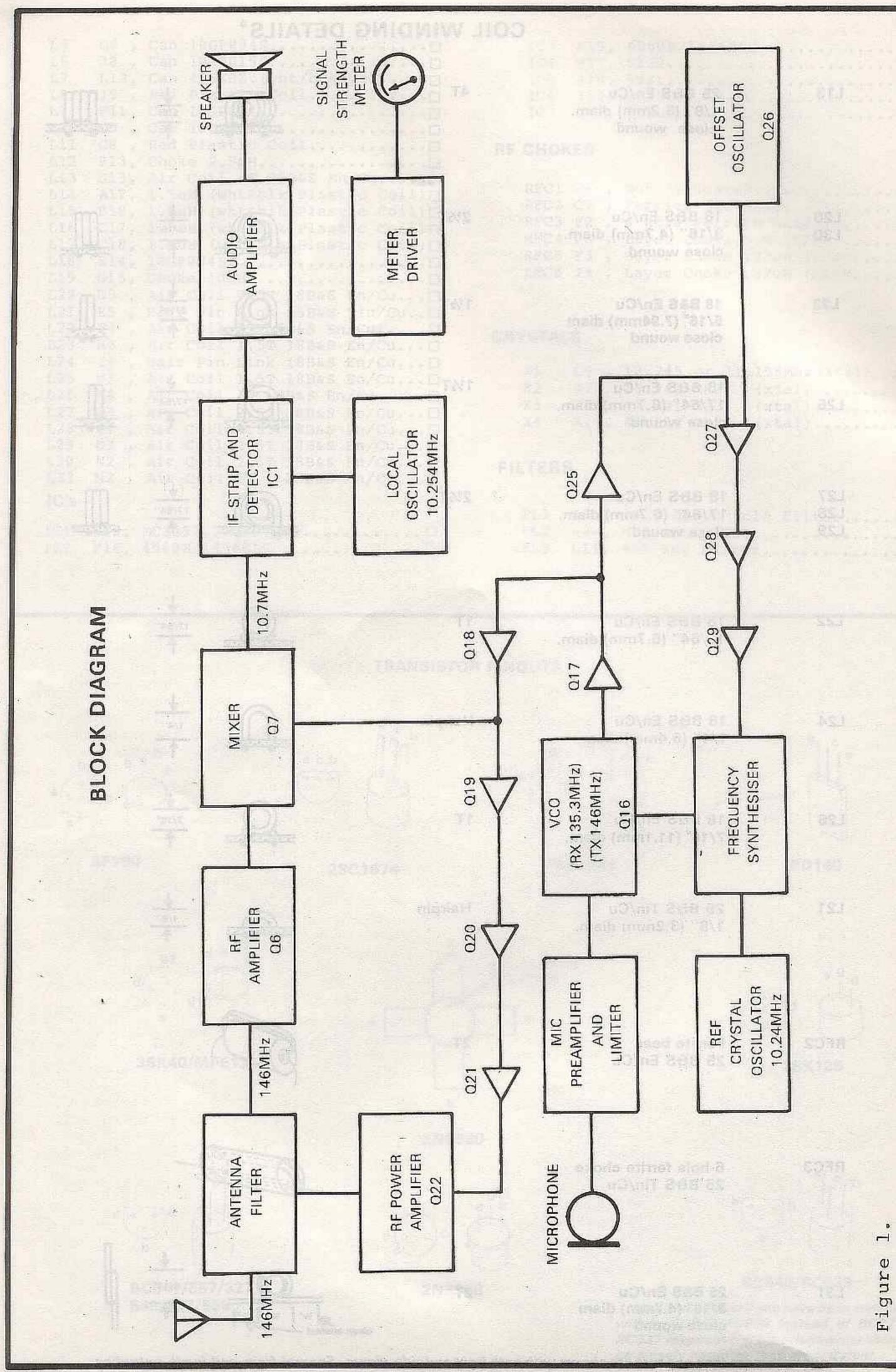
BC640/BC639

Please note that if you have been supplied with a BC640/BC639 instead of BC327/ BC337 respectively, pin orientations should be closely noted as they are different.

COIL WINDING DETAILS*

L13	25 B&S En/Cu 1/8" (3.2mm) diam. close wound	4T		<u>↓</u> 1/8" ↑	
L20 L30	18 B&S En/Cu 3/16" (4.7mm) diam. close wound	2½T		3/16"	
L23	18 B&S En/Cu 5/16" (7.94mm) diam close wound	11/2T		√ 5/16" ↑	
L25	18 B&S En/Cu 17/64" (6.7mm) diam. close wound	1½T		17/64"	
L27 L28 L29	18 B&S En/Cu 17/64" (6.7mm) diam. close wound	21∕₂T		17/64"	
L22	18 B&S En/Cu 17/64" (6.7mm) diam.	1T		17/64"	
L24	18 B&S En/Cu 1/4" (6.4mm) diam.	Hairpin		1/4"	
L26	18 B&S En/Cu 7/16" (11.1mm) diam.	1T	PANNE NAME OF THE PARTY OF THE	7/16"	
L21	25 B&S Tin/Cu 1/8" (3.2mm) diam.	Hairpin	5. J.	1/8"	Some and some
RFC2	Ferrite bead 25 B&S En/Cu	2T			punctulare of according to the second
RFC3	6-hole ferrite choke 25 B&S Tin/Cu)_	
L31	25 B&S En/Cu 3/16" (4.7mm) diam close wound	2T	clean enamel	3/16"	

^{*}Coils with more than one turn are shown with both front and side views. Enamel from coil leads extruding through the board should be scraped clean before soldering.



How it works

Readers who have already taken a look at the circuit and block diagrams will have noted the similarities to the circuit of the abovementioned UHF transceiver described last year. Some sections of the circuit, notably the microphone preamplifier and audio power amplifier, are identical while other sections, such as the antenna filter, IF strip and power supply, are also very similar.

For those not familiar with the series of articles on the UHF transceiver, let's now go through the block diagram, before attacking the main circuit diagram. Refer now to Fig. 1.

The block diagram shows that the transceiver is split into two sections, receiver and transmitter, which come together in the antenna filter. Both these sections employ a common frequency synthesiser and voltage controlled oscillator.

The receiver is a conventional double conversion superheterodyne with intermediate frequencies at 10.7MHz and 455kHZ. The second conversion from 10.7MHz to 455kHz is achieved in an integrated circuit which also includes limiting amplifiers and an FM quadrature detector. From there the signal is passed to an audio amplifier.

The VCO (voltage controlled oscillator) has two modes and, as you might have guessed, these are transmit and receive. In the transmit mode, the VCO is set to an exact frequency within the range of 144 to 148MHz by the frequency synthesiser which, in turn, is controlled by the offset oscillator. The output of the VCO is fed via Q17 and Q18 to the RF power amplifier and thence via the antenna filter circuit to the output socket.

In the receive mode, the VCO is set at a frequency exactly 10.7MHz below the incoming frequency. This is necessary to give the 10.7MHz intermediate frequency at the output of the mixer, Q7. The lower VCO frequency is obtained by switching a different crystal into the offset oscillator.

Circuit details

Now let's have a look at the circuit diagram. Don't shudder. If you figured out the UHF transceiver described last year, this one is more straightforward in most respects. We'll consider the receiver circuitry first.

Input signals from the antenna are fed via the antenna filter and RF switching network on the extreme righthand side of the circuit diagram. The signals pass via L30, L29, L27, L26 and L28 and C123. From there they go to the input of Q6 via transformer L2 and C11 (on the extreme lefthand side of the circuit).

The RF switching is performed by D13 (near L28, on the RH side of circuitry). In the transmit mode, D13 is forward biased and thus shorts out any RF signal from the transmitter which would otherwise be fed into the receiver input.

Q6 is a conventional common emitter amplifier with L3 as its collector load. L3 is part of the three-stage bandpass filter which only accepts signals in the 144 to 148MHz range.

Mosfet Q7 is the mixer. Gate 1 of Q7 is the incoming RF signal while gate 2 is the VCO (local oscillator) signal. L6 is the drain load of Q7 and the mixer output is the difference frequency, 10.7MHz. This is passed via FL1, a two-pole filter, to IC1.

IC1 is a Motorola MC3357 device specifically designed for use in a narrow-band FM dual conversion communications receiver which is exactly what this circuit is. We have already talked about the first conversion which is from 144 (to 148MHz) down to 10.7MHz which takes place in mixer Q7. The MC3357 handles the second conversion using an internal 10.245MHz local oscillator.

This gives a second intermediate frequency signal of 455kHz which is amplified, limited and detected by IC1. IC1 also provides the squelch function.

In greater detail, crystal X1 at pin 1 of IC1 sets the local oscillator frequency to 10:245MHz. This is internally mixed with the 10.7MHz signal from Q7 to produce a 455kHz IF which is then fed to an external filter at pin 3. Transistor Q8 amplifies the filtered 455kHz signal and feeds it back into the limiting amplifier input at pin 5.

The limiting amplifier is a five-stage differential amplifier which boosts the 455kHz signal well into clipping, at its output. That is, we say the signal is limited. This effectively removes any amplitude variations (AM) so that the signal only contains frequency modulation.

The limited signal is then fed to the internal FM quadrature detector associated with coil L7 and capacitor C37 at pins 7 and 8.

The detected audio is extracted from pin 9 and fed via R33 and C35 to VR40, the volume control. At the same time, a sample of the signal is coupled via R32 and C33 to an internal amplifier between

This amplifies any noise signal (hiss) above the expected audio passband which is then rectified by D7 and used to "squelch" the audio output via control pin 12. VR39 is the squelch control.

Transistor Q8 feeds a portion of the 455kHz signal (before limiting is applied) to IC7, the meter amplifier. This produces an indication of signal strength when in the receive mode.

Transistors Q9 to Q12 form a conventional audio amplifier. Q9 is a straightfor-

ward common emitter stage with negative feedback applied to the emitter via R44. Q10 is a class-A driver with bootstrapping via the output capacitor, C47. Its collector load is R49 and the

speaker itself.

pins 10 and 11.

If the speaker is disconnected for any reason the whole amplifier will latch up which is how it manages to withstand open-circuits continuously (see specs).

Q11 and Q12 form a fully complementary output pair with quiescent current set by R46 and D8. R47 and R48 are rather high in value at 2.2Ω which gives good bias stability, limits the power output to some extent and gives momentary short circuit protection.

Resistors R44 and R43 set the audio amplifier gain to around 25 (ie, 5600/220 = 25) while C45 rolls off the response

above 3kHz.

Transmitter operation

The transmitter is controlled by the press-to-talk switch on the microphone and this controls the various supply rails, as mentioned above. We'll come back to that. The signal from the microphone is fed to the preamplifier, Q13 and Q14, which provide substantial gain. The amplified signal is fed via C52 to a diode limiting circuit, D9 and D10, which prevent the following stages from being overloaded.

The signal from D10 is fed to Q15, a two pole active filter stage with a gain of unity. The output of this stage is the modulating signal which is applied from trimpot VR61 to varicap diode D11 via R62, C57 and R64. D11 is in the tank circuit of the VCO (Q16), and thus is able to frequency modulate the VCO according to the microphone signal voltage.

The VCO is a conventional grounded gate oscillator using an N-channel FET. It oscillates at a nominal 146MHz (centre of band) as set by L8 and C64. Varicap D12 sets the VCO to the exact frequency required, as controlled by the

frequency synthesiser.

The main VCO output signal is taken from its source and fed to Q17 and Q18, which are transformer coupled, and thence to Q19 and Q20 which are more or less conventional common emitter amplifier stages. Q21 and Q22, on the other hand, are class-C power amplifier stages which operate without forward bias at their bases.

By way of explanation, in a class-C amplifier such as Q22, the collector current flows for substantially less than every alternate half cycle with the tuned circuit preventing the generation of harmonics. In effect, a class-C amplifier tank circuit can be considered as the analog of a flywheel which has a short burst of energy applied to it during every cycle. It is a highly efficient amplifier.

The output power from Q22 is coupled to the antenna filter circuit mentioned previously. The path is via L26, L27, L29 and L30 to the output socket. A measure of the transmitter output is provided as follows: Gimmick capacitor C169 (two wires twisted together) feeds a small portion of the transmitter output to D14 which rectifies the signal and applies the resultant DC to the signal meter via R109 and filter capacitor C134.

Frequency synthesis

The method of frequency synthesis is essentially a variation on the conven-

Page 15

tional phase lock loop (PLL) circuit. A PLL normally comprises a voltage controlled oscillator (VCO), a reference oscillator, a programmable frequency divider (fed by the VCO), and a phase comparator which compares the frequency divided output of the VCO with the reference oscillator.

For a VHF transceiver it is usual to have three oscillators: a VCO, a reference oscillator and an offset oscillator. In this case the VCO is Q16, the reference oscillator is associated with IC6 and the offset oscillator is Q26. IC5 is the phase comparator and IC4 is the programmable divider.

Let's start by looking at IC6. This IC is a combined oscillator and divider with a division ratio of 1024. It drives crystal X2 at a frequency of 10.24MHz which when divided by 1024 produces a reference frequency of 10kHz at pin 7.

IC5, the phase comparator, compares the 10kHz reference frequency from IC6 against the 10kHz output from the programmable frequency divider, IC4. The output at pin 3 of IC5 is the PLL error voltage which is a series of pulses. These are filtered to produce smooth DC by R91, C156, R87, R86 and C153. This DC error voltage is then applied to D12 in the VCO (Q16) to maintain control over the VCO output.

As shown on the circuit, when the PLL is in the lock condition and the VCO output is 144MHz, then the error voltage at TP3 is 2.7 volts DC (after set-

ting up).

Where the frequency synthesiser circuit diverges from normal PLL practice is that the programmable divider does not merely "divide down" the output of the VCO. Instead, IC4 divides the difference between the VCO output and the third harmonic of the offset oscillator.

The reason for this indirect procedure is that it is not possible to easily provide for programmable division directly from 144MHz.

What happens is this. The offset oscillator, Q26, operates at 44.234966MHz in receive mode and at 47.801666MHz in transmit mode. The relevant crystals, X4 and X3, are switched into circuit by diodes D23 or D22.

The collector output circuit of Q26 is tuned to the third harmonic of these frequencies ie, 132.704898MHz and 143.404998MHz.

Depending on whether the transceiver is in receive or transmit mode, one or other of these offset frequencies will be substracted from the VCO output frequency by the offset mixer, Q27. The difference frequency will range from 595kHz (eg, 144-143.405) to 4.595MHz (148-143.405).

It is this range of difference frequen-Page 16 cies which is applied to the programmable frequency divider, IC4, via Q28 and Q29.

So IC4 is programmed by the thumbwheel switches to divide the relevant difference frequency from Q27 to provide a 10kHz output which is applied to the phase comparator, IC5.

Note, by the way, that the difference between the transmit and receive offset frequencies is 10.7MHz which is the required intermediate frequency.

So far so good. But now we have to backtrack a little. There is a problem in that IC4 cannot precisely divide frequencies that are not an exact multiple of 10kHz. Therefore that example of 595kHz (the lowest difference frequency) is not valid. And in fact, those offset oscillator frequencies given above are not quite correct.

Because of the provision for 5kHz channel spacing, the offset oscillator crystals are in fact 1666Hz too high. When the third harmonic of each crystal is considered it will be 5kHz high. So in normal operation, the crystals are pulled low by L14 and L15 for X4 and L16 and L17 and X3. So the normal offset transmit frequency is 47.8MHz (143.4MHz 3rd harmonic) and the offset receive frequency is 44.2333MHz (3rd harmonic is 132.7MHz).

When these offset frequencies are subtracted from the VCO the range of difference frequencies will be 600kHz to 4.6MHz. And note that 600kHz is an exact multiple of 10kHz.

When the +5kHz facility is switched on, L15 and L17 are switched out of circuit by diodes D24 and D25, so that now the crystals do run 1666Hz high and so the VCO frequency is shifted up by 5kHz.

Band protection

Note that when the 10kHz outputs of IC6 and IC4 (the programmable divider) are locked together IC5 turns on Q30. This turns on Q18 and Q19 and thus allows the transmitter to operate. Thus the transmitter is prevented from producing signals which are outside the 144 to 148MHz band.

But what about that +5kHz offset we have just discussed. When that is applied it would be possible for the VCO to operate at 148.005MHz and still produce a lock condition. The circuit design takes care of this possibility too since the thumbwheels are wired to only permit a maximum VCO frequency of 147.99MHz. When the 5kHz is added this gives a maximum VCO frequency of 147.995MHz which is still inside the band limits.

Strictly speaking then, this means that only 399 channels are available with 10kHz spacing and 798 channels with 5kHz spacing (144.005 to 147.995MHZ).

± 600kHz offset

Yet another factor has to be taken care of by the frequency synthesiser circuitry. For repeater operation, the transmitter frequency usually has to be offset by minus 600kHz from the receive frequency. Less often, it may have to be changed by plus 600kHz. This condition could be met by adding more crystals to the offset oscillator circuitry but in this circuit it has been achieved digitally.

As well as avoiding the expense of extra crystals, the decimal method of offset does not require any alignment. IC2 and IC3 are digital adders. They add a code of 60 or 120 to the code applied by IC4. In the normal simplex mode, the addition of the 60 code is the standard. For -600 kHz repeater operation, this code is removed (controlled by D18 and IC2).

For +600kHz operation, IC2 and IC3 are brought into play by D29 and D27 to add a code of 120 to IC4.

A neat advantage of this scheme is that it allows the "anti-repeater" operation whereby the receiver only can be shifted by $\pm 600 \mathrm{kHz}$. This is achieved by the pushbutton in conjunction with Q23, Q24 and associated diodes. The advantage of the anti-repeater function is that it allows the operator to listen directly to his contact instead of via the repeater.

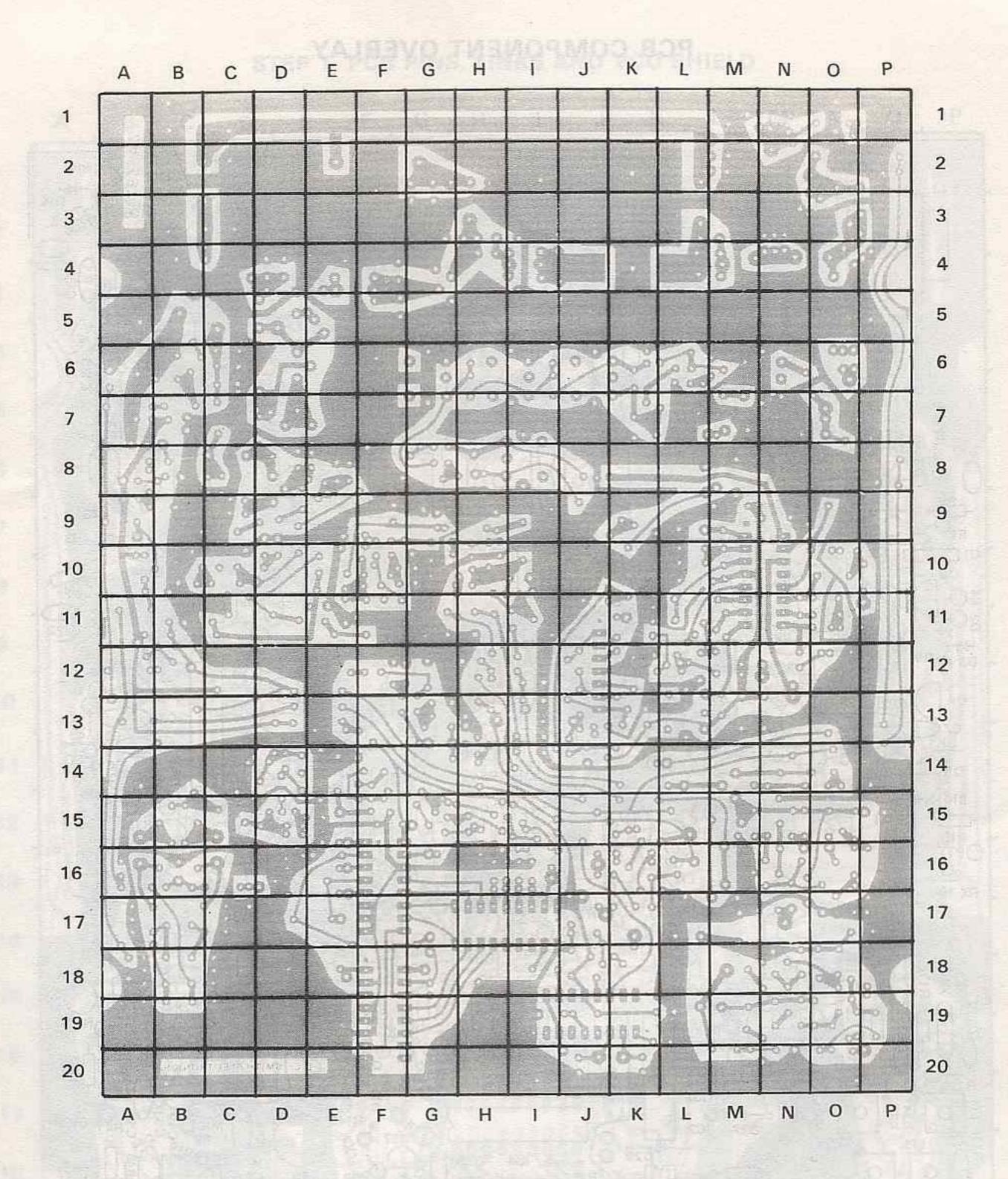
Note that when the 600kHz offset facility is in use, the out-of-band protection circuitry does not prevent transmission outside the band limits. In this case it is up to the operator to make sure he or she does not transgress.

Power supply

A +10V regulated supply derived from Q1, Q2 and D2 supplies power directly to the VCO, offset oscillator, frequency synthesiser circuitry and mix down amplifier (Q28 and Q29). The +10V regulated rail is also switched to various other sections of the circuit by Q4 and Q5, depending on whether the transceiver is in the receive or transmit mode.

When in the receive mode, the pressto-talk switch is open and D3, D4 and D5 cannot conduct. Therefore Q4 supplies the +10V Rx rail. When the PTT switch is closed for transmit mode, D3 and D4 conduct, turning off Q4 and turning on Q5 to supply the +10V Tx rail. D5 also conducts, turning on Q3 to supply the +12V Tx rail.

The final two stages of the RF power amplifier, Q21 and Q22, are powered directly from the 13.8V (battery) supply, as is the audio amplifier. This is OK since Q21 and Q22 are normally biased off and can only operate when Q19 and Q20 are turned on by the +12V Tx rail.



GENERAL INTRODUCTORY INFORMATION

As the diagram above shows, the overlays used in this manual are set out the same as any street directory. (Be it a Melway's, UBD or Gregory's.)

This has been done for a number of reasons, the main one being it will make it easier for the constructor to find his way around the circuit board. Because of the number of components used in this project it would be no problem at all to insert a component into the wrong hole only to discover it at a much later date.

As you can see, the grid we are using is very much like a street directory, with the alphabetic co-ordinates along the horizontal and the numeric co-ordinates along the vertical axis. All references to a location are in the form of alphabet followed by a numeral. If you care to look back at the parts list, you will see the component number followed by the location and value ,e.g., R1 A7,1K (brn-blk-red).

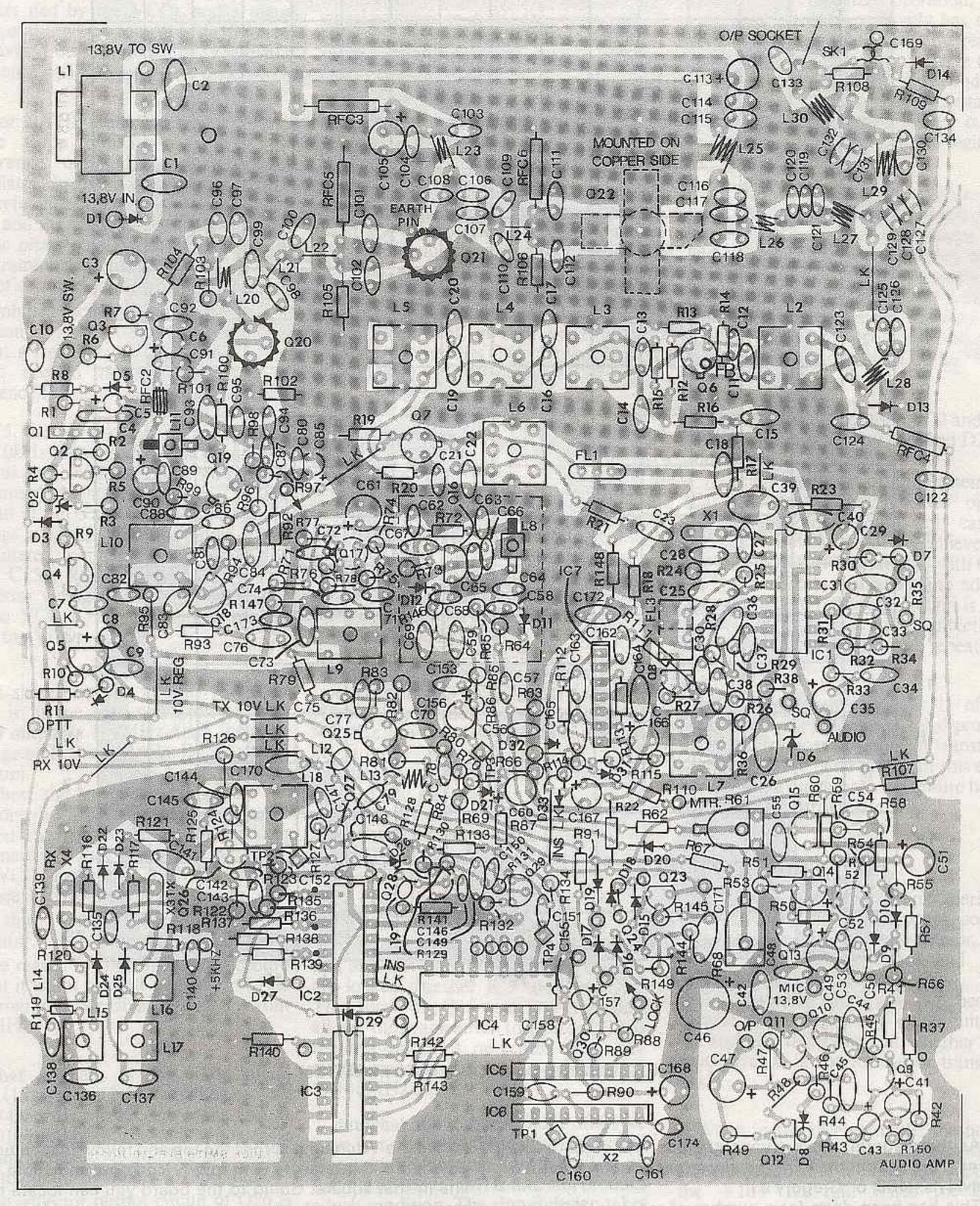
To locate this particular component location you first

locate the 'A' column across the top and follow that column down until it intersects with row 7. You now know that R1 sits in that square. Going to the board you can locate the area quickly and referring to the screen you have the exact location for that part.

Now that you know how to get around this board we might explain some of the other aspects of this project.

The insertion of the components follow the same sequence as any other kit, in that the components that sit closest to the board are inserted first. We insert resistors, capacitors, diodes, transistors, inductors, integrated circuits, chokes, crystals and then the filters. The overlays on the following pages show various stages of construction, broken up to provide easy to handle sections along with a checklist to make sure all parts are inserted as needed. This should prove invaluable to all constructors.

PCB COMPONENT OVERLAY



F/B = Ferrite Bead

MOUNTING PCB PINS, LINKS AND VCO SHIELD.

This is the first stage of construction, and as you can see, it involves only PCB pins, links (note position of insulated links) and VCO shield.

 First of all, we will start by mounting the VCO shield. The four PCB pins used in holding the shield together should be inserted into the PCB holes Page 18 from the copper side of the board. The long side of the pins should be inserted first (refer to Fig.1). This insures that the collars of the pins do not splay the sides of the shield.

 Supplied in your kit is a small piece of thin PCB material. This should then be cut into four equal lengths (approx-

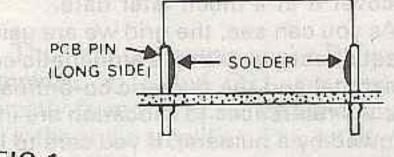
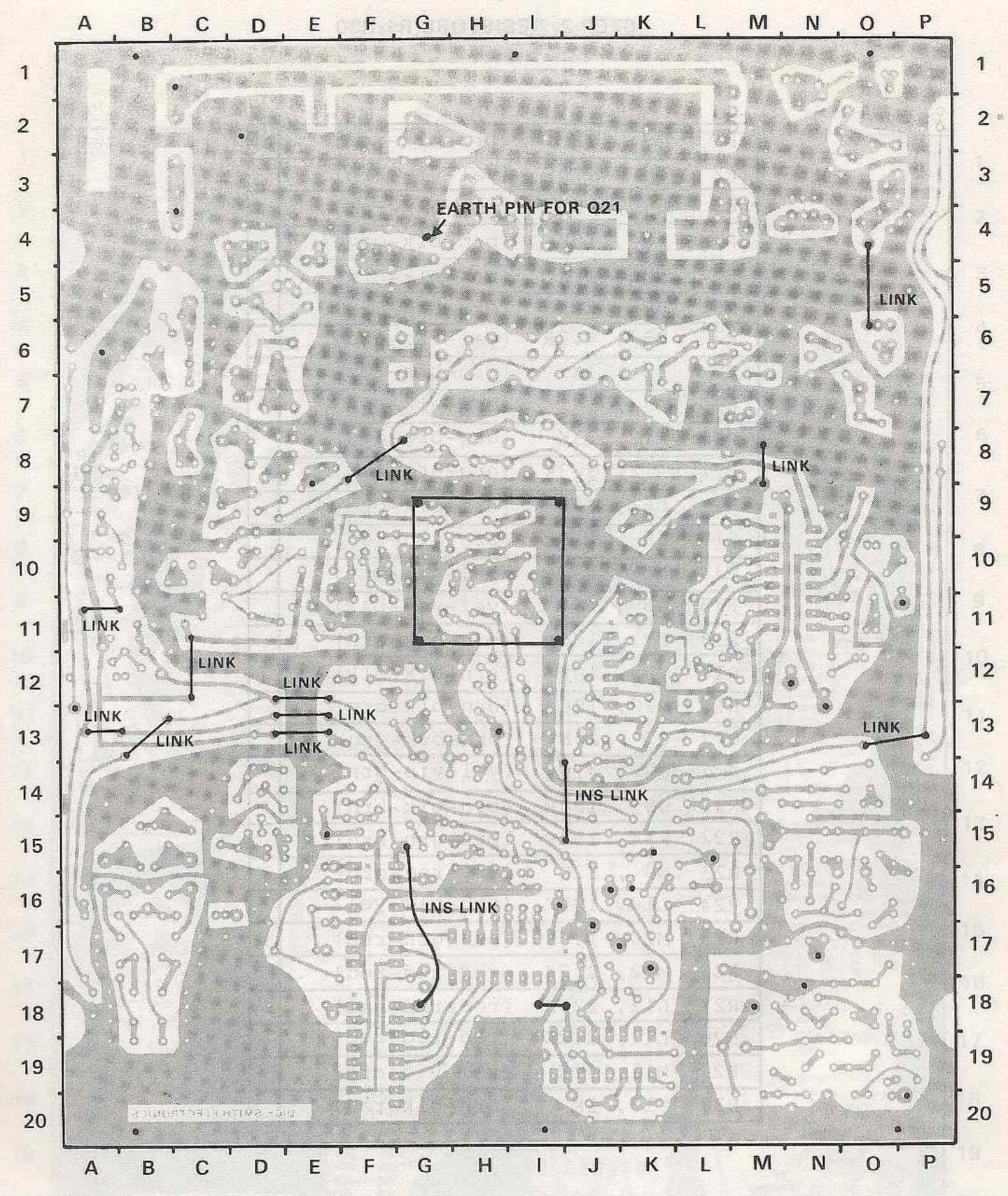


FIG.1

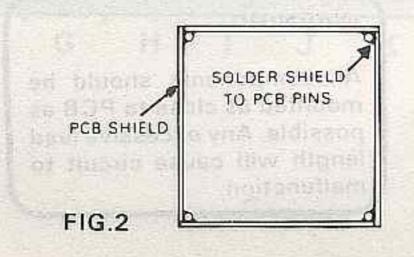
STEP 1. PCB PINS, LINKS AND VCO SHIELD



imately 25mm each) and soldered to the above pins, forming a shield for the VCO (refer to Fig. 2.).

3. Insert and solder all PCB pins and links as shown on layout. Use 25B&S Tin/Cu wire supplied for all links except those shown as insulated links (use telephone wire).

4. Earth pin for Q21 should be inserted from the copper side of the PCB and soldered to the transistor case once the transistor is fitted (please refer to Page . 44).



WARNING

readout (ie, 14-.--MHz). In the photos, this means that the transceiver is set for a frequency of 145.49MHz

Standard controls for volume and squelch require little comment as does the signal strength-cum-power meter. The microphone socket is a standard

configuration allowing press-to-talk operation.

In addition, there is a three-position switch for simplex and plus or minus 600kHz transmitter offset for working into repeaters and there is also an antirepeater button so that the transceiver can be used to listen in on the repeater receiving frequency.

Finally, there is the 5kHz offset switch which effectively doubles the number of channels from 400 to 800, albeit with 5kHz channel spacing.

INDEX

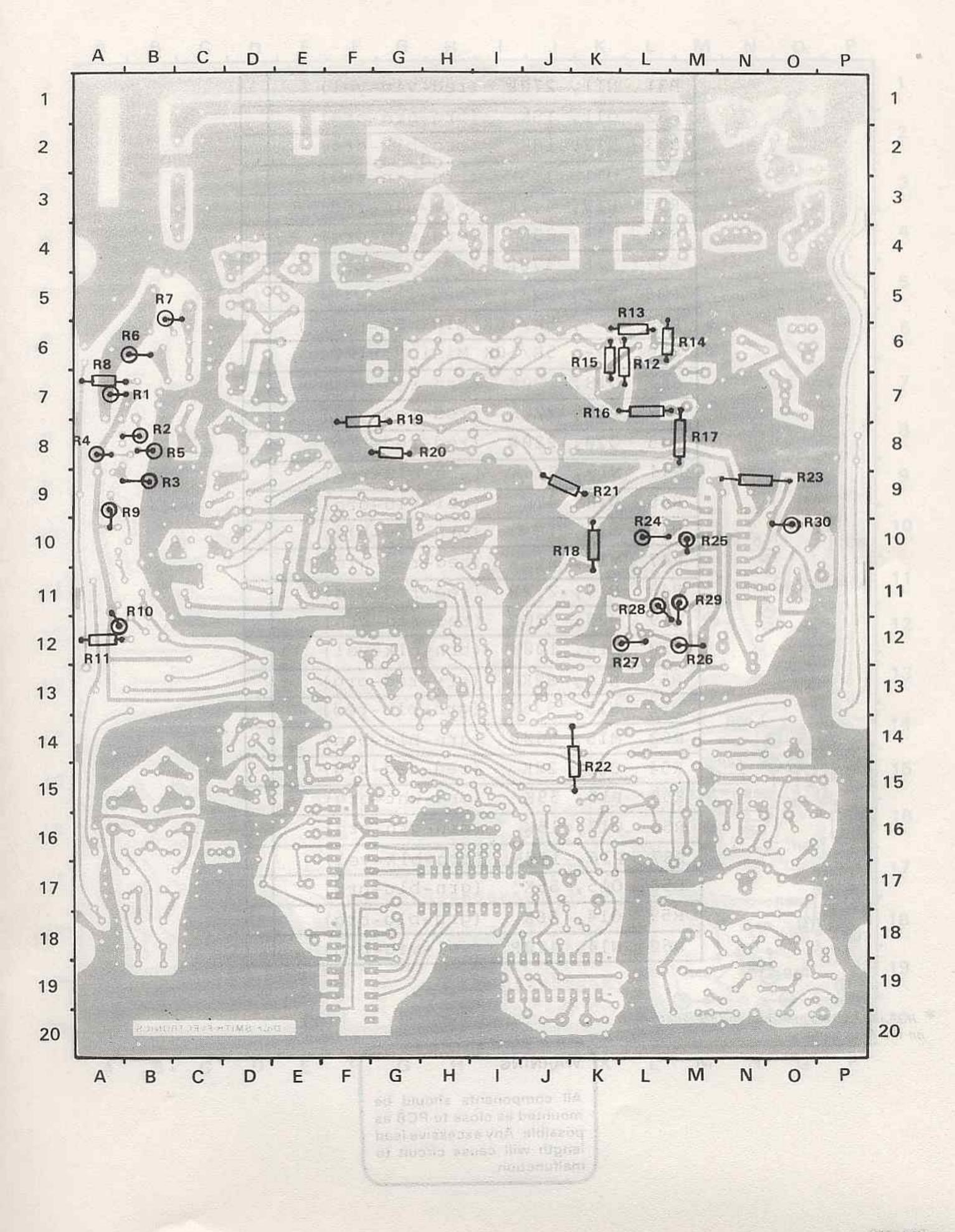
Introduction
Specifications
Guide to Kit Construction4
Parts List and Component Locations
Transistor Pinouts
Coil Winding Details
Block Diagram
How It Works
General Introductory Information
PCB Component Overlay
Mounting PCB Pins, Links and VCO Shield 18
PCB Pins, Links and VCO Shield
Resistors
Capacitors
Diodes42
Transistors
Inductors
Integrated Circuits48
RF Chokes
Crystals and Filters
Layout Showing Underboard Component 54
Transistor and IC Voltages
Assembly of Front and Back Panels
Operation of Thumbwheel
Front Panel Wiring Layout
Back Panel Wiring Layout
Test and Alignment Procedures 60
Amateur Beacons
How to Solder Coaxial Cable to a PL259 Plug 62
TC 9122 Program

The second secon			
Rl	A7 ,	lK	(brn-blk-red)
R2	в8 ,	470R	(yel-vio-brn)
R3	в9 ,	lK	(brn-blk-red)
R4	A8 ,	10K	(brn-blk-org)
R5	В8 ,	løk	(brn-blk-org)
R6	В6 ,	33K	(org-org-org)
R7	B5 ,	4.7R	(yel-vio-gld)
R8	A7 ,	1K	(brn-blk-red)
R9	A9 ,	1K	(brn-blk-red)
RlØ	A12,	33K	(org-org-org)
Rll	A12,	3.3k	(org-org-red)
R12	L6 ,	10k	(brn-blk-org)
R13	L6 ,	1.5k	(brn-grn-red)
R14	м6,	470R	(yel-vio-brn)
R15	К6,	47R	(yel-vio-blk)
R16	L7 ,	100R	(brn-blk-brn)
R17	м8,	10R	(brn-blk-blk)
R18	KlØ,	100R	(brn-blk-brn)
R19	F7 ,	10K	(brn-blk-org)
R20	G8 ,	470R	(yel-vio-brn)
R21	J9 ,	100R	(brn-blk-brn)
R22	K14,	150R	(brn-grn-brn)
R23	И9,	82K	(gry-red-org)
R24	LlØ,	100K	(brn-blk-yel)
R25	MlØ,	1.5K	(brn-grn-red)
R26	M12,	2.2K	(red-red-red)
R27	L12,	220K	(red-red-yel)
R28	Lll,	2.2K	(red-red-red)
R29	Mll,	47K	(yel-vio-org)
R30	010,	lK	(brn-blk-red)

WARNING

All components should be mounted as close to PCB as possible. Any excessive lead length will cause circuit to malfunction.

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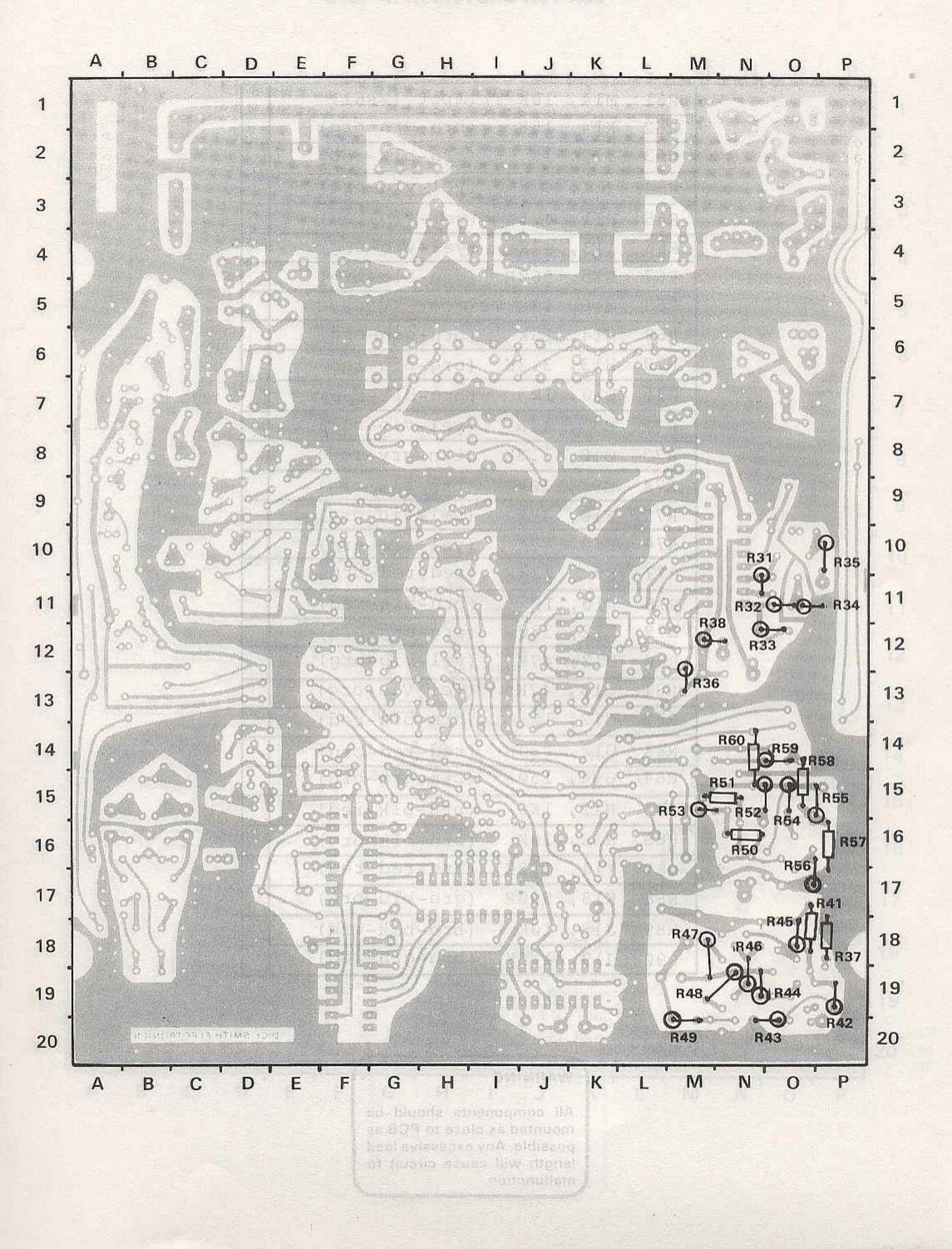
STEP 3. RESISTORS R31-R60

			Min-Balletin		
SERIO S	R31	Nll,	270k	(red-vio-yel)	Π
	R32	011,	15K	(brn-grn-org)	
	R33	N12,	10K	(brn-blk-org)	
	R34	011,	1.5K	(brn-grn-red)	
	R35	PlØ,	4.7K	(yel-vio-red)	
	R36	M13,	33K	(org-org-org)	
	R37	P18,	470R	(yel-vio-brn)	
	R38	M12,	22K	(red-red-org)	
*	R39	,	5K/10K	Mini Pot(VR39)	
*	R40	,	5K/luk	Mini Pot(VR40)	
	R41	018,	120K	(brn-red-yel)	
	R42	P19,	22ØK	(red-red-yel)	
	R43	020,	22ØR	(red-red-brn)	
	R44	N19,	5.6K	(grn-blu-red)	
	R45	018,	47K	(yel-vio-org)	
	R46	N19,	18R	(brn-gry-blk)	
	R47	M18,	2.2R	(red-red-gld)	
	R48	N19,	2.2R	(red-red-gld)	
	R49	M20,	220R	(red-red-brn)	
	R50	N16,	100K	(brn-blk-yel)	-3
	R51	N15,	82K	(gry-red-org)	
	R52	N15,	5.6K	(grn-blu-red)	
	R53	M15,	560R	(grn-blu-brn)	
	R54	015,	22K	(red-red-org)	
	R55	P15,	39K	(org-wht-org)	
	R56	017,	15K	(brn-grn-org)	
	R57	P16,	100K	(brn-blk-yel)	
	R58	015,	56K	(grn-blu-org)	
	R59	014,	56K	(grn-blu-org)	
	R60	N14,	47ØR	(yel-vio-brn)	
-					

^{*} R39 and R40 are mini pots and are located on the front panel.

WARNING

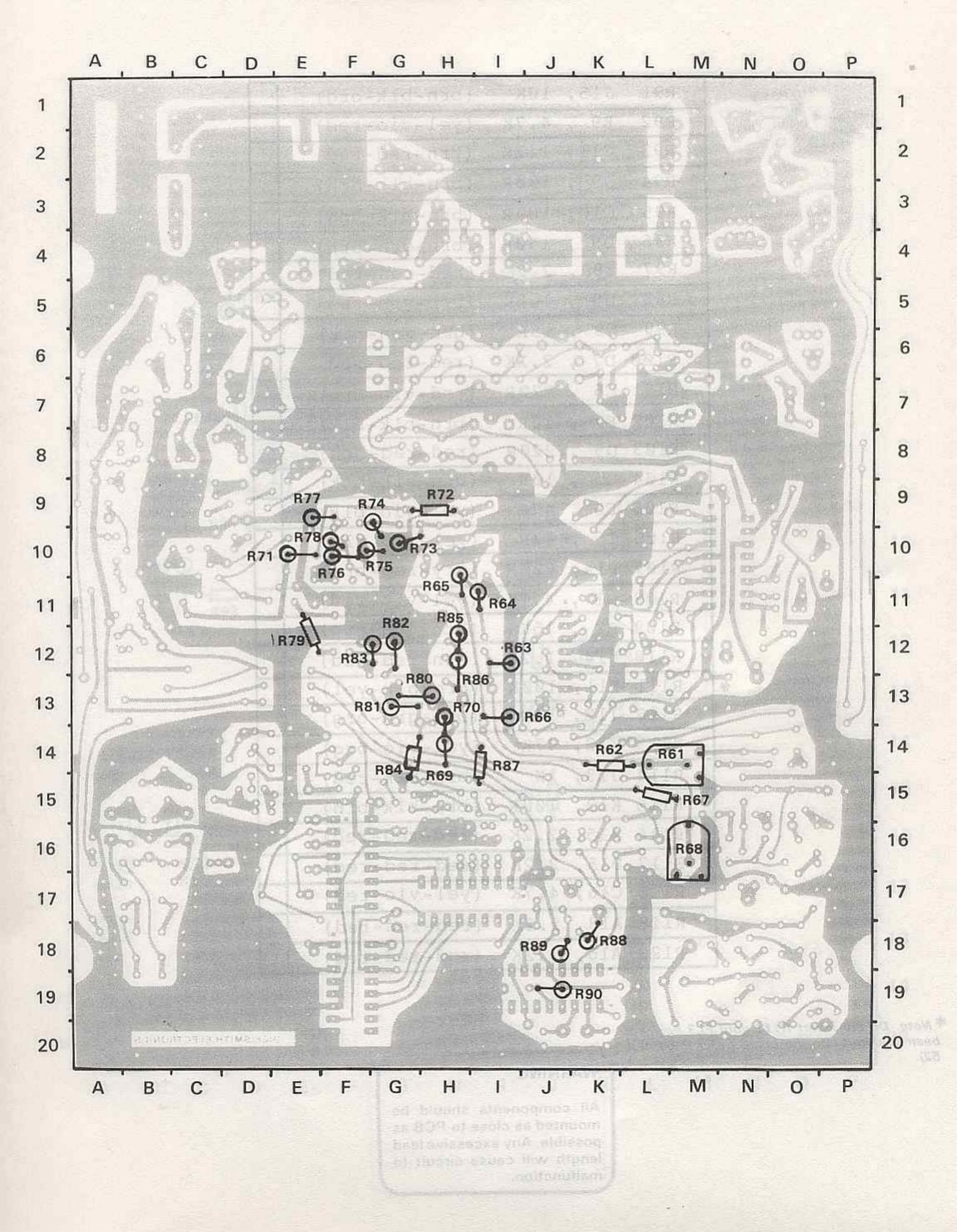
STEP 3. RESISTORS R31-R60



STEP 4. RESISTORS R61-R90

R61 M14, 10K Trimpot (VR61) R62 K14, 15K (brn-grn-org) R63 I12, 1K (brn-blk-red) R64 I11, 47K (yel-vio-org) R65 H11, 4.7K (yel-vio-org) R66 I13, 47K (yel-vio-org) R67 L15, 560R (grn-blu-brn) R68 M16, 10K Trimpot (VR68) R69 H14, 15k (brn-grn-org) R70 H13, 3.3K (org-org-red) R71 E10, 1k (brn-blk-red) R72 H9, 47R (yel-vio-blk) R73 G10, 1.8K (brn-gry-red) R74 G9, 10K (brn-blk-org) R75 F10, 47K (yel-vio-org) R76 F10, 47K (yel-vio-org) R77 E9, 220R (red-red-brn) R78 F10, 1K (brn-blk-red) R79 E12, 330R (org-org-brn) R80 H13, 47K (yel-vio-org) R81 G13, 47K (yel-vio-org) R82 G12, 1K (brn-blk-red) R83 G12, 220R (red-red-brn) R84 G14, 150R (brn-grn-brn) R85 H12, 1K (brn-blk-red) R86 H12, 10K (brn-blk-org) R87 I14, 1.2K (brn-blk-org) R88 K18, 560R (grn-blu-brn) R89 J18, 10K (brn-blk-org) R90 J19, 1.5K (brn-grn-red)	-			
R63 I12, 1K (brn-blk-red) R64 I11, 47K (yel-vio-org) R65 H11, 4.7K (yel-vio-red) R66 I13, 47K (yel-vio-org) R67 L15, 560R (grn-blu-brn) R68 M16, 10K Trimpot (VR68) R69 H14, 15k (brn-grn-org) R70 H13, 3.3K (org-org-red) R71 E10, 1k (brn-blk-red) R72 H9, 47R (yel-vio-blk) R73 G10, 1.8K (brn-gry-red) R74 G9, 10K (brn-blk-org) R75 F10, 47K (yel-vio-org) R76 F10, 47K (yel-vio-org) R77 E9, 220R (red-red-brn) R78 F10, 1K (brn-blk-red) R79 E12, 330R (org-org-brn) R80 H13, 47K (yel-vio-org) R81 G13, 47K (yel-vio-org) R82 G12, 1K (brn-blk-red) R83 G12, 220R (red-red-brn) R84 G14, 150R (brn-grn-brn) R85 H12, 1K (brn-blk-red) R86 H12, 10K (brn-blk-org) R87 I14, 1.2K (brn-blk-org) R88 K18, 560R (grn-blu-brn) R89 J18, 10K (brn-blk-org)	R61	M14,	10K Trimpot (VR61)	
R64 Ill, 47K (yel-vio-org) R65 Hll, 4.7K (yel-vio-red) R66 Il3, 47K (yel-vio-org) R67 Ll5, 560R (grn-blu-brn) R68 Ml6, 10K Trimpot (VR68) R69 Hl4, 15k (brn-grn-org) R70 Hl3, 3.3K (org-org-red) R71 El0, 1k (brn-blk-red) R72 H9, 47R (yel-vio-blk) R73 Gl0, 1.8K (brn-gry-red) R74 G9, 10K (brn-blk-org) R75 Fl0, 47K (yel-vio-org) R76 Fl0, 47K (yel-vio-org) R77 E9, 220R (red-red-brn) R78 Fl0, 1K (brn-blk-red) R79 El2, 330R (org-org-brn) R80 Hl3, 47K (yel-vio-org) R81 Gl3, 47K (yel-vio-org) R82 Gl2, 1K (brn-blk-red) R83 Gl2, 220R (red-red-brn) R84 Gl4, 150R (brn-plk-red) R85 Hl2, 1K (brn-blk-red) R86 Hl2, 10K (brn-blk-org) R87 Il4, 1.2K (brn-blk-org) R87 Il4, 1.2K (brn-red-red) R88 Kl8, 560R (grn-blu-brn) R89 Jl8, 10K (brn-blk-org)	R62	K14,	15K (brn-grn-org)	
R65 H11, 4.7K (yel-vio-red) R66 I13, 47K (yel-vio-org) R67 L15, 560R (grn-blu-brn) R68 M16, 10K Trimpot (VR68) R69 H14, 15k (brn-grn-org) R70 H13, 3.3K (org-org-red) R71 E10, lk (brn-blk-red) R72 H9, 47R (yel-vio-blk) R73 G10, 1.8K (brn-gry-red) R74 G9, 10K (brn-blk-org) R75 F10, 47K (yel-vio-org) R76 F10, 47K (yel-vio-org) R77 E9, 220R (red-red-brn) R78 F10, lK (brn-blk-red) R79 E12, 330R (org-org-brn) R80 H13, 47K (yel-vio-org) R81 G13, 47K (yel-vio-org) R82 G12, lK (brn-blk-red) R83 G12, 220R (red-red-brn) R84 G14, 150R (brn-grn-brn) R85 H12, lK (brn-blk-red) R86 H12, 10K (brn-blk-org) R87 I14, 1.2K (brn-red-red) R88 K18, 560R (grn-blu-brn) R89 J18, 10K (brn-blk-org)	R63	112,	lK (brn-blk-red)	
R66 I13, 47K (yel-vio-org) R67 L15, 560R (grn-blu-brn) R68 M16, 10K Trimpot (VR68) R69 H14, 15k (brn-grn-org) R70 H13, 3.3K (org-org-red) R71 E10, 1k (brn-blk-red) R72 H9, 47R (yel-vio-blk) R73 G10, 1.8K (brn-gry-red) R74 G9, 10K (brn-blk-org) R75 F10, 47K (yel-vio-org) R76 F10, 47K (yel-vio-org) R77 E9, 220R (red-red-brn) R78 F10, 1K (brn-blk-red) R79 E12, 330R (org-org-brn) R80 H13, 47K (yel-vio-org) R81 G13, 47K (yel-vio-org) R82 G12, 1K (brn-blk-red) R83 G12, 220R (red-red-brn) R84 G14, 150R (brn-grn-brn) R85 H12, 1K (brn-blk-red) R86 H12, 10K (brn-blk-org) R87 I14, 1.2K (brn-red-red) R88 K18, 560R (grn-blu-brn) R89 J18, 10K (brn-blk-org)	R64	Ill,	47K (yel-vio-org)	
R67 L15, 560R (grn-blu-brn) R68 M16, 10K Trimpot (VR68) R69 H14, 15k (brn-grn-org) R70 H13, 3.3K (org-org-red) R71 E10, lk (brn-blk-red) R72 H9, 47R (yel-vio-blk) R73 G10, 1.8K (brn-gry-red) R74 G9, 10K (brn-blk-org) R75 F10, 47K (yel-vio-org) R76 F10, 47K (yel-vio-org) R77 E9, 220R (red-red-brn) R78 F10, lK (brn-blk-red) R79 E12, 330R (org-org-brn) R80 H13, 47K (yel-vio-org) R81 G13, 47K (yel-vio-org) R82 G12, lK (brn-blk-red) R83 G12, 220R (red-red-brn) R84 G14, 150R (brn-grn-brn) R85 H12, lK (brn-blk-red) R86 H12, 10K (brn-blk-org) R87 I14, 1.2K (brn-red-red) R88 K18, 560R (grn-blu-brn) R89 J18, 10K (brn-blk-org)	R65	н11,	4.7K (yel-vio-red)	
R68 M16, 10K Trimpot (VR68) R69 H14, 15k (brn-grn-org) R70 H13, 3.3K (org-org-red) R71 E10, 1k (brn-b1k-red) R72 H9, 47R (yel-vio-b1k) R73 G10, 1.8K (brn-gry-red) R74 G9, 10K (brn-b1k-org) R75 F10, 47K (yel-vio-org) R76 F10, 47K (yel-vio-org) R77 E9, 220R (red-red-brn) R78 F10, 1K (brn-b1k-red) R79 E12, 330R (org-org-brn) R80 H13, 47K (yel-vio-org) R81 G13, 47K (yel-vio-org) R82 G12, 1K (brn-b1k-red) R83 G12, 220R (red-red-brn) R84 G14, 150R (brn-grn-brn) R85 H12, 1K (brn-b1k-red) R86 H12, 10K (brn-b1k-red) R87 I14, 1.2K (brn-b1k-org) R88 K18, 560R (grn-b1u-brn) R89 J18, 10K (brn-b1k-org)	R66	I13,	47K (yel-vio-org)	
R69 H14, 15k (brn-grn-org) R70 H13, 3.3K (org-org-red) R71 E10, lk (brn-blk-red) R72 H9, 47R (yel-vio-blk) R73 G10, l.8K (brn-gry-red) R74 G9, l0K (brn-blk-org) R75 F10, 47K (yel-vio-org) R76 F10, 47K (yel-vio-org) R77 E9, 220R (red-red-brn) R78 F10, lK (brn-blk-red) R79 E12, 330R (org-org-brn) R80 H13, 47K (yel-vio-org) R81 G13, 47K (yel-vio-org) R82 G12, lK (brn-blk-red) R83 G12, 220R (red-red-brn) R84 G14, 150R (brn-grn-brn) R85 H12, lK (brn-blk-red) R86 H12, lK (brn-blk-red) R87 I14, l.2K (brn-red-red) R88 K18, 560R (grn-blu-brn) R89 J18, l0K (brn-blk-org)	R67	L15,	560R (grn-blu-brn)	
R70 H13, 3.3K (org-org-red) R71 E10, lk (brn-blk-red) R72 H9, 47R (yel-vio-blk) R73 G10, l.8K (brn-gry-red) R74 G9, l0K (brn-blk-org) R75 F10, 47K (yel-vio-org) R76 F10, 47K (yel-vio-org) R77 E9, 220R (red-red-brn) R78 F10, lK (brn-blk-red) R79 E12, 330R (org-org-brn) R80 H13, 47K (yel-vio-org) R81 G13, 47K (yel-vio-org) R82 G12, lK (brn-blk-red) R83 G12, 220R (red-red-brn) R84 G14, l50R (brn-grn-brn) R85 H12, lK (brn-blk-red) R86 H12, l0K (brn-blk-org) R87 I14, l.2K (brn-red-red) R88 K18, 560R (grn-blu-brn) R89 J18, l0K (brn-blk-org)	R68	M16,	10K Trimpot (VR68)	
R71 E10, lk (brn-blk-red) R72 H9, 47R (yel-vio-blk) R73 G10, l.8K (brn-gry-red) R74 G9, l0K (brn-blk-org) R75 F10, 47K (yel-vio-org) R76 F10, 47K (yel-vio-org) R77 E9, 220R (red-red-brn) R78 F10, lK (brn-blk-red) R79 E12, 330R (org-org-brn) R80 H13, 47K (yel-vio-org) R81 G13, 47K (yel-vio-org) R82 G12, lK (brn-blk-red) R83 G12, 220R (red-red-brn) R84 G14, l50R (brn-grn-brn) R85 H12, lK (brn-blk-red) R86 H12, l0K (brn-blk-org) R87 I14, l.2K (brn-red-red) R88 K18, 560R (grn-blu-brn) R89 J18, l0K (brn-blk-org)	R69	н14,	15k (brn-grn-org)	
R72 H9 , 47R (yel-vio-blk) R73 GlØ, l.8K (brn-gry-red) R74 G9 , lØK (brn-blk-org) R75 FlØ, 47K (yel-vio-org) R76 FlØ, 47K (yel-vio-org) R77 E9 , 22ØR (red-red-brn) R78 FlØ, lK (brn-blk-red) R79 E12, 33ØR (org-org-brn) R80 H13, 47K (yel-vio-org) R81 Gl3, 47K (yel-vio-org) R82 Gl2, lK (brn-blk-red) R83 Gl2, 22ØR (red-red-brn) R84 Gl4, l5ØR (brn-grn-brn) R85 H12, lK (brn-blk-red) R86 H12, lØK (brn-blk-org) R87 I14, l.2K (brn-red-red) R88 K18, 56ØR (grn-blu-brn) R89 J18, lØK (brn-blk-org)	R7Ø	н13,	3.3K (org-org-red)	
R73 GlØ, 1.8K (brn-gry-red) R74 G9 , lØK (brn-blk-org) R75 FlØ, 47K (yel-vio-org) R76 FlØ, 47K (yel-vio-org) R77 E9 , 22ØR (red-red-brn) R78 FlØ, lK (brn-blk-red) R79 El2, 33ØR (org-org-brn) R8Ø Hl3, 47K (yel-vio-org) R81 Gl3, 47K (yel-vio-org) R82 Gl2, lK (brn-blk-red) R83 Gl2, 22ØR (red-red-brn) R84 Gl4, 15ØR (brn-grn-brn) R85 Hl2, lK (brn-blk-red) R86 Hl2, lØK (brn-blk-org) R87 Il4, 1.2K (brn-red-red) R88 Kl8, 56ØR (grn-blu-brn) R89 Jl8, lØK (brn-blk-org)	R71	E10,	lk (brn-blk-red)	
R74 G9 , 10K (brn-blk-org) R75 F10, 47K (yel-vio-org) R76 F10, 47K (yel-vio-org) R77 E9 , 220R (red-red-brn) R78 F10, lK (brn-blk-red) R79 E12, 330R (org-org-brn) R80 H13, 47K (yel-vio-org) R81 G13, 47K (yel-vio-org) R82 G12, lK (brn-blk-red) R83 G12, 220R (red-red-brn) R84 G14, 150R (brn-grn-brn) R85 H12, lK (brn-blk-red) R86 H12, l0K (brn-blk-org) R87 I14, 1.2K (brn-red-red) R88 K18, 560R (grn-blu-brn) R89 J18, 10K (brn-blk-org)	R72	н9 ,	47R (yel-vio-blk)	
R75 F10, 47K (yel-vio-org) R76 F10, 47K (yel-vio-org) R77 E9, 220R (red-red-brn) R78 F10, 1K (brn-blk-red) R79 E12, 330R (org-org-brn) R80 H13, 47K (yel-vio-org) R81 G13, 47K (yel-vio-org) R82 G12, 1K (brn-blk-red) R83 G12, 220R (red-red-brn) R84 G14, 150R (brn-grn-brn) R85 H12, 1K (brn-blk-red) R86 H12, 10K (brn-blk-org) R87 I14, 1.2K (brn-red-red) R88 K18, 560R (grn-blu-brn) R89 J18, 10K (brn-blk-org)	R73	GlØ,	1.8K (brn-gry-red)	
R76 F10, 47K (yel-vio-org) R77 E9, 220R (red-red-brn) R78 F10, 1K (brn-blk-red) R79 E12, 330R (org-org-brn) R80 H13, 47K (yel-vio-org) R81 G13, 47K (yel-vio-org) R82 G12, 1K (brn-blk-red) R83 G12, 220R (red-red-brn) R84 G14, 150R (brn-grn-brn) R85 H12, 1K (brn-blk-red) R86 H12, 10K (brn-blk-org) R87 I14, 1.2K (brn-red-red) R88 K18, 560R (grn-blu-brn) R89 J18, 10K (brn-blk-org)	R74	G9 ,	10K (brn-blk-org)	
R77 E9 , 220R (red-red-brn) R78 F10, lK (brn-blk-red) R79 E12, 330R (org-org-brn) R80 H13, 47K (yel-vio-org) R81 G13, 47K (yel-vio-org) R82 G12, lK (brn-blk-red) R83 G12, 220R (red-red-brn) R84 G14, 150R (brn-grn-brn) R85 H12, lK (brn-blk-red) R86 H12, l0K (brn-blk-org) R87 I14, 1.2K (brn-red-red) R88 K18, 560R (grn-blu-brn) R89 J18, l0K (brn-blk-org)	R75	FlØ,	47K (yel-vio-org)	
R78 F10, 1K (brn-blk-red) R79 E12, 330R (org-org-brn) R80 H13, 47K (yel-vio-org) R81 G13, 47K (yel-vio-org) R82 G12, 1K (brn-blk-red) R83 G12, 220R (red-red-brn) R84 G14, 150R (brn-grn-brn) R85 H12, 1K (brn-blk-red) R86 H12, 10K (brn-blk-org) R87 I14, 1.2K (brn-red-red) R88 K18, 560R (grn-blu-brn) R89 J18, 10K (brn-blk-org)	R76	F10,	47K (yel-vio-org)	
R79 E12, 330R (org-org-brn) R80 H13, 47K (yel-vio-org) R81 G13, 47K (yel-vio-org) R82 G12, 1K (brn-blk-red) R83 G12, 220R (red-red-brn) R84 G14, 150R (brn-grn-brn) R85 H12, 1K (brn-blk-red) R86 H12, 10K (brn-blk-org) R87 I14, 1.2K (brn-red-red) R88 K18, 560R (grn-blu-brn) R89 J18, 10K (brn-blk-org)	R77	E9 ,	220R (red-red-brn)	
R80 H13, 47K (yel-vio-org) R81 G13, 47K (yel-vio-org) R82 G12, 1K (brn-blk-red) R83 G12, 220R (red-red-brn) R84 G14, 150R (brn-grn-brn) R85 H12, 1K (brn-blk-red) R86 H12, 10K (brn-blk-org) R87 I14, 1.2K (brn-red-red) R88 K18, 560R (grn-blu-brn) R89 J18, 10K (brn-blk-org)	R78	FlØ,	lK (brn-blk-red)	
R81 G13, 47K (yel-vio-org) R82 G12, 1K (brn-blk-red) R83 G12, 220R (red-red-brn) R84 G14, 150R (brn-grn-brn) R85 H12, 1K (brn-blk-red) R86 H12, 10K (brn-blk-org) R87 I14, 1.2K (brn-red-red) R88 K18, 560R (grn-blu-brn) R89 J18, 10K (brn-blk-org)	R79	E12,	330R (org-org-brn)	
R82 Gl2, lK (brn-blk-red) R83 Gl2, 220R (red-red-brn) R84 Gl4, l50R (brn-grn-brn) R85 H12, lK (brn-blk-red) R86 H12, l0K (brn-blk-org) R87 I14, l.2K (brn-red-red) R88 K18, 560R (grn-blu-brn) R89 J18, l0K (brn-blk-org)	R80	Н13,	47K (yel-vio-org)	
R83 G12, 220R (red-red-brn) R84 G14, 150R (brn-grn-brn) R85 H12, 1K (brn-blk-red) R86 H12, 10K (brn-blk-org) R87 I14, 1.2K (brn-red-red) R88 K18, 560R (grn-blu-brn) R89 J18, 10K (brn-blk-org)	R81	G13,	47K (yel-vio-org)	
R84 G14, 150R (brn-grn-brn) R85 H12, 1K (brn-blk-red) R86 H12, 10K (brn-blk-org) R87 I14, 1.2K (brn-red-red) R88 K18, 560R (grn-blu-brn) R89 J18, 10K (brn-blk-org)	R82	G12,	lK (brn-blk-red)	
R85 H12, 1K (brn-blk-red) R86 H12, 10K (brn-blk-org) R87 I14, 1.2K (brn-red-red) R88 K18, 560R (grn-blu-brn) R89 J18, 10K (brn-blk-org)	R83	G12,	220R (red-red-brn)	
R86 H12, 10K (brn-blk-org) R87 I14, 1.2K (brn-red-red) R88 K18, 560R (grn-blu-brn) R89 J18, 10K (brn-blk-org)	R84	G14,	150R (brn-grn-brn)	
R87 I14, 1.2K (brn-red-red) R88 K18, 560R (grn-blu-brn) R89 J18, 10K (brn-blk-org)	R85	H12,	lK (brn-blk-red)	
R88 K18, 560R (grn-blu-brn) R89 J18, 10K (brn-blk-org)	R86	Н12,	10K (brn-blk-org)	
R89 J18, 10K (brn-blk-org)	R87	I14,	1.2K (brn-red-red)	
	R88	K18,	560R (grn-blu-brn)	
R90 J19, 1.5K (brn-grn-red)	R89	J18,	10K (brn-blk-org)	
	R90	J19,	1.5K (brn-grn-red)	

WARNING



STEP 5. RESISTORS R91-R120

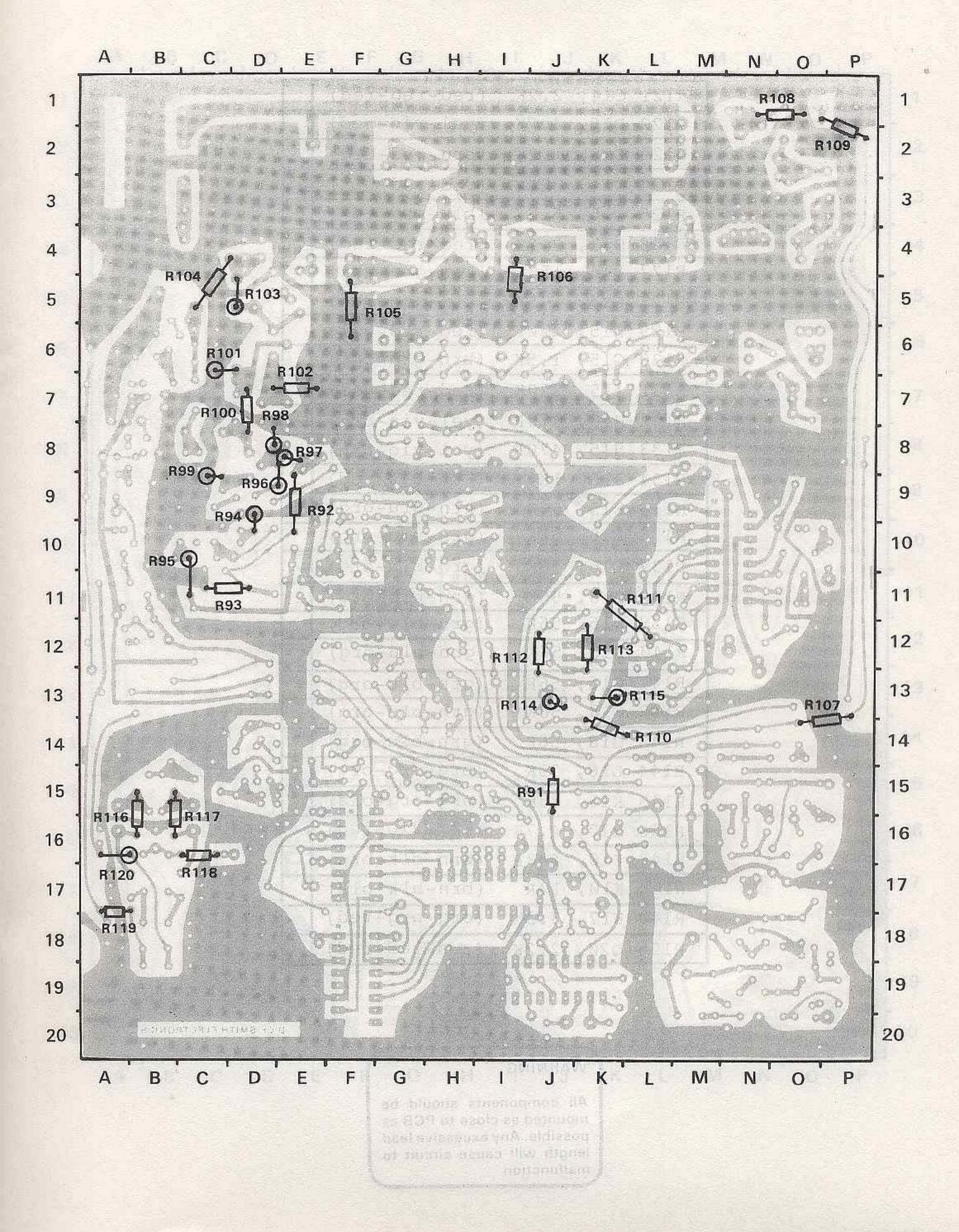
-5-5-				Charles Manager and Control of the C	
	R91	J15,	10K	(brn-blk-org)	
	R92	E9 ,	4.7K	(yel-vio-red)	
	R93	Cll,	1.2K	(brn-red-red)	
	R94	D9 ,	100R	(brn-blk-brn)	
	R95	C10,	100R	(brn-blk-brn)	
	R96	D9 ,	150R	(brn-grn-brn)	
	R97	E8 ,	2.2K	(red-red-red)	
	R98	D8 ,	1.5K	(brn-grn-red)	
	R99	C9 ,	15R	(brn-grn-blk)	
	R100	D7 ,	2.2K	(red-red-red)	
	R101	C6 ,	270R	(red-vio-brn)	
	R102	E7 ,	10R	(brn-blk-blk)	
	R103	D5 ,	220R	(red-red-brn)	
	R104	C5 ,	10R	(brn-blk-blk)	
	R105	F5 ,	47R	(yel-vio-blk)	
	R106	I5 ,	47R	(yel-vio-blk)	
	R107	P14,	820R	(gry-red-brn)	
	R108	01,	4.7K	(yel-vio-red)	
	R109	P2 ,	15K	(brn-grn-org)	
	R110	K14,	1.2K	(brn-red-red)	
k	R111	Kll,	100K	(brn-blk-yel)	
	R112	112,	15K	(brn-grn-org)	
	R113	K12,	47K	(yel-vio-org)	
	R114	J13,	1K	(brn-blk-red)	
	R115	K13,	100R	(brn-blk-brn)	
	R116	A15,	2.2K	(red-red-red)	
	R117	B15,	2.2K	(red-red-red)	
	R118	C16,	4.7K	(yel-vio-red)	
	R119	A18,	2.2K	(red-red-red)	
	R120	A16,	2.2K	(red-red-red)	
-					_

^{*} Note. Do not insert R111 until FL3 has been soldered into the board (refer Page 52).

WARNING

All components should be mounted as close to PCB as possible. Any excessive lead length will cause circuit to malfunction.

33.



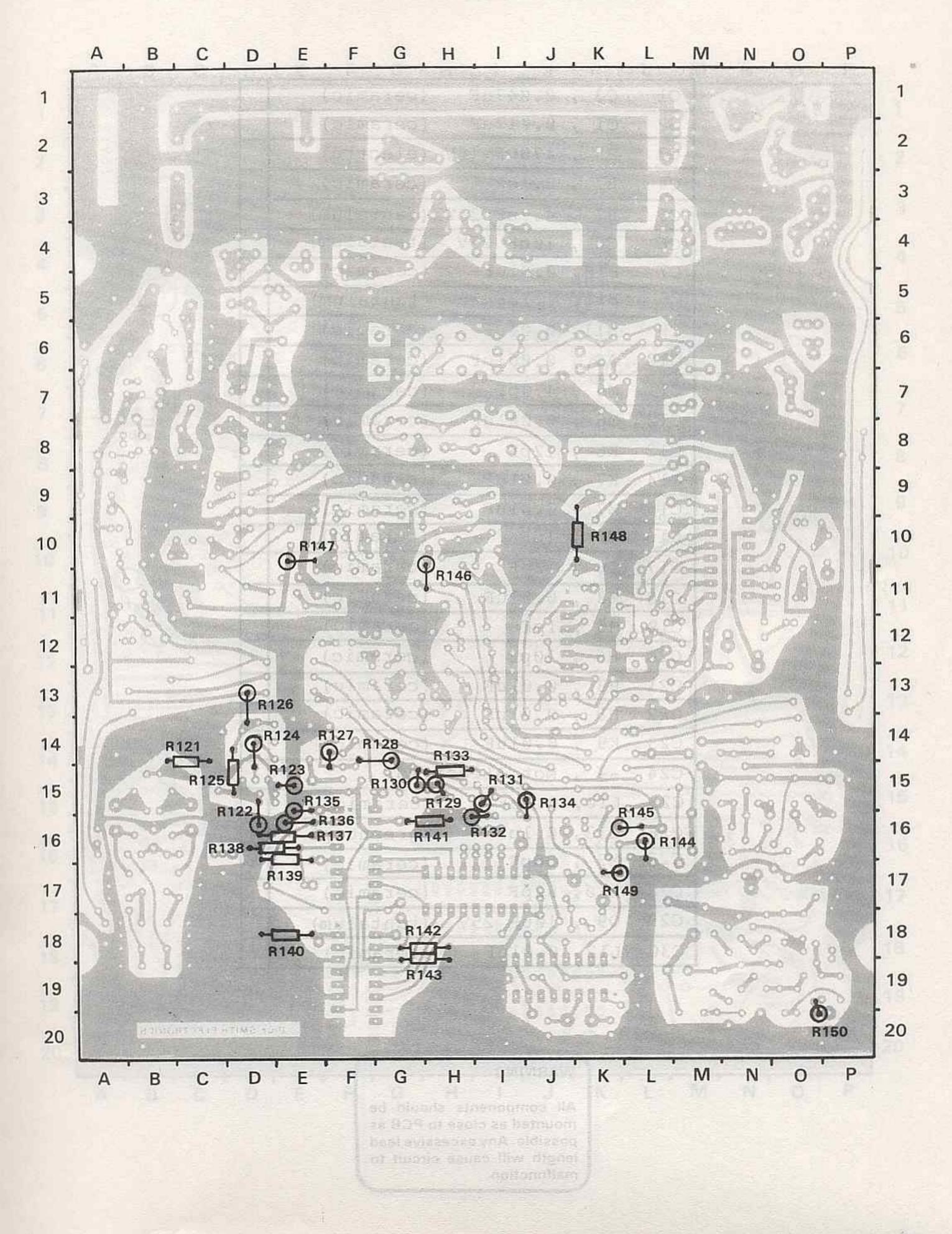
STEP 6. RESISTORS R121-R150

O W W W B B B

R121 C1	4, 2.2K	(red-red-red)	
R122 D1	6, 4.7K	(yel-vio-red)	
R123 E1	5, 1.2K	(brn-red-red)	
R124 D1	4, 22R	(red-red-blk)	
R125 D1	5, 6.8K	(blu-gry-red)	
R126 D1	3, 2.2K	(red-red-red)	
R127 E1	4, 150K	(brn-grn-yel)	
R128 G1	4, 1.5K	(brn-grn-red)	
R129 H1	5, 220K	(red-red-yel)	
R13Ø G1	5, 1.5K	(brn-grn-red)	
R131 I1:	5, 220K	(red-red-yel)	
R132 H1	6, 47ØR	(yel-vio-brn)	
R133 H1	5, 470R	(yel-vio-brn)	As A
R134 J1	5, lK	(brn-blk-red)	
R135 E1	5, 56K	(grn-blu-org)	
R136 E1	6, 56K	(grn-blu-org)	
R137 E1	6, 56K	(grn-blu-org)	
R138 D1	6, 56K	(grn-blu-org)	
R139 D1	6, 56K	(grn-blu-org)	
R140 E18	8, 56K	(grn-blu-org)	
R141 G1	6, 56K	(grn-blu-org)	
R142 G1	8, 56K	(grn-blu-org)	
R143 G1	8, 56K	(grn-blu-org)	
R144 L1	6, 33K	(org-org-org)	
R145 Kl	6, 33K	(org-org-org)	
R146 H1	Ø, 4.7K	(yel-vio-red)	
R147 E1	Ø, 100R	(brn-blk-brn)	
R148 Kl	Ø, lØR	(brn-blk-blk)	4 3
R149 K1	7, 3.3K	(org-org-red)	
R150 02	Ø, 2.2K	(red-red-red)	
		The state of the s	

WARNING

STEP 6. RESISTORS R121-R150



SPECIFICATIONS

GENERAL

Frequency Coverage 144 to 148MHz (see text) Channel Spacing 10kHz; with 5kHz offset three parties of the property of the contract

Number of Channels 400 @ 10kHz; 800 @ 5kHz (see text)

Frequency Stability within ±10ppm from 0 to 60°C

Modulation Frequency Modulation District on Smith Starts Tailed Hor World Temperature Range from 5 to 50°C

Duty Cycle two minutes transmit, two minutes receive

Polarity negative chassis

Transmit: 1.9A at 10W; 2.5A at 15W

(a) 3A in-line fuse

(b) diode reverse polarity protection (D1)

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Stock Chicago

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The Tard of Prival and its prival and its law a

and the desired the desired and the

(c) RF power amplifier can withstand up to 5:1 VSWR and open or short-circuit conditions for at least two minutes

(d) audio power amplifier can withstand open circuit continuously and momentary

short circuits

TRANSMITTER

THE DECEMBER

Many of the second to you are broom

Maximum Deviation limited to 5kHz under normal operation; up

to 10kHz with overdrive

Distortion less than 10% at 3kHz deviation Spurious Emissions less than 60dB with respect to carrier

Harmonics less than 60dB Microphone Sensitivity . . . 5mV RMS

RECEIVER

. 0.5μV into 50Ω for 12dB SINAD; typically Sensitivity Singular set to viteo lescon a deficia

0.4 µV

Selectivity better than 60dB at ± 25kHz

Audio power......1W at 1% THD into 8Ω

Frequency response 6dB/octave rolloff above 1kHz

Dear Customer,

\$205

We are pleased that this company is the first Australian company to release a kit as sophisticated and as functional as the Commander VHF Transceiver kit. It is bound to bring great satisfaction to you in constructing it.

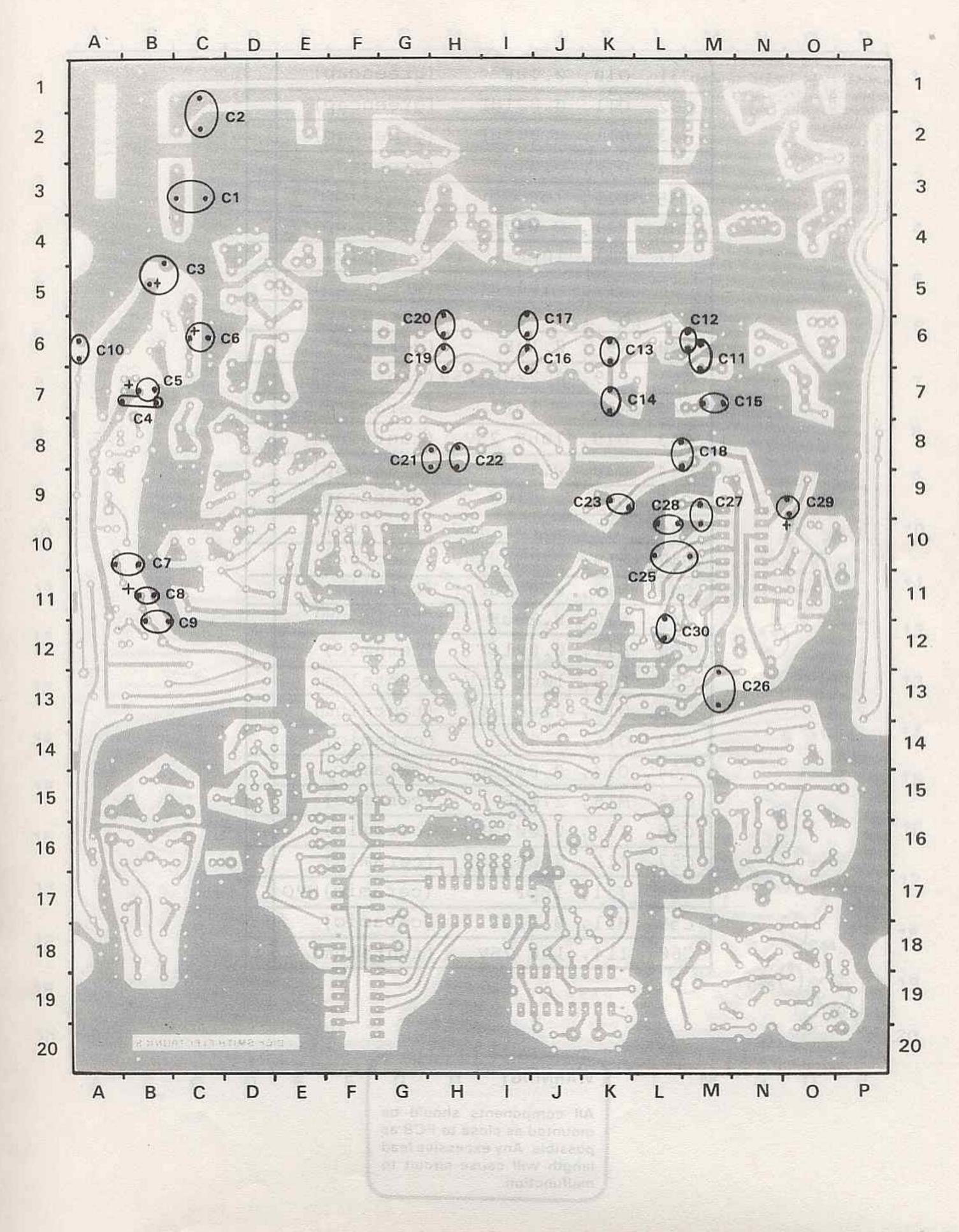
We would also like to give a word of warning. This kit is complex, and so we feel that it should not be undertaken by anyone who does not have considerable experience in constructing RF equipment. Most 'Amateurs' will have the skills necessary to complete this project without great difficulty, but for the inexperienced may we suggest you gain qualified assistance or else return the kit to us in its original packing for a full refund.

> Thanking you, Dick Smith and Staff

STEP 7. CAPACITORS C1-C30

C1	C3 ,	0.047uF	(ceramic)
C2	Cl,	0.047uF	(ceramic)
C3	B5 ,	470uF 16V	(electro)
C4	в7 ,	0.luF	(ceramic)
C5	В7 ,	4.7uF 25V	(tantalum)
C6	C6 ,	10uF 25V	(tantalum)
C7	BlØ,	Ø.0luF	(ceramic)
C8	B11,	4.7uF 25V	(tantalum)
C9	B11,	0.0luF	(ceramic)
C10	A6 ,	0.001uF	(ceramic)
C11	M6 ,	470pF	(ceramic)
C12	M6 ,	Ø.00luF	(ceramic)
C13	К6,	12pF	(ceramic)
C14	К7,	Ø.ØluF	(ceramic)
C15	M7 ,	Ø.ØluF	(ceramic)
C16	16,	1pF	(ceramic)
C17	16,	12pF	(ceramic)
C18	M8 ,	0.0luF	(ceramic)
C19	Н6,	lpF	(ceramic)
C20	Н6,	10pF	(ceramic)
C21	Н8 ,	Ø.ØluF	(ceramic)
C22	Н8,	0.0luF	(ceramic)
C23	к9 ,	0.0luF	(ceramic)
C24	,	Not Alloca	ited
C25	LlØ,	0.luF	(ceramic)
C26	M13,	Ø.luF	(greencap)
C27	м9,	56pF	(ceramic)
C28	LlØ,	82pF	(ceramic)
C29	09 ,	10uF 25V	(tantalum)
C30	L12,	Ø.0luF	(ceramic)

WARNING

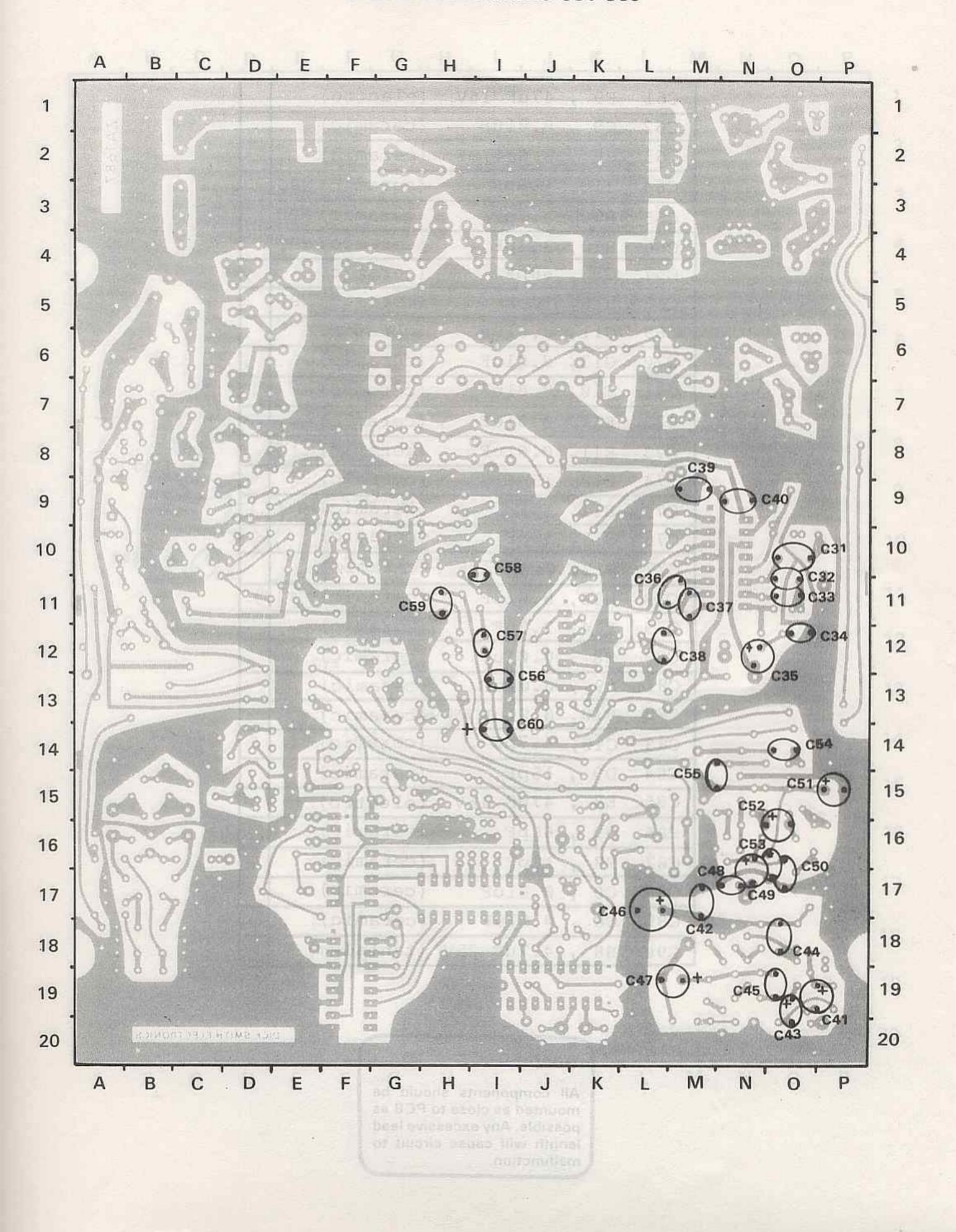


STEP 8. CAPACITORS C31-C60

C31 O10, 0.1uF (greencap) C32 O11, 0.001uF (greencap) C33 O11, 0.001uF (greencap) C34 O12, 0.01uF (greencap) C35 N12, 1uF 25V (tantalum) C36 M11, 0.047uF (greencap) C37 M11, 10pF (ceramic) C38 L12, 0.047uF (greencap) C39 M9, 0.1uF (greencap) C40 N9, 0.1uF (greencap) C41 P19, 0.22uF 25V (tantalum) C42 M17, 0.1uF (ceramic) C43 O19, 10uF 25V (tantalum) C44 O18, 0.1uF (greencap) C45 O19, 0.01uF (greencap) C46 L17, 470uF 16V (electro) C47 M19, 220uF 16V (electro) C48 N17, 0.001uF (ceramic) C49 N17, 0.22uF 35V(tantalum) C50 H11, 0.001uF (ceramic) C51 P15, 10uF 25V (tantalum) C52 O16, 22uF 16V (tantalum) C53 O16, 0.01uF (ceramic) C54 O14, 0.0022uF (ceramic) C55 M15, 270pF (ceramic) C56 I13, 0.001uF (ceramic) C57 I12, 0.0022uF (ceramic) C59 H11, 18pF (ceramic) C59 H11, 0.01uF (ceramic)	Company of the same				
C33 O11, Ø.ØØluF (greencap) C34 O12, Ø.ØluF (greencap) C35 N12, luF 25V (tantalum) C36 M11, Ø.Ø47uF (greencap) C37 M11, lØpF (ceramic) C38 L12, Ø.Ø47uF (greencap) C39 M9, Ø.luF (greencap) C40 N9, Ø.luF (greencap) C41 P19, Ø.22uF 25V (tantalum) C42 M17, Ø.luF (ceramic) C43 O19, lØuF 25V (tantalum) C44 O18, Ø.luF (greencap) C45 O19, Ø.ØluF (greencap) C46 L17, 47ØuF 16V (electro) C47 M19, 22ØuF 16V (electro) C48 N17, Ø.ØØluF (ceramic) C49 N17, Ø.22uF 35V (tantalum) C50 H11, Ø.ØØluF (ceramic) C51 P15, lØuF 25V (tantalum) C52 O16, 22uF 16V (tantalum) C53 O16, Ø.ØluF (ceramic) C54 O14, Ø.ØØ22uF (ceramic) C55 M15, 27ØpF (ceramic) C57 I12, Ø.ØØ22uF (ceramic) C58 I11, l8pF (ceramic) C59 H11, Ø.ØluF (ceramic)	C31	010,	Ø.luF	(greencap)	
C34 O12, Ø.ØluF (greencap) C35 N12, luF 25V (tantalum) C36 M11, Ø.Ø47uF (greencap) C37 M11, lØpF (ceramic) C38 L12, Ø.Ø47uF (greencap) C39 M9, Ø.luF (greencap) C40 N9, Ø.luF (ceramic) C41 P19, Ø.22uF 25V (tantalum) C42 M17, Ø.luF (ceramic) C43 O19, lØuF 25V (tantalum) C44 O18, Ø.luF (greencap) C45 O19, Ø.ØluF (greencap) C46 L17, 47ØuF 16V (electro) C47 M19, 22ØuF 16V (electro) C48 N17, Ø.ØØluF (ceramic) C49 N17, Ø.22uF 35V (tantalum) C50 H11, Ø.ØØluF (ceramic) C51 P15, lØuF 25V (tantalum) C52 O16, 22uF 16V (tantalum) C53 O16, Ø.ØluF (ceramic) C54 O14, Ø.ØØ22uF (ceramic) C55 M15, 27ØpF (ceramic) C56 I13, Ø.ØØluF (ceramic) C57 I12, Ø.ØØ22uF (ceramic) C58 I11, l8pF (ceramic) C59 H11, Ø.ØluF (ceramic)	C32	011,	0.001uF	(greencap)	
C35 N12, luF 25V (tantalum) C36 M11, Ø.047uF (greencap) C37 M11, lØpF (ceramic) C38 L12, Ø.047uF (greencap) C39 M9, Ø.luF (greencap) C40 N9, Ø.luF (ceramic) C41 P19, Ø.22uF 25V (tantalum) C42 M17, Ø.luF (ceramic) C43 O19, lØuF 25V (tantalum) C44 O18, Ø.luF (greencap) C45 O19, Ø.0luF (greencap) C46 L17, 470uF 16V (electro) C47 M19, 220uF 16V (electro) C48 N17, Ø.00luF (ceramic) C49 N17, Ø.22uF 35V (tantalum) C50 H11, Ø.00luF (ceramic) C51 P15, lØuF 25V (tantalum) C52 O16, 22uF 16V (tantalum) C53 O16, Ø.0luF (ceramic) C54 O14, Ø.0022uF (ceramic) C55 M15, 270pF (ceramic) C56 I13, Ø.00luF (ceramic) C57 I12, Ø.0022uF (ceramic) C58 I11, l8pF (ceramic) C59 H11, Ø.0luF (ceramic)	C33	011,	0.001uF	(greencap)	
C36 M11, Ø.Ø47uF (greencap) C37 M11, 10pF (ceramic) C38 L12, Ø.Ø47uF (greencap) C39 M9, Ø.luF (greencap) C40 N9, Ø.luF (ceramic) C41 P19, Ø.22uF 25V(tantalum) C42 M17, Ø.luF (ceramic) C43 O19, 10uF 25V (tantalum) C44 O18, Ø.luF (greencap) C45 O19, Ø.ØluF (greencap) C46 L17, 470uF 16V (electro) C47 M19, 220uF 16V (electro) C48 N17, Ø.ØØluF (ceramic) C49 N17, Ø.22uF 35V(tantalum) C50 H11, Ø.ØØluF (ceramic) C51 P15, 10uF 25V (tantalum) C52 O16, 22uF 16V (tantalum) C53 O16, Ø.ØluF (ceramic) C54 O14, Ø.ØØ22uF (ceramic) C55 M15, 270pF (ceramic) C56 I13, Ø.ØØluF (ceramic) C57 I12, Ø.ØØ22uF (ceramic) C58 I11, 18pF (ceramic) C59 H11, Ø.ØluF (ceramic)	C34	012,	0.01uF	(greencap)	
C37 M11, 10pF (ceramic) C38 L12, 0.047uF (greencap) C39 M9, 0.1uF (greencap) C40 N9, 0.1uF (ceramic) C41 P19, 0.22uF 25V(tantalum) C42 M17, 0.1uF (ceramic) C43 O19, 10uF 25V (tantalum) C44 O18, 0.1uF (greencap) C45 O19, 0.01uF (greencap) C46 L17, 470uF 16V (electro) C47 M19, 220uF 16V (electro) C48 N17, 0.001uF (ceramic) C49 N17, 0.22uF 35V(tantalum) C50 H11, 0.001uF (ceramic) C51 P15, 10uF 25V (tantalum) C52 O16, 22uF 16V (tantalum) C53 O16, 0.01uF (ceramic) C54 O14, 0.0022uF (ceramic) C55 M15, 270pF (ceramic) C56 I13, 0.001uF (ceramic) C57 I12, 0.0022uF (ceramic) C58 I11, 18pF (ceramic) C59 H11, 0.01uF (ceramic)	C35	N12,	luF 25V	(tantalum)	
C38 L12, Ø.Ø47uF (greencap) C39 M9, Ø.luF (greencap) C40 N9, Ø.luF (ceramic) C41 P19, Ø.22uF 25V(tantalum) C42 M17, Ø.luF (ceramic) C43 O19, lØuF 25V (tantalum) C44 O18, Ø.luF (greencap) C45 O19, Ø.ØluF (greencap) C46 L17, 47ØuF 16V (electro) C47 M19, 22ØuF 16V (electro) C48 N17, Ø.ØØluF (ceramic) C49 N17, Ø.22uF 35V(tantalum) C50 H11, Ø.ØØluF (ceramic) C51 P15, lØuF 25V (tantalum) C52 O16, 22uF 16V (tantalum) C53 O16, Ø.ØluF (ceramic) C54 O14, Ø.ØØ22uF (ceramic) C55 M15, 27ØpF (ceramic) C56 I13, Ø.ØØluF (ceramic) C57 I12, Ø.ØØ22uF (ceramic) C58 I11, l8pF (ceramic) C59 H11, Ø.ØluF (ceramic)	C36	Mll,	0.047uF	(greencap)	
C39 M9 , Ø.luF (greencap) C40 N9 , Ø.luF (ceramic) C41 P19, Ø.22uF 25V(tantalum) C42 M17, Ø.luF (ceramic) C43 O19, lØuF 25V (tantalum) C44 O18, Ø.luF (greencap) C45 O19, Ø.ØluF (greencap) C46 L17, 47ØuF 16V (electro) C47 M19, 22ØuF 16V (electro) C48 N17, Ø.ØØluF (ceramic) C49 N17, Ø.22uF 35V(tantalum) C50 H11, Ø.ØØluF (ceramic) C51 P15, lØuF 25V (tantalum) C52 O16, 22uF 16V (tantalum) C53 O16, Ø.ØluF (ceramic) C54 O14, Ø.ØØ22uF (ceramic) C55 M15, 27ØpF (ceramic) C56 I13, Ø.ØØluF (ceramic) C57 I12, Ø.ØØ22uF (ceramic) C58 I11, l8pF (ceramic) C59 H11, Ø.ØluF (ceramic)	C37	Mll,	10pF	(ceramic)	
C40 N9, 0.1uF (ceramic) C41 P19, 0.22uF 25V(tantalum) C42 M17, 0.1uF (ceramic) C43 O19, 10uF 25V (tantalum) C44 O18, 0.1uF (greencap) C45 O19, 0.01uF (greencap) C46 L17, 470uF 16V (electro) C47 M19, 220uF 16V (electro) C48 N17, 0.001uF (ceramic) C49 N17, 0.22uF 35V(tantalum) C50 H11, 0.001uF (ceramic) C51 P15, 10uF 25V (tantalum) C52 O16, 22uF 16V (tantalum) C53 O16, 0.01uF (ceramic) C54 O14, 0.0022uF (ceramic) C55 M15, 270pF (ceramic) C56 I13, 0.001uF (ceramic) C57 I12, 0.0022uF (ceramic) C58 I11, 18pF (ceramic)NPO C59 H11, 0.01uF (ceramic)	C38	L12,	0.047uF	(greencap)	
C41 P19, Ø.22uF 25V(tantalum) C42 M17, Ø.1uF (ceramic) C43 O19, 1ØuF 25V (tantalum) C44 O18, Ø.1uF (greencap) C45 O19, Ø.01uF (greencap) C46 L17, 47ØuF 16V (electro) C47 M19, 22ØuF 16V (electro) C48 N17, Ø.0Ø1uF (ceramic) C49 N17, Ø.22uF 35V(tantalum) C50 H11, Ø.0Ø1uF (ceramic) C51 P15, 1ØuF 25V (tantalum) C52 O16, 22uF 16V (tantalum) C53 O16, Ø.01uF (ceramic) C54 O14, Ø.0Ø22uF (ceramic) C55 M15, 27ØpF (ceramic) C56 I13, Ø.0Ø1uF (ceramic) C57 I12, Ø.0Ø22uF (ceramic) C58 I11, 18pF (ceramic) NPO C59 H11, Ø.01uF (ceramic)	C39	м9 ,	Ø.luF	(greencap)	
C42 M17, Ø.luF (ceramic) C43 O19, lØuF 25V (tantalum) C44 O18, Ø.luF (greencap) C45 O19, Ø.ØluF (greencap) C46 L17, 47ØuF 16V (electro) C47 M19, 22ØuF 16V (electro) C48 N17, Ø.ØØluF (ceramic) C49 N17, Ø.22uF 35V(tantalum) C5Ø H11, Ø.ØØluF (ceramic) C51 P15, lØuF 25V (tantalum) C52 O16, 22uF 16V (tantalum) C53 O16, Ø.ØluF (ceramic) C54 O14, Ø.ØØ22uF (ceramic) C55 M15, 27ØpF (ceramic) C56 I13, Ø.ØØluF (ceramic) C57 I12, Ø.ØØ22uF (ceramic) C58 I11, l8pF (ceramic) C59 H11, Ø.ØluF (ceramic)	C40	N9 ,	Ø.luF	(ceramic)	
C43 O19, 10uF 25V (tantalum) C44 O18, 0.1uF (greencap) C45 O19, 0.01uF (greencap) C46 L17, 470uF 16V (electro) C47 M19, 220uF 16V (electro) C48 N17, 0.001uF (ceramic) C49 N17, 0.22uF 35V(tantalum) C50 H11, 0.001uF (ceramic) C51 P15, 10uF 25V (tantalum) C52 O16, 22uF 16V (tantalum) C53 O16, 0.01uF (ceramic) C54 O14, 0.0022uF (ceramic) C55 M15, 270pF (ceramic) C56 I13, 0.001uF (ceramic) C57 I12, 0.0022uF (ceramic) C58 I11, 18pF (ceramic) C59 H11, 0.01uF (ceramic)	C41	P19,	Ø.22uF 25V	(tantalum)	
C44 O18, Ø.luF (greencap) C45 O19, Ø.ØluF (greencap) C46 L17, 47ØuF 16V (electro) C47 M19, 22ØuF 16V (electro) C48 N17, Ø.ØØluF (ceramic) C49 N17, Ø.22uF 35V(tantalum) C5Ø H11, Ø.ØØluF (ceramic) C51 P15, 1ØuF 25V (tantalum) C52 O16, 22uF 16V (tantalum) C53 O16, Ø.ØluF (ceramic) C54 O14, Ø.ØØ22uF (ceramic) C55 M15, 27ØpF (ceramic) C56 I13, Ø.ØØluF (ceramic) C57 I12, Ø.ØØ22uF (ceramic) C58 I11, 18pF (ceramic) C59 H11, Ø.ØluF (ceramic)	C42	M17,	Ø.luF	(ceramic)	
C45 O19, Ø.ØluF (greencap) C46 L17, 47ØuF 16V (electro) C47 M19, 22ØuF 16V (electro) C48 N17, Ø.ØØluF (ceramic) C49 N17, Ø.22uF 35V(tantalum) C5Ø H11, Ø.ØØluF (ceramic) C51 P15, 1ØuF 25V (tantalum) C52 O16, 22uF 16V (tantalum) C53 O16, Ø.ØluF (ceramic) C54 O14, Ø.ØØ22uF (ceramic) C55 M15, 27ØpF (ceramic) C56 I13, Ø.ØØluF (ceramic) C57 I12, Ø.ØØ22uF (ceramic) C58 I11, 18pF (ceramic) C59 H11, Ø.ØluF (ceramic)	C43	019,	10uF 25V	(tantalum)	
C46 L17, 470uF 16V (electro) C47 M19, 220uF 16V (electro) C48 N17, 0.00luF (ceramic) C49 N17, 0.22uF 35V(tantalum) C50 H11, 0.00luF (ceramic) C51 P15, 10uF 25V (tantalum) C52 O16, 22uF 16V (tantalum) C53 O16, 0.0luF (ceramic) C54 O14, 0.0022uF (ceramic) C55 M15, 270pF (ceramic) C56 I13, 0.00luF (ceramic) C57 I12, 0.0022uF (ceramic) C58 I11, 18pF (ceramic) C59 H11, 0.0luF (ceramic)	C44	018,	Ø.luF	(greencap)	
C47 M19, 220uF 16V (electro) C48 N17, 0.00luF (ceramic) C49 N17, 0.22uF 35V(tantalum) C50 H11, 0.00luF (ceramic) C51 P15, 10uF 25V (tantalum) C52 O16, 22uF 16V (tantalum) C53 O16, 0.0luF (ceramic) C54 O14, 0.0022uF (ceramic) C55 M15, 270pF (ceramic) C56 I13, 0.00luF (ceramic) C57 I12, 0.0022uF (ceramic) C58 I11, 18pF (ceramic) C59 H11, 0.0luF (ceramic)	C45	019,	Ø.ØluF	(greencap)	
C48 N17, 0.00luF (ceramic) C49 N17, 0.22uF 35V(tantalum) C50 H11, 0.00luF (ceramic) C51 P15, 10uF 25V (tantalum) C52 O16, 22uF 16V (tantalum) C53 O16, 0.0luF (ceramic) C54 O14, 0.0022uF (ceramic) C55 M15, 270pF (ceramic) C56 I13, 0.00luF (ceramic) C57 I12, 0.0022uF (ceramic) C58 I11, 18pF (ceramic) C59 H11, 0.0luF (ceramic)	C46	L17,	470uF 16V	(electro)	2
C49 N17, 0.22uF 35V(tantalum) C50 H11, 0.001uF (ceramic) C51 P15, 10uF 25V (tantalum) C52 O16, 22uF 16V (tantalum) C53 O16, 0.01uF (ceramic) C54 O14, 0.0022uF (ceramic) C55 M15, 270pF (ceramic) C56 I13, 0.001uF (ceramic) C57 I12, 0.0022uF (ceramic) C58 I11, 18pF (ceramic) C59 H11, 0.01uF (ceramic)	C47	M19,	220uF 16V	(electro)	
C50 H11, 0.001uF (ceramic) C51 P15, 10uF 25V (tantalum) C52 O16, 22uF 16V (tantalum) C53 O16, 0.01uF (ceramic) C54 O14, 0.0022uF (ceramic) C55 M15, 270pF (ceramic) C56 I13, 0.001uF (ceramic) C57 I12, 0.0022uF (ceramic) C58 I11, 18pF (ceramic) C59 H11, 0.01uF (ceramic)	C48	N17,	0.001uF	(ceramic)	
C51 P15, 10uF 25V (tantalum) C52 O16, 22uF 16V (tantalum) C53 O16, 0.01uF (ceramic) C54 O14, 0.0022uF (ceramic) C55 M15, 270pF (ceramic) C56 I13, 0.001uF (ceramic) C57 I12, 0.0022uF (ceramic) C58 I11, 18pF (ceramic) C59 H11, 0.01uF (ceramic)	C49	N17,	0.22uF 35V	(tantalum)	
C52 O16, 22uF 16V (tantalum) C53 O16, 0.0luF (ceramic) C54 O14, 0.0022uF (ceramic) C55 M15, 270pF (ceramic) C56 I13, 0.00luF (ceramic) C57 I12, 0.0022uF (ceramic) C58 I11, 18pF (ceramic) C59 H11, 0.0luF (ceramic)	C5Ø	H11,	0.001uF	(ceramic)	
C53 016, 0.01uF (ceramic) C54 014, 0.0022uF (ceramic) C55 M15, 270pF (ceramic) C56 I13, 0.001uF (ceramic) C57 I12, 0.0022uF (ceramic) C58 I11, 18pF (ceramic)NPO C59 H11, 0.01uF (ceramic)	C51	P15,	10uF 25V	(tantalum)	Ы
C54 014, 0.0022uF (ceramic) C55 M15, 270pF (ceramic) C56 I13, 0.001uF (ceramic) C57 I12, 0.0022uF (ceramic) C58 I11, 18pF (ceramic)NPO C59 H11, 0.01uF (ceramic)	C52	016,	22uF 16V	(tantalum)	
C55 M15, 270pF (ceramic) C56 I13, 0.00luF (ceramic) C57 I12, 0.0022uF (ceramic) C58 I11, 18pF (ceramic)NPO C59 H11, 0.0luF (ceramic)	C53	016,	0.01uF	(ceramic)	
C56 I13, 0.00luF (ceramic) C57 I12, 0.0022uF (ceramic) C58 I11, 18pF (ceramic)NPO C59 H11, 0.0luF (ceramic)	C54	014,	0.0022uF	(ceramic)	
C57 Il2, Ø.ØØ22uF (ceramic) C58 Il1, 18pF (ceramic)NPO C59 Hll, Ø.ØluF (ceramic)	C55	M15,	270pF	(ceramic)	
C58 Ill, 18pF (ceramic)NPO C59 Hll, Ø.ØluF (ceramic)	C56	113,	0.00luF	(ceramic)	
C59 Hll, Ø.ØluF (ceramic)	C57	112,	0.0022uF	(ceramic)	
	C58	111,	18pF	(ceramic)NPO	
CER TIA ILIT OFTE (LICELEI)	C59	Hll,	Ø.ØluF	(ceramic)	
C60 Il4, luF 25V (tantalum)	C60	114,	luF 25V	(tantalum)	

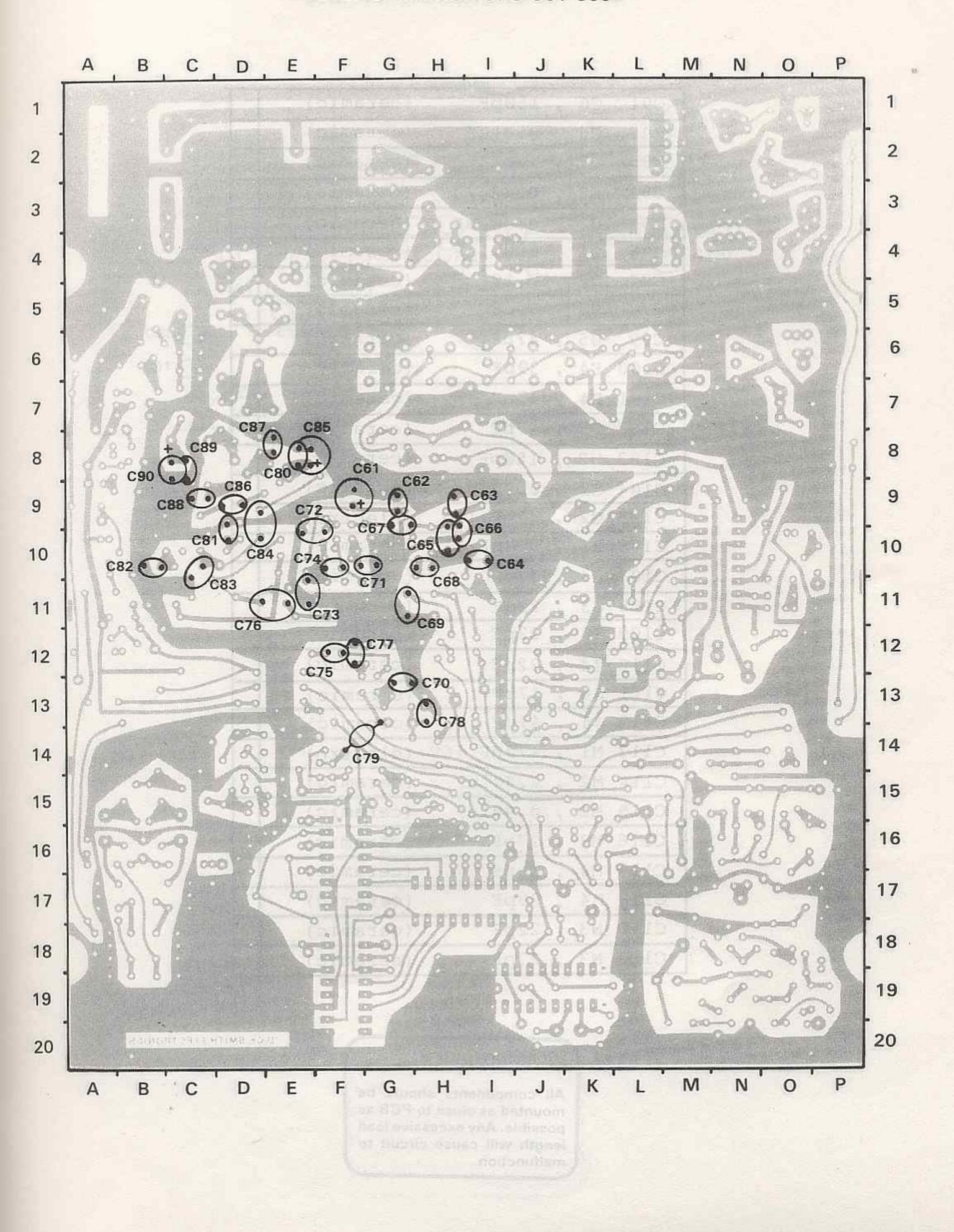
WARNING

STEP 8. CAPACITORS C31-C60



C61 F9 , 47uF 16V (electro) C62 G9 , Ø.ØluF (ceramic) C63 H9 , Ø.ØØ47uF (ceramic) C64 I1Ø, 5.6pF (ceramic) NP C65 H1Ø, 4.7pF (ceramic) NP C66 H1Ø, 3.3pF (ceramic) NP C67 G9 , 68pF (ceramic) C68 H1Ø, 12pF (ceramic) C70 G13, Ø.ØluF (ceramic) C70 G13, Ø.ØluF (ceramic) C71 F1Ø, Ø.ØluF (ceramic) C72 E1Ø, Ø.ØluF (ceramic) C73 E11, Ø.ØluF (ceramic) C74 F1Ø, 15pF (ceramic) C75 F12, lpF (ceramic) C76 E11, lØpF (ceramic) C77 F12, Ø.ØØ22uF (ceramic) C78 H13, Ø.ØluF (ceramic) C79 F14, 3.3pF (ceramic)	
C63 H9 , Ø.ØØ47uF (ceramic) C64 I10, 5.6pF (ceramic) NP C65 H10, 4.7pF (ceramic) NP C66 H10, 3.3pF (ceramic) NP C67 G9 , 68pF (ceramic) C68 H10, 12pF (ceramic) C69 G11, Ø.ØluF (ceramic) C70 G13, Ø.ØluF (ceramic) C71 F10, Ø.ØluF (ceramic) C72 E10, Ø.ØluF (ceramic) C73 E11, Ø.ØluF (ceramic) C74 F10, 15pF (ceramic) C75 F12, lpF (ceramic) C76 E11, lØpF (ceramic) C77 F12, Ø.ØØ22uF (ceramic) C78 H13, Ø.ØluF (ceramic)	
C64 I10, 5.6pF (ceramic) NP C65 H10, 4.7pF (ceramic) NP C66 H10, 3.3pF (ceramic) NP C67 G9, 68pF (ceramic) C68 H10, 12pF (ceramic) C69 G11, 0.01uF (ceramic) C70 G13, 0.01uF (ceramic) C71 F10, 0.01uF (ceramic) C72 E10, 0.01uF (ceramic) C73 E11, 0.01uF (ceramic) C74 F10, 15pF (ceramic) C75 F12, 1pF (ceramic) C76 E11, 10pF (ceramic) C77 F12, 0.0022uF (ceramic) C78 H13, 0.01uF (ceramic)	
C65 H10, 4.7pF (ceramic) NP C66 H10, 3.3pF (ceramic) NP C67 G9, 68pF (ceramic) C68 H10, 12pF (ceramic) NP C69 G11, 0.01uF (ceramic) C70 G13, 0.01uF (ceramic) C71 F10, 0.01uF (ceramic) C72 E10, 0.01uF (ceramic) C73 E11, 0.01uF (ceramic) C74 F10, 15pF (ceramic) C75 F12, 1pF (ceramic) C76 E11, 10pF (ceramic) C77 F12, 0.0022uF (ceramic) C78 H13, 0.01uF (ceramic)	
C66 H10, 3.3pF (ceramic) NP C67 G9, 68pF (ceramic) C68 H10, 12pF (ceramic) NP C69 G11, 0.01uF (ceramic) C70 G13, 0.01uF (ceramic) C71 F10, 0.01uF (ceramic) C72 E10, 0.01uF (ceramic) C73 E11, 0.01uF (ceramic) C74 F10, 15pF (ceramic) C75 F12, 1pF (ceramic) C76 E11, 10pF (ceramic) C77 F12, 0.0022uF (ceramic) C78 H13, 0.01uF (ceramic)	0
C67 G9 , 68pF (ceramic) C68 H10, 12pF (ceramic) NP C69 G11, 0.01uF (ceramic) C70 G13, 0.01uF (ceramic) C71 F10, 0.01uF (ceramic) C72 E10, 0.01uF (ceramic) C73 E11, 0.01uF (ceramic) C74 F10, 15pF (ceramic) C75 F12, 1pF (ceramic) C76 E11, 10pF (ceramic) C77 F12, 0.0022uF (ceramic) C78 H13, 0.01uF (ceramic)	0
C68 H10, 12pF (ceramic) NP C69 G11, 0.01uF (ceramic) C70 G13, 0.01uF (ceramic) C71 F10, 0.01uF (ceramic) C72 E10, 0.01uF (ceramic) C73 E11, 0.01uF (ceramic) C74 F10, 15pF (ceramic) C75 F12, 1pF (ceramic) C76 E11, 10pF (ceramic) C77 F12, 0.0022uF (ceramic) C78 H13, 0.01uF (ceramic)	0
C69 G11, Ø.ØluF (ceramic) C70 G13, Ø.ØluF (ceramic) C71 F10, Ø.ØluF (ceramic) C72 E1Ø, Ø.ØluF (ceramic) C73 E11, Ø.ØluF (ceramic) C74 F1Ø, 15pF (ceramic) C75 F12, lpF (ceramic) C76 E11, lØpF (ceramic) C77 F12, Ø.ØØ22uF (ceramic) C78 H13, Ø.ØluF (ceramic)	
C70 G13, 0.01uF (ceramic) C71 F10, 0.01uF (ceramic) C72 E10, 0.01uF (ceramic) C73 E11, 0.01uF (ceramic) C74 F10, 15pF (ceramic) C75 F12, 1pF (ceramic) C76 E11, 10pF (ceramic) C77 F12, 0.0022uF (ceramic) C78 H13, 0.01uF (ceramic)	0
C71 F10, 0.0luF (ceramic) C72 E10, 0.0luF (ceramic) C73 E11, 0.0luF (ceramic) C74 F10, 15pF (ceramic) C75 F12, lpF (ceramic) C76 E11, l0pF (ceramic) C77 F12, 0.0022uF (ceramic) C78 H13, 0.0luF (ceramic)	
C72 E10, 0.0luF (ceramic) C73 E11, 0.0luF (ceramic) C74 F10, 15pF (ceramic) C75 F12, 1pF (ceramic) C76 E11, 10pF (ceramic) C77 F12, 0.0022uF (ceramic) C78 H13, 0.0luF (ceramic)	
C73 E11, 0.01uF (ceramic) C74 F10, 15pF (ceramic) C75 F12, 1pF (ceramic) C76 E11, 10pF (ceramic) C77 F12, 0.0022uF (ceramic) C78 H13, 0.01uF (ceramic)	
C74 F10, 15pF (ceramic) C75 F12, 1pF (ceramic) C76 E11, 10pF (ceramic) C77 F12, 0.0022uF (ceramic) C78 H13, 0.01uF (ceramic)	
C75 F12, lpF (ceramic) C76 E11, l0pF (ceramic) C77 F12, 0.0022uF (ceramic) C78 H13, 0.0luF (ceramic)	
C76 Ell, l@pF (ceramic) C77 Fl2, Ø.ØØ22uF (ceramic) C78 Hl3, Ø.ØluF (ceramic)	
C77 F12, Ø.ØØ22uF (ceramic) C78 H13, Ø.ØluF (ceramic)	
C78 H13, Ø.ØluF (ceramic)	
C79 F14, 3.3pF (ceramic)	
the state of the s	3
C80 E8 , 0.0luF (ceramic)	
C81 D9 , Ø.ØluF (ceramic)	
C82 Bl0, Ø.0luF (ceramic)	10-6
C83 C10, 4.7pF (ceramic)	H A
C84 D9 , 15pF (ceramic)	
C85 E8 , 47uF 16V (electro)	
C86 D9 , 68pF (ceramic)	
C87 E8 , 18pF (ceramic)	
C88 C9 , Ø.ØluF (ceramic)	1
C89 C8 , 0.0luF (ceramic)	
C90 B8 , 4.7uF 25V (tantalum)	

WARNING



STEP 10. CAPACITORS C91-C120

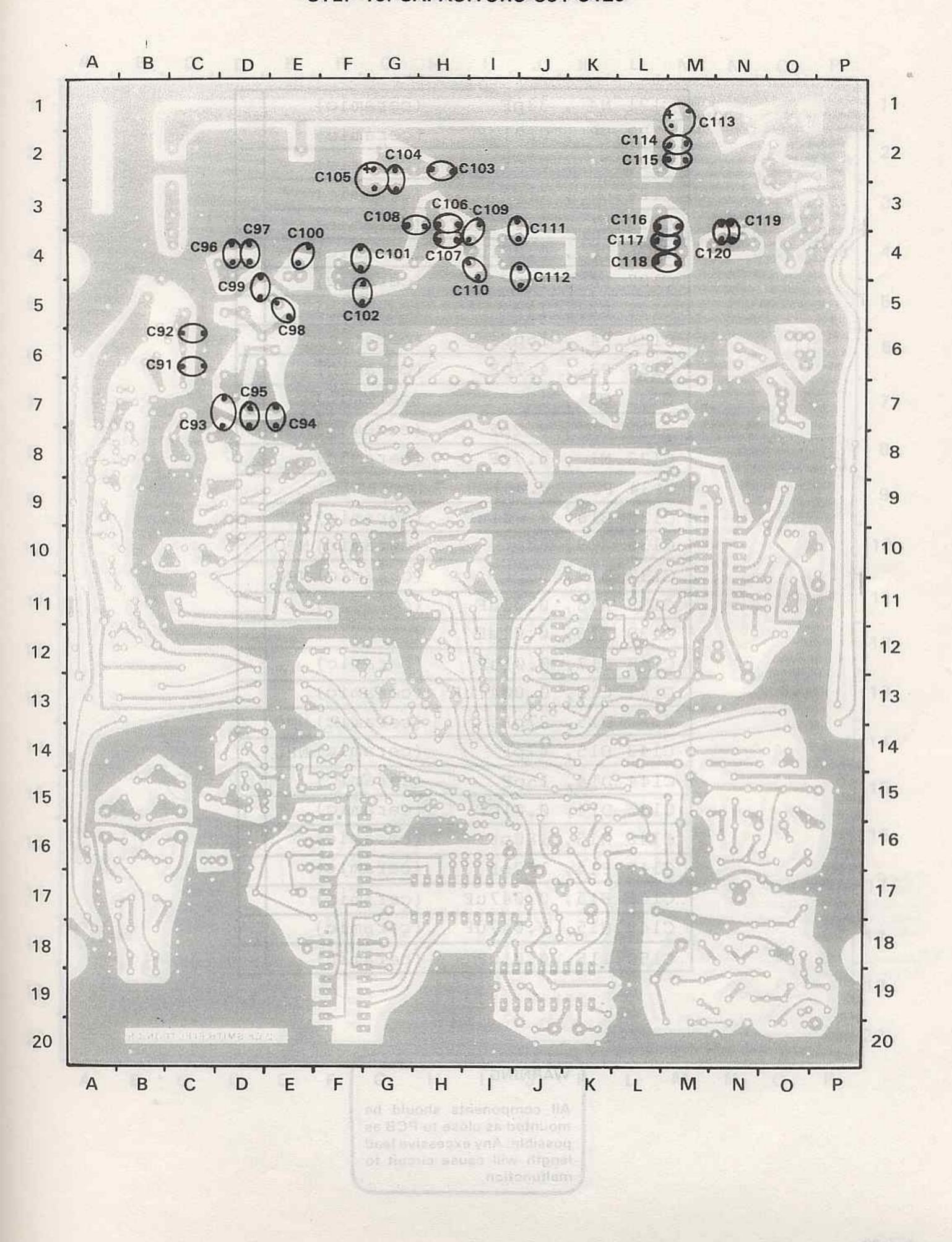
C91	C6	,	150pF	(ceramic)
C92	C6	,	0.01uF	(ceramic)
C93	D7	,	18pF	(ceramic)
C94	E7	,	0.0047uF	(ceramic)
C95	D7	,	0.00luF	(ceramic)
C96	D4	,	0.00luF	(ceramic)
C97	D4	,	0.00luF	(ceramic)
C98	E5	,	82pF	(ceramic)
C99	D5	,	47pF	(ceramic)
C100	E4	,	39pF	(ceramic)
C101	F4	,	47pF	(ceramic)
C102	F5	,	47pF	(ceramic)
C103	Н2	,	150pF	(ceramic)
C104	G2	,	0.00luF	(ceramic)
C105	G2	,	47uF 16V	(electro)
C106	Н3	,	8.2pF	(ceramic)
C107	H4	,	22pF	(ceramic)
C108	G3	,	22pF	(ceramic)
C109	13	,	22pF	(ceramic)
C110	14	,	22pF	(ceramic)
C111	J4	,	47pF	(ceramic)
C112	J4		47pF	(ceramic)
C113	Ml	,	470uF 16V	(electro)
C114	M2	,	Ø.00luF	(ceramic)
C115	M2	,	0.00luF	(ceramic)
C116	М3	,	27pF	(ceramic)
C117	M4	,	15pF	(ceramic)
C118	M4	,	39pF	(ceramic)
C119	N3	,	22pF	(ceramic)
C120	И3	,	27pF	(ceramic)
		-57		

WARNING

All components should be mounted as close to PCB as possible. Any excessive lead length will cause circuit to malfunction.

SF

ME



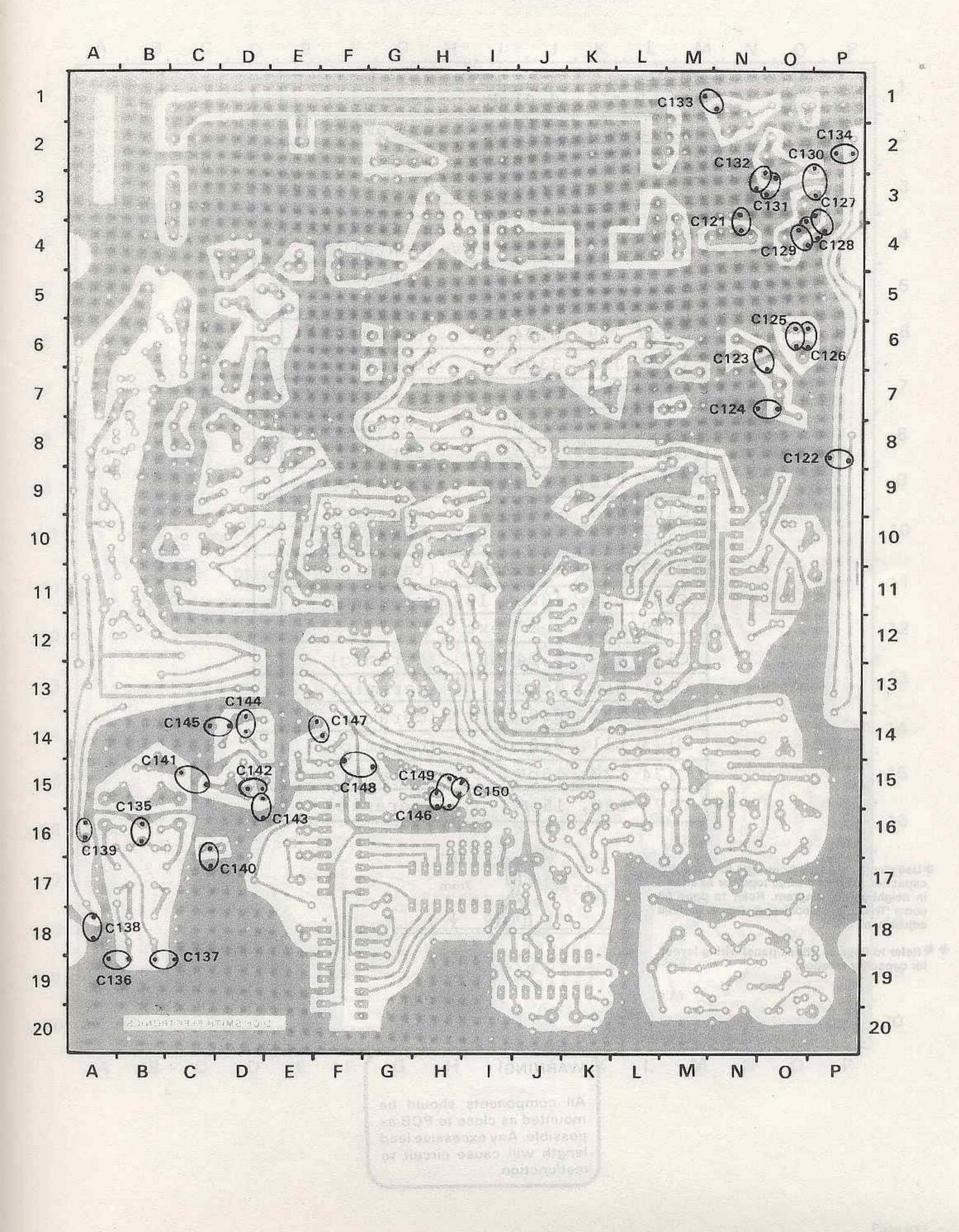
			Charles to the second second second	
C121	N4 ,	33pF	(ceramic)	
C122	P8 ,	0.0luF	(ceramic)	
C123	06,	22pF	(ceramic)	
C124	07,	47pF	(ceramic)	
C125	06 ,	0.0047uF	(ceramic)	
C126	P6 ,	0.001uF	(ceramic)	
C127	P4 ,	15pF	(ceramic)	
C128	P4 ,	12pF	(ceramic)	
C129	P4 ,	15pF	(ceramic)	
C130	P3 ,	4.7pF	(ceramic)	
C131	03,	12pF	(ceramic)	0
C132	03,	8.2pF	(ceramic)	3
C133	Nl,	4.7pF	(ceramic)	
C134	P2 ,	0.00luF	(ceramic)	
C135	B16,	0.00luF	(ceramic)	
C136	A19,	68pF	(ceramic) NPO	
C137	в19,	56pF	(ceramic) NPO	
C138	A18,	0.0luF	(ceramic)	
C139	A16,	Ø.ØluF	(ceramic)	
C140	C17,	0.0luF	(ceramic)	
C141	C15,	0.0047uF	(ceramic)	
C142	D15,	27pF	(ceramic) NPO	
C143	D15,	47pF	(ceramic) NPO	
C144	D14,	15pF	(ceramic)	
C145	D14,	Ø.01uF	(ceramic)	
C146	Н15,	180pF	(ceramic)	1
C147	F14,	180pF	(ceramic)	N.
C148	F15,	0.047uF	(ceramic)	
C149	Н15,	0.047uF	(ceramic)	
C150	115.	Ø.ØluF	(ceramic)	

WARNING

All components should be mounted as close to PCB as possible. Any excessive lead length will cause circuit to malfunction.

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STEP 11. CAPACITORS C121-C150



A GENERAL GUIDE TO KIT CONSTRUCTION

FOLLOW THE MANUAL

Read each step completely — before starting. Make sure you understand everything that's involved.

TAKE YOUR TIME

Allow yourself plenty of time to build the kit. Set aside an area where you can work undisturbed, and can leave the kit between sessions.

CHECK YOUR WORK

Refer frequently to the kit's instruction manual, check each step as it is completed.

SOLDERING

Poor soldering is the major cause of kits not working. This is simply because most people do not take the time to learn how to solder properly and practise it.

THE IRON

The soldering iron used should be suited to electronic work. A wattage of from 10 to 30 watts is ideal, with a tip size from 1.5 to 4mm across. A chisel shape is usually best.

The tip should be kept clean at all times. The best way is to keep a damp sponge or cloth handy and wipe the iron on it occasionally. If the tip is pitted it will have to be reshaped by filing (except iron plated tips which must not be filed).

THE SOLDER

The best solder for general electronics use is 60/40 multicore (60% tin/ 40% lead with inbuilt resin flux). SAV-BIT is a variation of this type with 2% copper added to improve tip life. 'Acid core' solders must not be used.

METHOD

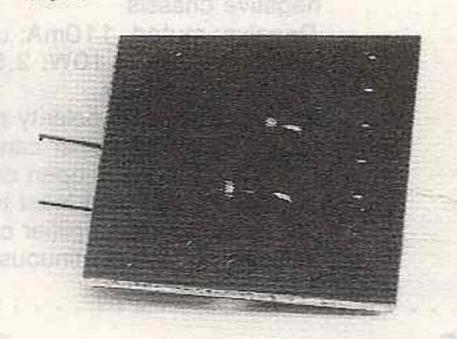
The joint must be clean and free from tarnish, lacquers etc. for the solder to adhere properly. If necessary, use sandpaper or a fine file to clean the joint.

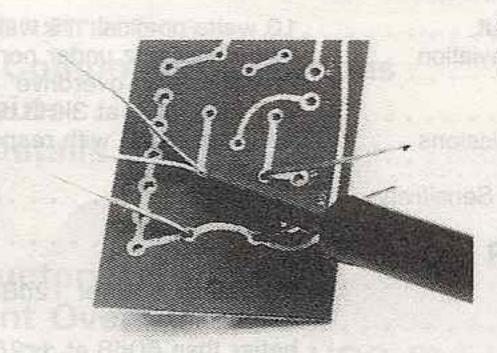
Make a good mechanical connection: bend leads of components mounted on printed circuit boards at 45° once inserted; and on wires connecting to switches, terminals etc. at 90°.

Hold the iron as you hold a pencil and apply it to the joint before the solder to pre-heat the joint (about one second for PC boards) then apply the solder to the joint and the iron. The solder will flow freely when the joint is hot enough. Remove the iron and and solder when the solder has flowed across the whole joint. If the solder forms a ball the joint needs more heat.

Don't move anything while the solder is cooling. If you do, re-heat and add a little more solder to ensure a clean joint. The connection should be shiny and the solder should flow smoothly into it. If it looks cracked or frosty, the joint is dry and must be re-done.

If you've never used an iron before, do some practise runs first. Get the feel of the solder flow, and when to apply and remove the solder and the iron.









When soldering semiconductors and other sensitive components it is a good idea to hold the lead with pliers or a heatsink clip to prevent damage by overheating. This isn't necessary once you can solder fast and reliably.

When it is cool, inspect each joint carefully; look for solder 'bridges' shorting across PC tracks, pinholes and cracks in the joints.

COMPONENT IDENTIFICATION

One of the biggest problems for the beginning constructor is identifying the components correctly. The main trap is in the maze of numbers put on components by manufacturers. There will normally be a drawing of the parts in the kit manual, but identifying numbers may not be easy to find on the components themselves. As an example, what's described as a '741' IC may be marked LM741CN, N5741T, 741TC, MC1741CP1 or SN52741N. Confusing, isn't it? Notice though, that there is a '741' somewhere in all the numbers. The other numbers and letters indicate the manufacturer, and various batch and variety codes of the particular manufacturer. All these may be ignored as any of these ICs would work equally well in a circuit.

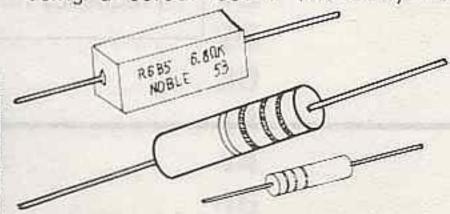
We will now go through the common components in our kits.

RESISTORS

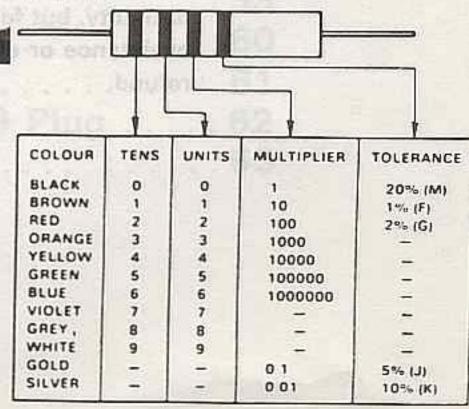
So called because they 'resist' the flow of current. They are normally in the form of small cylinders about 10mm long. Some high wattage types are rectangular.

Resistance is measured in ohms, abbreviated to Ω or R. Thousands are indicated by 'k', millions by 'M'. Thus a 12k resistor has a resistance of 12 000 ohms.

This value is marked on the resistors using a colour code. The body has



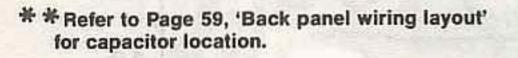
(normally) four stripes. The first three indicate the resistance, the last the tolerance - how much the resistor may vary from its quoted resistance. The last band need not concern us as it is normally gold (5%) in our kits, which is accurate for most uses. To read the colour code, start with the band closest to the end. The first two are the significant figures, and the third is the number of zeroes following. The chart below shows the value of the different colours.

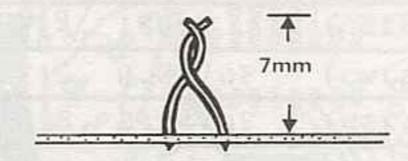


STEP 12. CAPACITORS C151-C174

C151	116,	Ø.ØluF	(ceramic)	
C152	F15,	0.047uF	(ceramic)	
C153	Н12,	0.022uF	(greencap)	
C154	,	Not Alloca	ated	
C155	J17,	0.047uF	(ceramic)	
C156	H12,	3.3uF 25V	(tantalum)	
C157	J17,	luF 25V	(tantalum)	
C158	J18,	0.047uF	(ceramic)	
C159	J19,	0.047uF	(ceramic)	
C160	J20,	33pF	(ceramic)	
C161	K20,	56pF	(ceramic)	
C162	Kll,	220pF	(ceramic)	
C163	J12,	5.6pF	(ceramic)	
C164	K12,	Ø.047uF	(greencap)	
C165	J13,	0.001uF	(ceramic)	
C166	к13,	10uF 25V	(tantalum)	
C167	J14,	luF 25V	(tantalum)	
C168	L19,	100uF 16V	(electro)	
C169	01,	See Text *		
C170	E13,	0.047uF	(ceramic)	
C171	L16,	Ø.luF	(ceramic)	
C172	J11,	Ø.ØluF	(ceramic)	
C173	Ell,	Ø.ØluF	(ceramic)	
C174	L20,	15pF	(ceramic)	
C175	L20,	15pF	(ceramic)	
	C152 C153 C154 C155 C156 C157 C158 C159 C160 C161 C162 C162 C163 C164 C165 C165 C166 C170 C170 C171 C172 C173 C174	C152 F15, C153 H12, C154, C155 J17, C156 H12, C157 J17, C158 J18, C159 J19, C160 J20, C161 K20, C162 K11, C163 J12, C164 K12, C165 J13, C166 K13, C167 J14, C168 L19, C169 O1, C170 E13, C171 L16, C172 J11, C173 E11, C174 L20,	C152 F15, Ø.Ø47uF C153 H12, Ø.Ø22uF C154, Not Alloca C155 J17, Ø.Ø47uF C156 H12, 3.3uF 25V C157 J17, luF 25V C158 J18, Ø.Ø47uF C159 J19, Ø.Ø47uF C160 J2Ø, 33pF C161 K2Ø, 56pF C162 K11, 22@pF C163 J12, 5.6pF C164 K12, Ø.Ø47uF C165 J13, Ø.Ø01uF C166 K13, løuF 25V C167 J14, luF 25V C168 L19, løøuF 16V C169 O1 , See Text *	C162 K11, 220pF (ceramic) C163 J12, 5.6pF (ceramic) C164 K12, 0.047uF (greencap) C165 J13, 0.00luF (ceramic) C166 K13, l0uF 25V (tantalum) C167 J14, luF 25V (tantalum) C168 L19, l00uF 16V (electro) C169 O1 , See Text* C170 E13, 0.047uF (ceramic) C171 L16, 0.luF (ceramic) C172 J11, 0.0luF (ceramic) C173 E11, 0.0luF (ceramic) C174 L20, l5pF (ceramic)

^{*}Use single core telephone wire to make this capacitor. Twist two wires together as shown in neighbouring diagram. Refer to page 60 under 'Tranceiver Modulation', Part 2. for final adjustment.



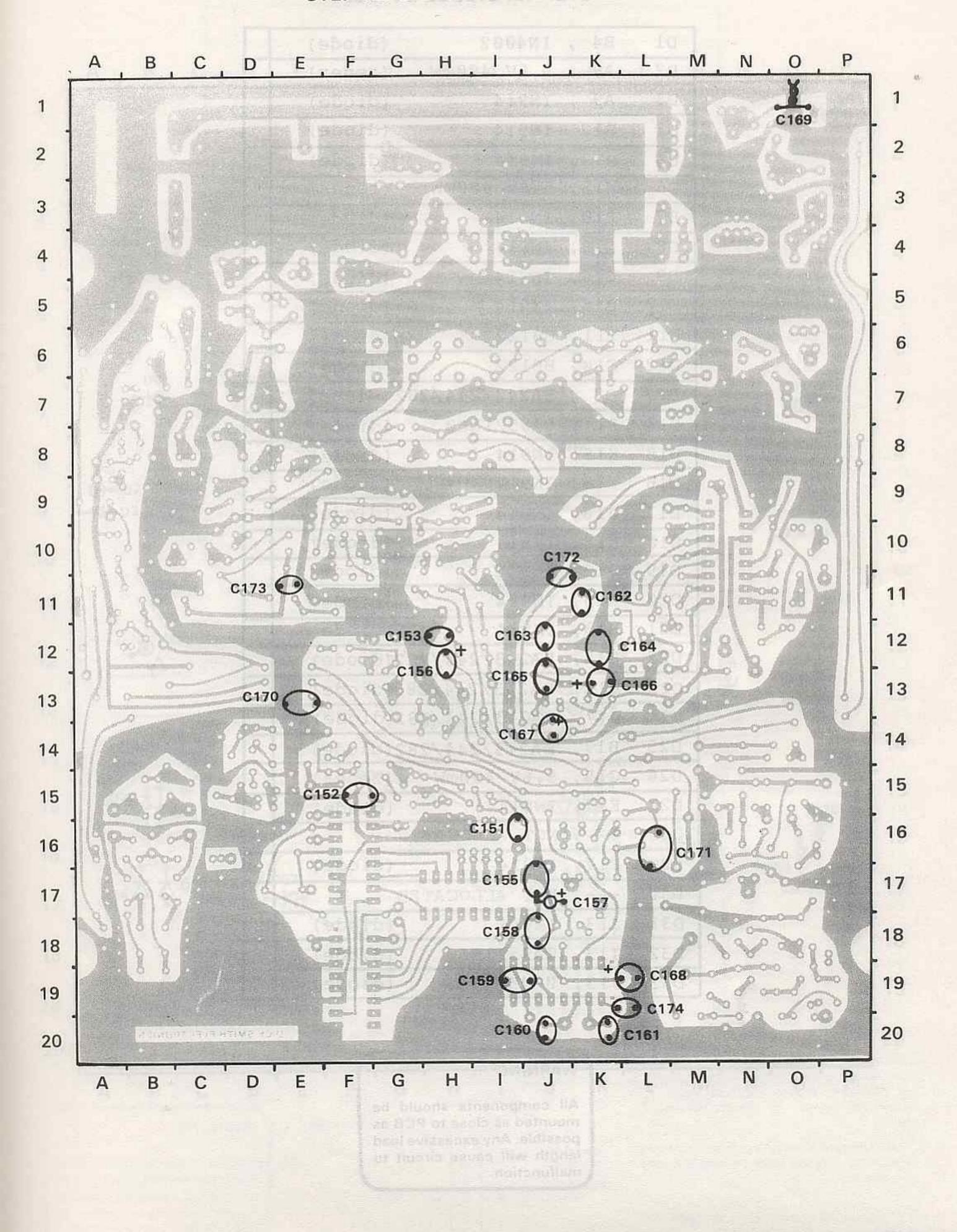


WARNING

All components should be mounted as close to PCB as possible. Any excessive lead length will cause circuit to malfunction.

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STEP 12. CAPACITORS C151-C174



STEP 13. DIODES D1-D33

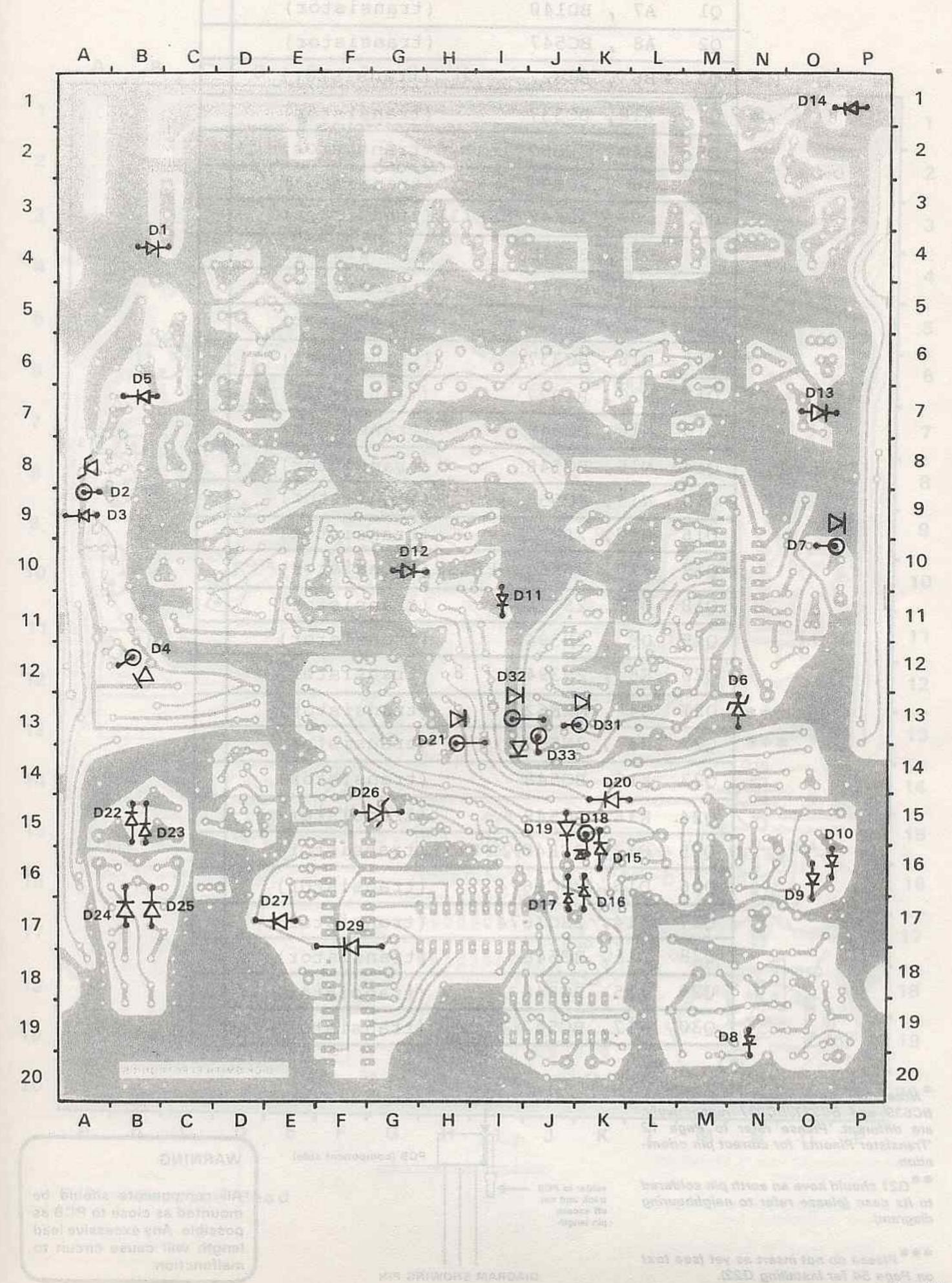
Dl	В4 ,	IN4002	(diode)
D2	A8 ,	5.6V 400mW	(zener)
D3	A9 ,	IN914	(diode)
D4	B12,	IN914	(diode)
D5	В7 ,	IN914	(diode)
D6	N13,	5.6V 400mW	(zener)
D7	PlØ,	IN914	(diode)
D8	N19,	IN914	(diode)
D9	016,	IN914	(diode)
D10	P16,	IN914	(diode)
Dll	Ill,	BB122	(diode)
D12	G10,	BB122	(diode)
D13	07 ,	BA243/244/28	32(diode)
D14	Pl,	OA95/1N60	(diode)
D15	K15,	IN914	(diode)
D16	K16,	IN914	(diode)
D17	J16,	IN914	(diode)
D18	K15,	IN914	(diode)
D19	J15,	IN914	(diode)
D20	K15,	IN914	(diode)
D21	н13,	IN914	(diode)
D22	B15,	BA243/244/28	32(diode)
D23	B15,	BA243/244/28	32(diode)
D24	B17,	BA243/244/28	32(diode)
D25	В17,	BA243/244/28	32(diode)
D26	G15,	5.6V 400mW	(Zener)
D27	E17,	IN914	(diode)
D28	,	NOT ALLOCATE	D
D29	F17,	IN914	(diode)
D30	,	NOT ALLOCATE	2D
D31	J13,	IN914	(diode)
D32	113,	ØA95/1N60	(diode)
D33	J13,	0A95/1N60	(diode)

WARNING

All components should be mounted as close to PCB as possible. Any excessive lead length will cause circuit to malfunction.

STEP 13. DIODES D1-D33

STEP 14. TRANSISTORS 01-030

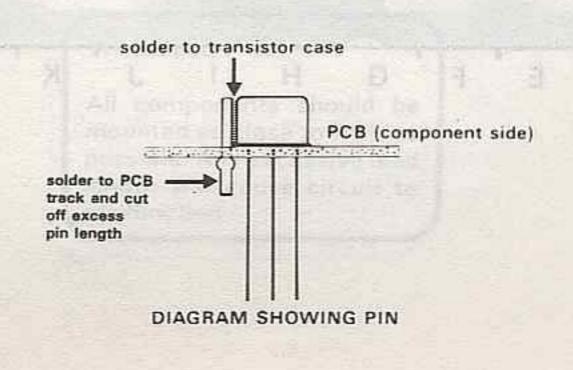


STEP 14. TRANSISTORS Q1-Q30

			aq night saught a	81:949
	Ql	A7 ,	BD140	(transistor)
10	Q2	A8 ,	BC547	(transistor)
*	Q3	В6 ,	BC327	(transistor)
*	Q4	A10,	BC337	(transistor)
	Q5	В11,	BC557	(transistor)
	Q6	L6 ,	BFY90	(transistor)
	Q7	G8 ,	3SK40/MFE131	(transistor)
	Q8	L12,	BC548	(transistor)
	Q9	019,	BC548	(transistor)
	QlØ	N18,	BC558	(transistor)
*	Q11	N18,	BC337	(transistor)
*	Q12	N20,	BC327	(transistor)
	Q13	N16,	BC548	(transistor)
	Q14	N15,	BC548	(transistor)
37	Q15	N14,	BC558	(transistor)
	Q16	HlØ,	2SK125	(transistor)
	Q17	FlØ,	3SK40/MFE131	(transistor)
	Q18	D10,	2SC1674	(transistor)
	Q19	D8 ,	2N3948	(transistor)
	Q2Ø	E6 ,	2N3948	(transistor)
**	Q21	G4 ,	MRF629	(transistor)
**	Q22	K4 ,	2N559Ø	(transistor)
	Q23	K15,	BC548	(transistor)
	Q24	К16,	BC548	(transistor)
	Q25	G13,	3SK40/MFE131	(transistor)
	Q26	D15,	2SC1674	(transistor)
1	Q27	F14,	2SC1674	(transistor)
	Q28	Н15,	BC548	(transistor)
W.	Q29	I15,	BC548	(transistor)
	Q3Ø	J17,	BC547	(transistor)

^{*}Note that pin orientations of BC640/ BC639 and BC327/BC337 respectively, are different. Please refer to Page 12 Transistor Pinouts' for correct pin orientation.

^{***} Please do not insert as yet (see text on Page 54 for installing Q22).



WARNING

All components should be mounted as close to PCB as possible. Any excessive lead length will cause circuit to malfunction.

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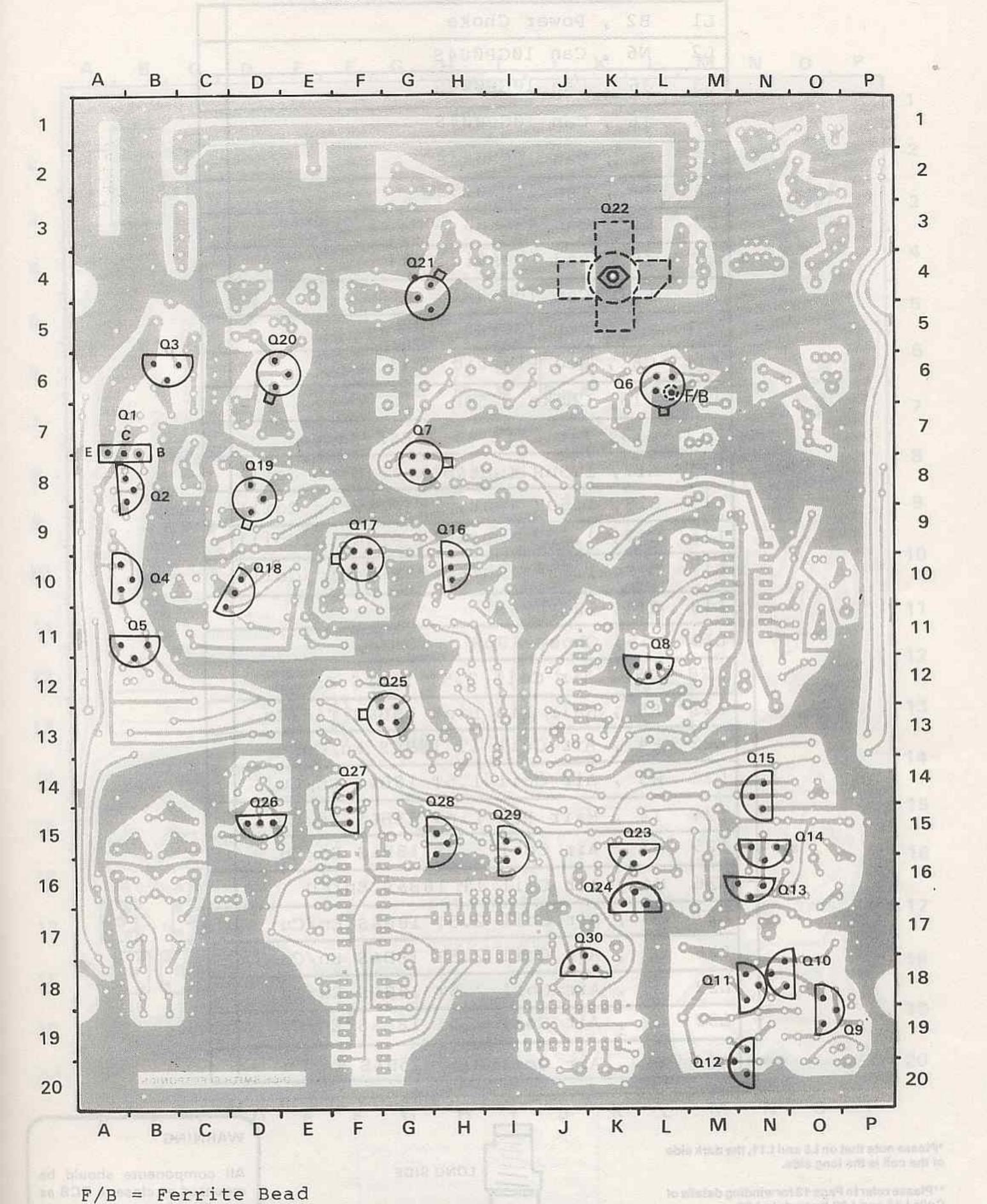
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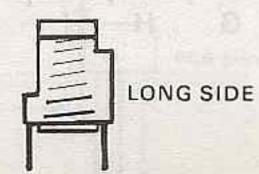
^{**} Q21 should have an earth pin soldered to its case (please refer to neighbouring diagram).



STEP 15. INDUCTORS L1-L30

	L1	B2 , Power Choke	
	L2	N6 , Can 10GP004S	
) Fil	L3	J6 , Can løGPØØ4S	
	L4	I6 , Can lØGPØØ4S	
	L5	G6 , Can 10GP004S	
	L6	J8 , Can 10MA015S	
	L7	L13, Can 455KHZ (wht/blk/yel)	
*	L8	I9 , Red Plastic Coil	
	L9	F11, Can 10GP004S	
	LlØ	C9 , Can 10GP004S	
*	Lll	C8 , Red Plastic Coil	
SE	L12	F13, Choke 2.5mH	
**	L13	G13, Air Coil 4T 25B&S En/Cu	
	L14	Al7, 1.5uH (wht&blk Plastic Coil)	
77	L15	B18, 1.5uH (wht&blk Plastic Coil)	
	L16	Cl7, 1.5uH (wht&blk Plastic Coil)	
	L17	Cl8, 1.5uH (wht&blk Plastic Coil)	
	L18	E14, 10GP004S	3
	L19	G15, Choke 10uH	
1	L20	D5 , Air Coil 2.5T 18B&S En/Cu	
	L21	E5 , Hair Pin Link 25B&S Tin/Cu	
	L22	F4 , Air Coil 1T 18B&S En/Cu	
	L23	H3 , Air Coil 1.5T 18B&S En/Cu	
	L24	I4 , Hair Pin Link 18B&S En/Cu	
. <	L25	M3 , Air Coil 1.5T 18B&S En/Cu	
	L26	M4 , Air Coil 1T 18B&S En/Cu	
	L27	04 , Air Coil 2.5T 18B&S En/Cu	
	L28	07 , Air Coil 2.5T 18B&S En/Cu	
	L29	03 , Air Coil 2.5T 18B&S En/Cu	
	L30	N2 , Air Coil 2.5T 18B&S En/Cu	
* * *	L31	N2 , Air Coil 2T 25B&S En/Cu	1

^{*}Please note that on L8 and L11, the dark side of the coil is the long side.



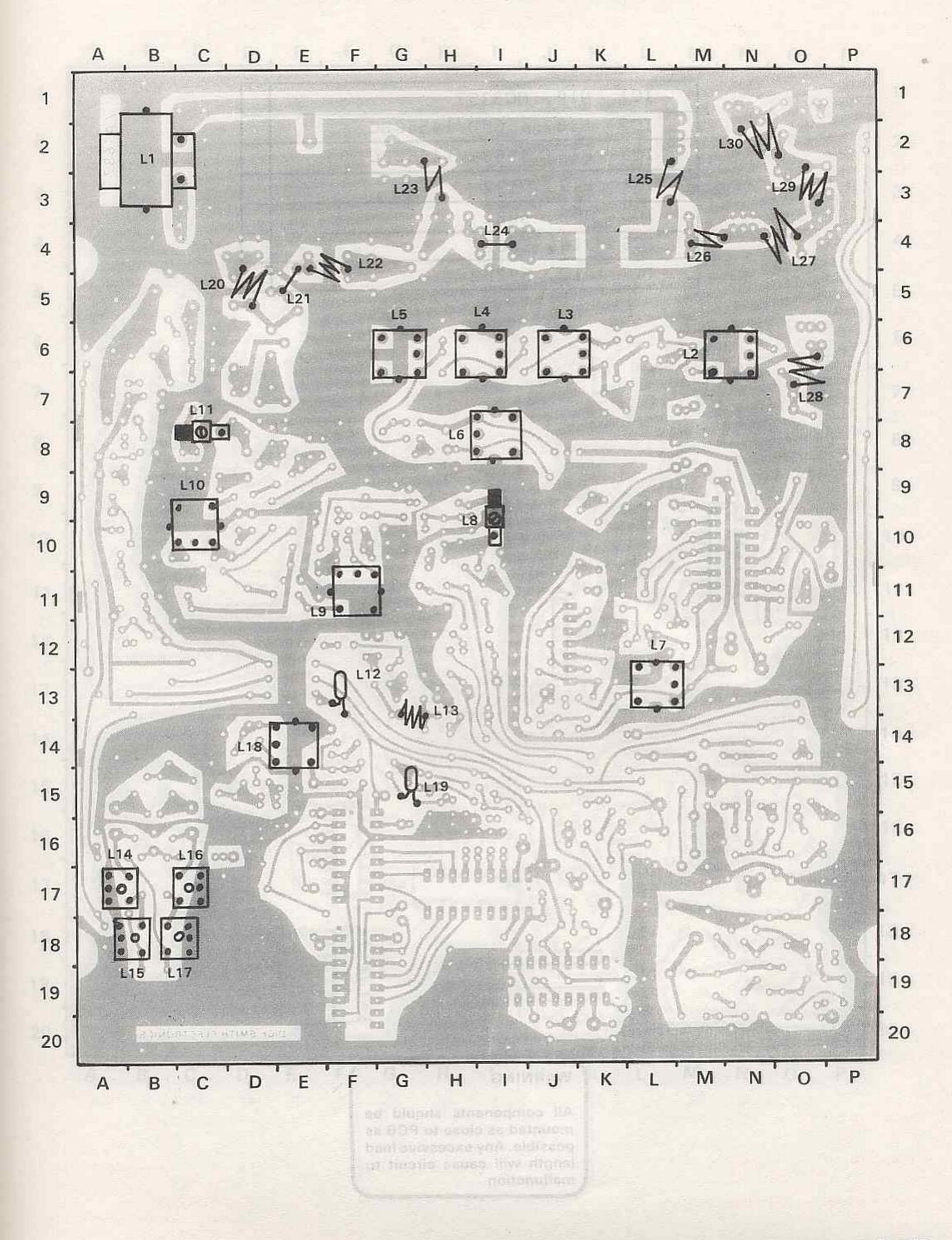
WARNING

All components should be mounted as close to PCB as possible. Any excessive lead length will cause circuit to malfunction.

^{**}Please refer to Page 13 for winding details of Coils L13 and L20 through to L30.

^{***}Please refer to page 59 for mounting details.

STEP 15. INDUCTORS L1-L30



STEP 16. INTEGRATED CIRCUITS IC1-IC7

ICl	NIØ,	MC3357	
IC2	F16,	456ØB/1456ØBC	- 3
IC3	F19,	456ØB/1456ØBC	
IC4	н17,	9122	
IC5	J18,	5081	
IC6	J19,	5082	
IC7	J12,	592H2	

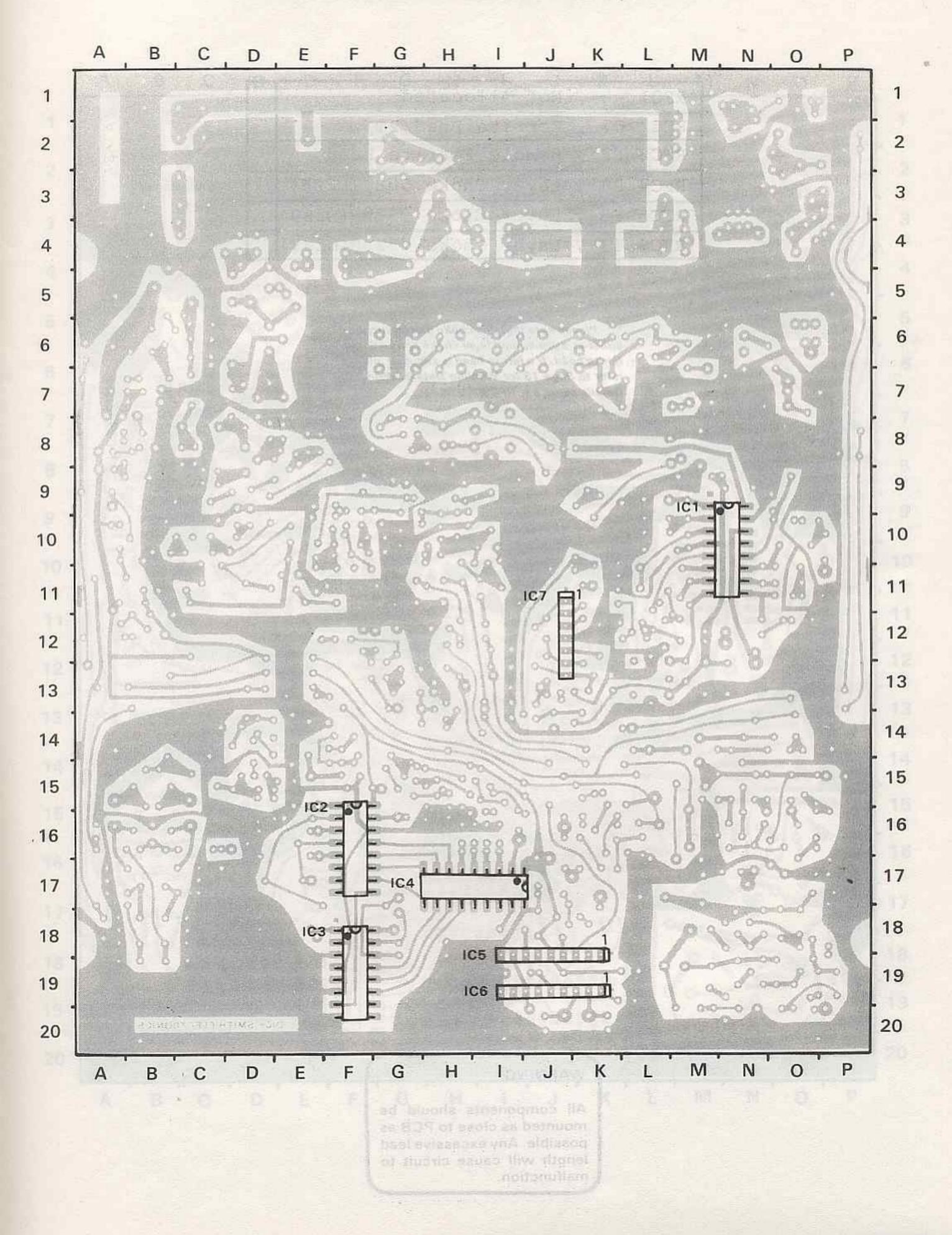
01

WARNING

All components should be mounted as close to PCB as possible. Any excessive lead length will cause circuit to malfunction.

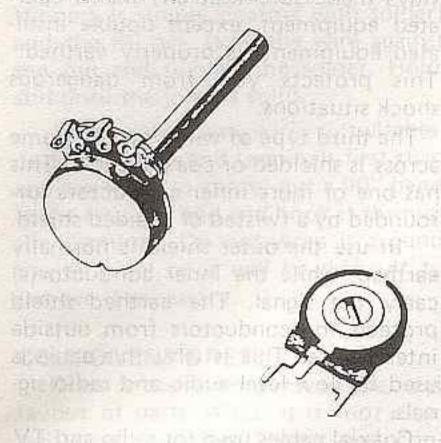
ATT LAND

STEP 16. INTEGRATED CIRCUITS IC1-IC7



POTENTIOMETERS

Potentiometers are variable resistors. There are two main types in kits: normal potentiometers (often called pots) which are used as front panel controls for volume, speed or whatever; and 'trimpots' which are smaller devices mounted on the circuit board. These



are used for initial adjustment of frequencies, levels etc. and are not normally adjusted once set.

CAPACITORS

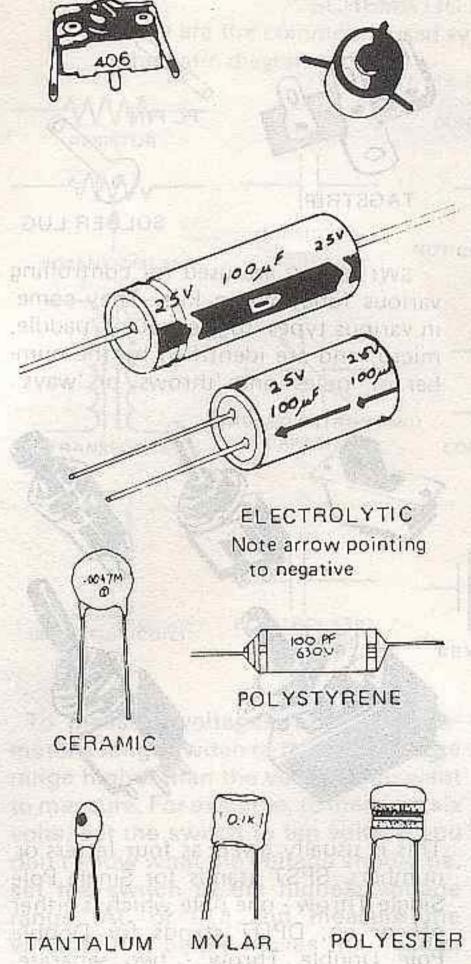
Capacitors store a charge. They come in an enormous range of sizes and types with the most confusing identification of all the components

The most common types are mylar (greencaps), ceramic, electrolytic and tantalum. Some kits also use polystyrene and polyester. Electrolytic and tantalum capacitors are 'polarised', that is, have a positive and negative end which must be installed in the correct direction for the circuit to work.

Capacitance is measured in Farads. This is too large a unit for most uses so various fractions are used: micro-Farad (uF)- a millionth of a Farad; nanoFarad (nF)- a thousandth of a microFarad; picoFarad (pF)- a thousandth of a nanoFarad. So 0.01uF= 10nF = 10 000pF.

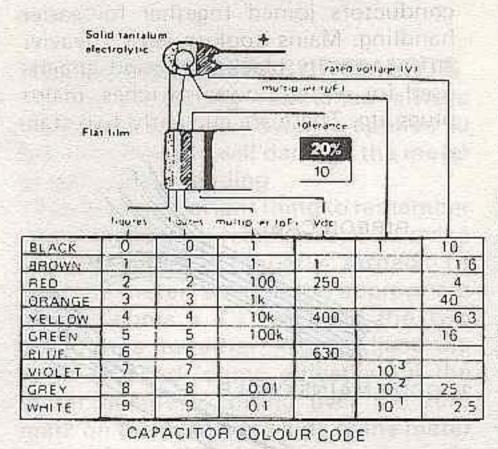
Capacitors are marked in all these units - often without indicating which one! Electrolytics and some tantalum capacitors are marked in uF with the working voltage; ceramics in pF and mylar in pF or uF.

Many ceramic and mylar capacitors are marked using the IEC capacitor code, a system of three numbers and a letter giving the value and tolerance of a capacitor. The first two numbers are the significant figures, and the third the number of zeroes following (value in picoFarads). The letter indicates the tolerance · M = 20%; K = 10%: J = 5%. So a 123K is a 12 000pFlor 12nF or 0.012uF 10% capacitor.



Some of the larger value greencaps are marked in uF (usually 0.1uF and larger). Smaller ceramics are usually marked in pF. This is why many constructors find capacitors confusing!

One more method is used to identify capacitors. Some polyester and tantalum capacitors are marked with a colour code similar to resistors.



DIODES

Diodes are used to convert AC current to DC (rectify), or to detect signals. Most are in the form of a black or clear cylinder 3 - 10mm long. Diodes are also polarised, with a cathode end (k), and an anode (a) end. The cathode is marked with a black or silver stripe, or in some small signal diodes, a white end. Always check that they are installed the right way round.

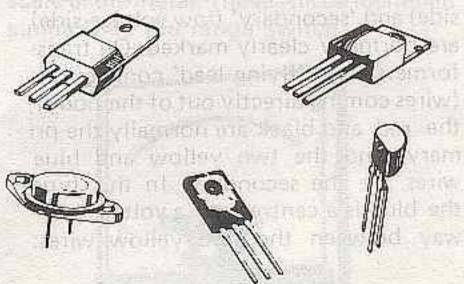
Light emitting diodes (LEDs) are a special type of diode which lights up red, green or yellow when voltage is applied. These are also polarised, and must be fed the correct voltage, with an appropriate resistor to limit the current.

CATHODE	POWER DIODE	ANODE
CATHODE	SIGNAL DIODE	triventure fying the
CATHODE	ZENER DIODE	NE HOWO
An 20110	◆ POSIT-VI	nerg A

imno bina visitabala altata of systemas

TRANSISTORS

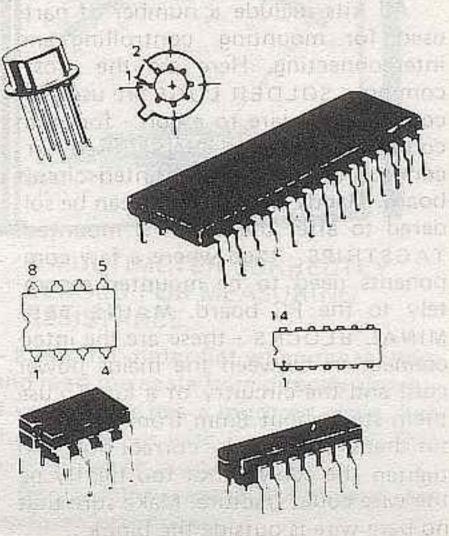
Transistors are the heart of most solid state equipment. They are used to amplify and switch signals. Transistors generally have three leads called emitter (e), base (b) and collector (c) and come in a wide variety of different cases. Always check that the leads are installed in the correct positions - two transistors may look the same, they may even work the same, but their leads could be differently oriented. The number of a transistor is normally printed on the case. Any other numbers or letters are manufacturers' codes and may be ignored. Typical transistors are illustrated alongside.



ALWAYS FOLLOW THE PIN CONNECTIONS ON THE CIRCUIT DIAGRAMS CAREFULLY

INTEGRATED CIRCUITS (IC.)

Integrated circuits are just what their name indicates: a complete circuit in a single package. They perform a wide variety of functions - amplifying, timing, switching, counting - the list is enormous. They are usually packaged in a dual-in-line (DIL) package with from eight to forty pins.



STEP 17. RF CHOKES RFC1-RFC6

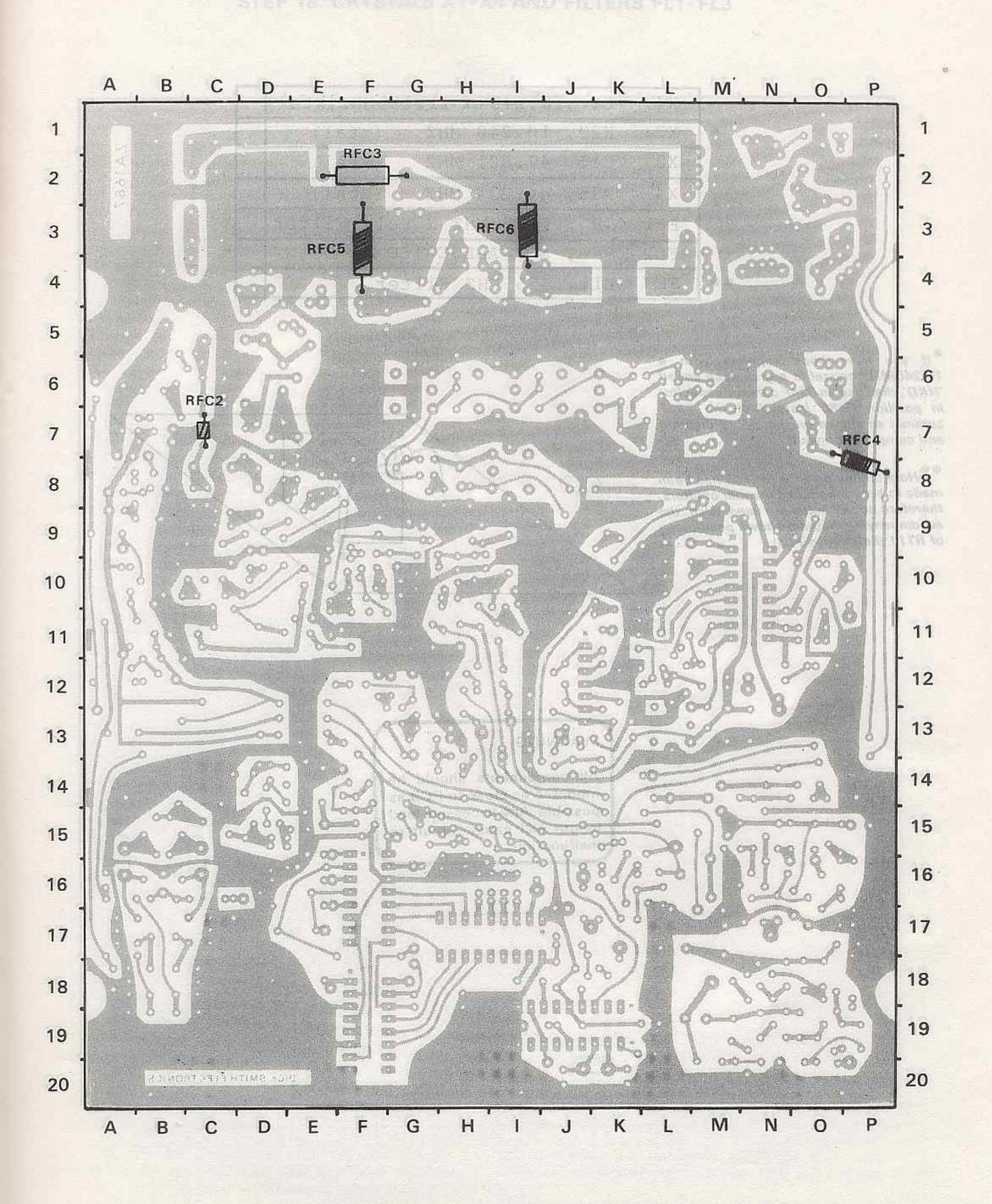
	RFC1		,	Not Allocated
	RFC2	C7	,	Ferrite Bead/2T
	RFC3	F2	,	6 Hole Ferrite Bead
	RFC4	P8	,	Layer Choke 5uH (L208)
	RFC5	F3	,	Layer Choke .22uH(L209)
I	RFC6	13	,	Layer Choke .22uH(L209)

* Please note that this choke can be supplied either as a pre-wound layer choke or as a 6 hole ferrite bead. If a ferrite bead is supplied, please refer to Page 13 for Winding Details. (Winding Details same as RFC3).

WARNING

All components should be mounted as close to PCB as possible. Any excessive lead length will cause circuit to malfunction.

81

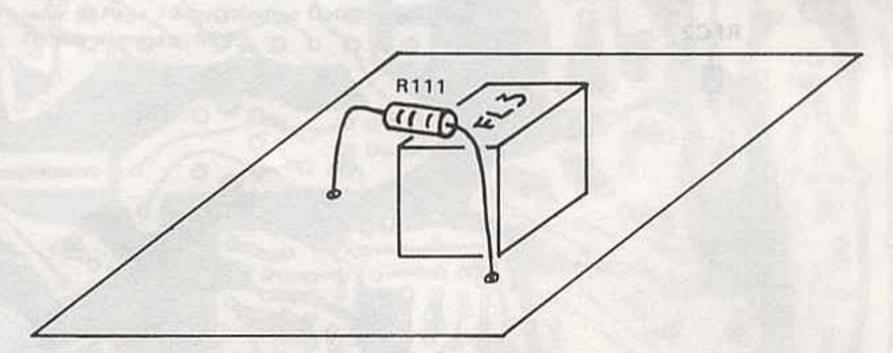


STEP 18. CRYSTALS X1-X4 AND FILTERS FL1-FL3

		The second second	and the same of th	100	Secretary of the second	The second second
NI NI	Xl	L9 ,1	Ø.245 o	r 11.	155MH	Hz(xtal)
6	X2	K20,	10.240	MHZ	(x	tal)
	Х3	C15,	47.801	MHZ	(x	tal)
	X4	A15,	44.234	MHZ	(x	tal)
T	FLl	J8 ,	10.7 MH	HZ 2	Pole	Filter
	FL2	,	NOT ALI	COCA	ΓED	
*	FL3	L11,	455 KH2	z Fil	Lter	

^{*}If you have been supplied with a 10.240MHz crystal in a grey case coded 'HKD', then use an 82pF ceramic capacitor in position C160 instead of the 33pF ceramic as shown on the circuit diagram and component layout.

^{**} Hole drilling on PCB for FL3 has been made to accommodate a number of filters, therefore not all holes are used. Also, the accompanying diagram shows positioning of R111 (i.e., above FL3).



OF

WARNING

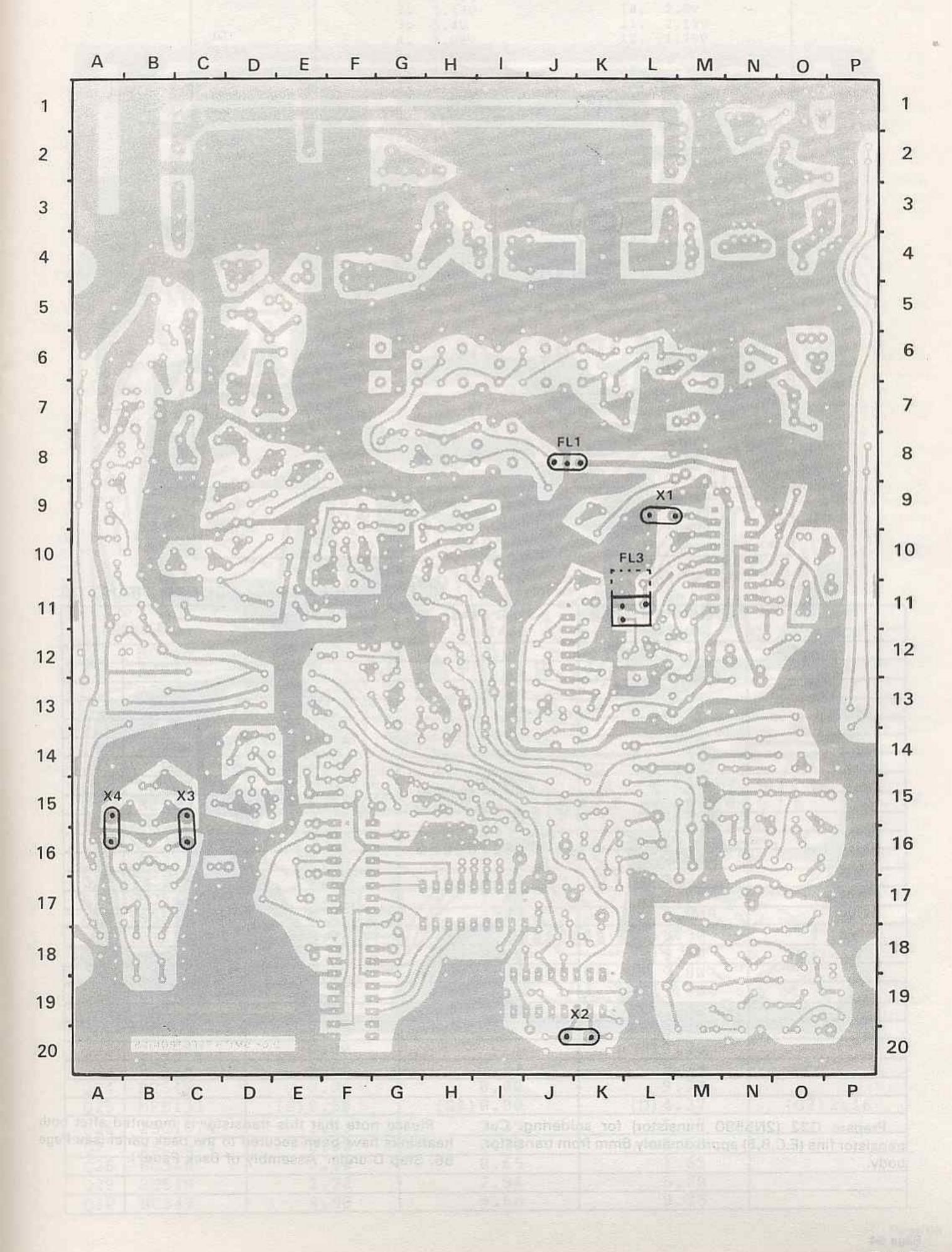
All components should be mounted as close to PCB as possible. Any excessive lead length will cause circuit to malfunction.

di

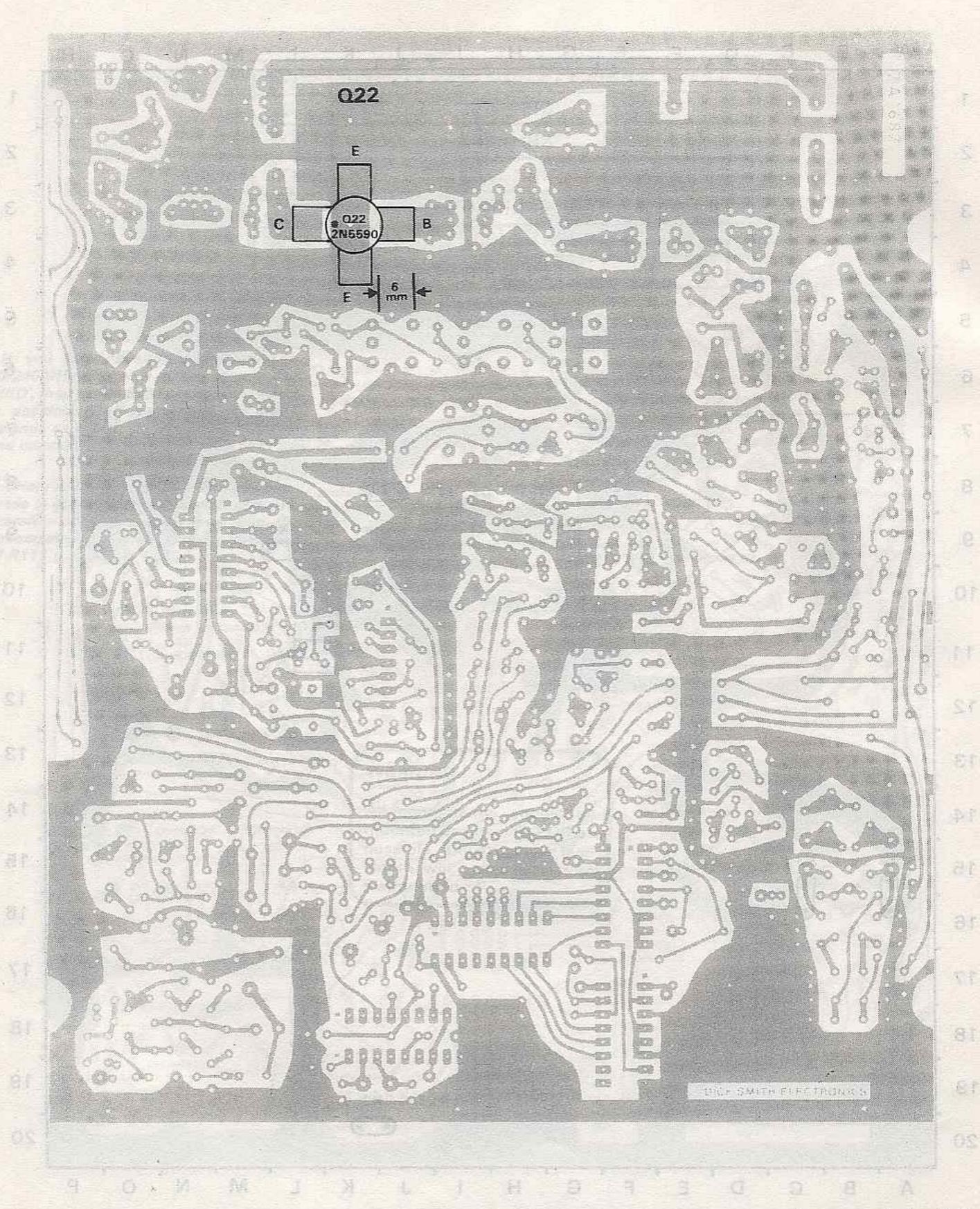
ar

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STEP 18. CRYSTALS X1-X4 AND FILTERS FL1-FL3



LAYOUT SHOWING UNDERBOARD COMPONENT



Prepare Q22 (2N5590 transistor) for soldering. Cut transistor fins (E,C,B,E) approximately 6mm from transistor body.

Please note that this transistor is mounted after both heatsinks have been secured to the back panel (see Page 56, Step D under 'Assembly of Back Panel').

TRANSISTOR AND IC VOLTAGES

DC CHART (IC'S) SUPPLY @ 13.8V

DEVICE	PIN VOLTAGE	First inquest the two toggets u
IC1 3375	1. 5.65V 2. 5.13V 3. 5.4V 4. 5.68V 5. 1.02V 6. 1.02V 7. 1.04V 8. 5.68V	9. 2.7V 10. 2.0V 11. 2.12V 12. 1.25V 13 14 15 16. 2.05V
IC2 & IC3 4560	8. 0.00 16. 10.00V	Other pins depend upon program.
IC4 9122	1. 9.75 2. 3.67 3. 4. 5. Depends 6. Upon Program 8. 9.	10. 11. 12. 13. 14. 15. 16. 17. 0.8V 18. 0.00V
IC5 5081	1. 8.28V 2 3. 2.61V 4. 9.78V 5. 9.76V	6 7. 0.81V 8. 3.02V 9. 0.00V
IC6 5082	1. 1.63V 2. 2.73V 3. 2.46V 4. 3.03V 5. 6.07V	6. 3.03V 7. 3.03V 8. 3.00V 9. 0.00V
IC7 592H2	1. 2.01V 2. 0.63 3. 0.02V 4. 0.00V	5. 0.69V 6. 1.30V 7. 5.50V

DC CHART (TRANSISTORS) SUPPLY @13.8V

Q1 BD140		EMITTER/SOURCE VOLTAGE	BASE/GATE VOLTAGE	COLLECTOR/DRAIN VOLTAGE	GATE 2 VOLTAGE	
		13.78	13.07	10.15		
Q2	BC547	4.44	5.04	12.78	TATE OF THE PARTY	
Q3	BC327	13.78			STATE OF THE STATE	
Q4	BC337	8.29	9.99	10.15		
Q5	BC557	10.15	9.50	10.20		
Q6	BFY90	0.38	1.10	8.90	SAST OF RES	
Q7	MFE131	(S)0.40	(G1)0.00	(D)9.00	(G2)0.00	
Q8	BC548	0.00	0.65	1.59	A He oppose	
Q9	BC548	8.20	8.76	13.00	THE SEC STREET	
Q10	BC558	7.80	13.00	13.77	merical alegan a	
Q11	BC337	7.20	7.80	13.77	wall heavy to at his	
Q12	BC327	7.14	6.55	0.00	DESID A MADERIAL PROPERTY.	
Q13	BC548	0.00	0.57	1.30		
Q14	BC548	0.65	1.30	2.50		
Q15	BC558	5.40	4.77	0.00		
Q16	2SK125	(S)3.20	(G) Ø.ØØ	(D)8.30	DESCRIPTION OF THE PERSON OF T	
Q17	MFE131	(S)1.20	(G1)0.00	(D) 9.60	(G2)4.75	
Q18	2SC1674	0.35	0.94	9.80	Se south the state of	
Q19	2N3948	0.66	1.40	13.00		
Q20	2N3948	0.50	1.18	12.00	er side sin as the 18	
Q21	MRF629	0.00		13.40	East Elizade and	
Q22	2N5590	0.00		13.20	landa esta	
Q23	BC548	8.65	9.22	9.29	anaming I.i. e	
Q24	BC548	0.00	0.00	9.22	OT SHADING	
Q25	MFE131	(S)0.50	(G1)0.00	(D) 4.37	(G2)2.16	
Q26	2SC1674	1.63	2.39	5.88	and to most off	
Q27	2SC1674	0.00	0.70	3.60	denoted temps	
Q28	BC548	0.00	0.65	1.65	rebles restricts	
Q29	BC548	2.28	2.94	5.00	The state of the said	
Q3Ø	BC547	8.98	9.66	9.75	13 Tollinear Area	

V:

but the said dans

ASSEMBLY OF FRONT AND BACK PANELS

ASSEMBLY OF FRONT PANEL

STEP A. First mount the two toggle switches, the push-on switch, microphone socket and pots to the front panel.

STEPB. Once all the above have been properly secured, slide the front panel and the main PCB into the case. Align the front panel so that it sits at 90° to the main board.

Now solder the three PCB pins closest to the edge of the main board to the front panel. It may be necessary to bend these pins forward a little so that the pins can be easily soldered to the front panel.

The copper side of the main PCB can be tack soldered to the front panel. This should only be done when the unit has been finished, tuned and tested, as it will be very difficult to unsolder the front panel to rectify a neighbouring fault.

STEP C. Now, you may proceed to wire the items in Step A. to the main PCB.

STEP D. Fit and glue the signal/power meter into position. Do not wire as yet - allow the glue to dry.

STEP E. Wire the thumbwheel switches to the main PCB. Note that the thumbwheel switches will have to be separated to allow you to solder wires to the inner pads. Figures 3 and 4 show how these switches are separated.

STEP F. You will notice that every individual thumbwheel will have its own PCB. On each PCB, a connection code (i.e., C, 1, 2, 4 and 8) will be found.

Solder a length of wire (approximately 70mm) to each copper pad located nearest to the switch body - coded C, 1, 2, 4 and 8 (see Fig. 5).

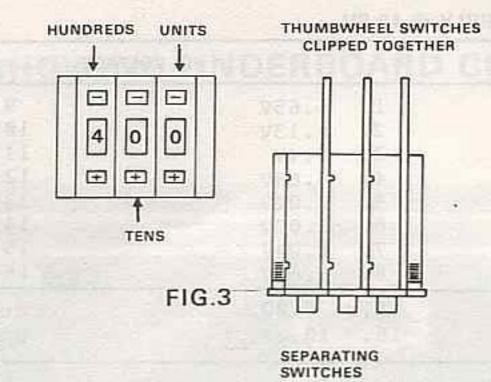
As you will note in Fig.6, the thumbwheel PCB nearest to the edge of the switch will only use two wires (i.e., to pads 1 and 2). Pads 4 and 8 are not used.

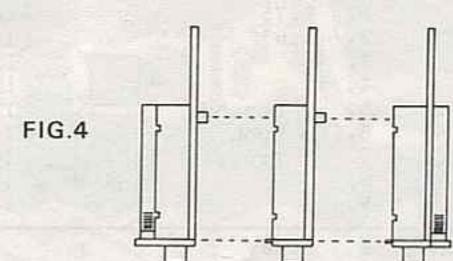
STEP G. Once all wires have been soldered in place, clip the switches together (back in their original state) and check that you have 10 wires (approximately 70mm) coming from it.

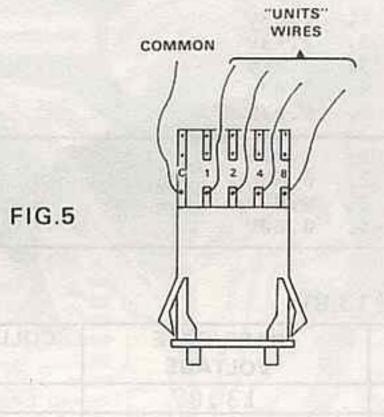
STEP H. Note that the common pad (coded 'C') of all three switches will have to be linked together. Run a common link and then solder a length of wire (approximately 70mm) to it. This will then be terminated to the main PCB together with the other 10 wires from Step G.

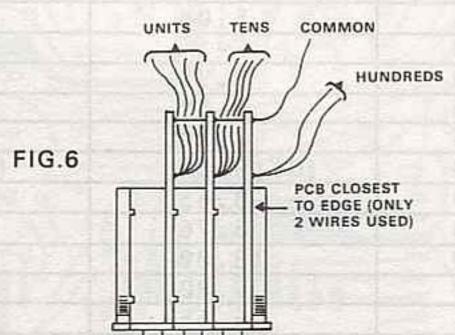
STEP I. Wire-up the meter to the main PCB .(Glue should be set, keeping the meter into place).

STEP J. WIRING THE THUMB-WHEEL SWITCHES TO THE MAIN PCB. Take note that the switch is mounted through the front of the panel. Insert all switch wires through the front panel slot and then solder to the correct locations. Do not slide the switch completely through the slot and clip until all thumbwheel wires have been terminated to the main board.









ASSEMBLY OF BACK PANEL

STEP A. Secure cable grommet, 3.5mm DC socket and antenna output socket to the back panel.

STEP B. Align and solder the back panel to the main board, in the same mannner as explained in Step B of the 'Assembly of Front Panel'.

STEP C. Mount the heatsinks to the back panel as shown in Fig. 7).

STEP D. Once the heatsinks have been tightly secured, Q22 (2N5590) transistor can be mounted to the heatsink and then soldered to the copper side of the main board (as shown in Fig. 7).

Please note that silicon grease should be used in the area where both the heatsinks are secured together and also beneath the aluminium extrusion where Q22 touches the heatsink.

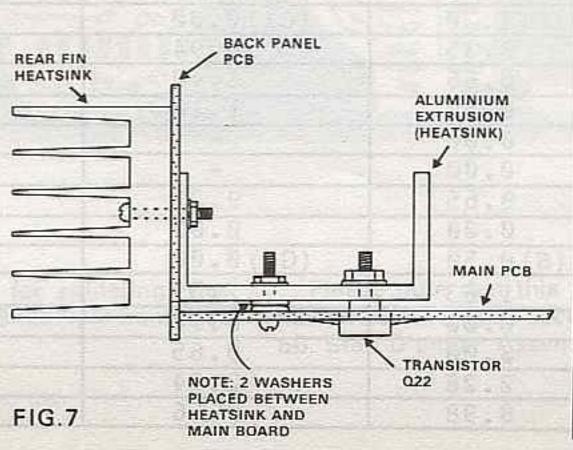
STEP E. Final wiring of speaker socket, output socket, and power lead may proceed.

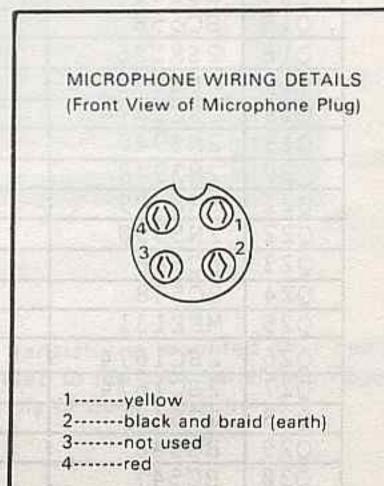
OPERATION OF THUMBWHEEL

Because there is no mechanical stop in the X1 MHz thumbwheel, the following digits correspond to:

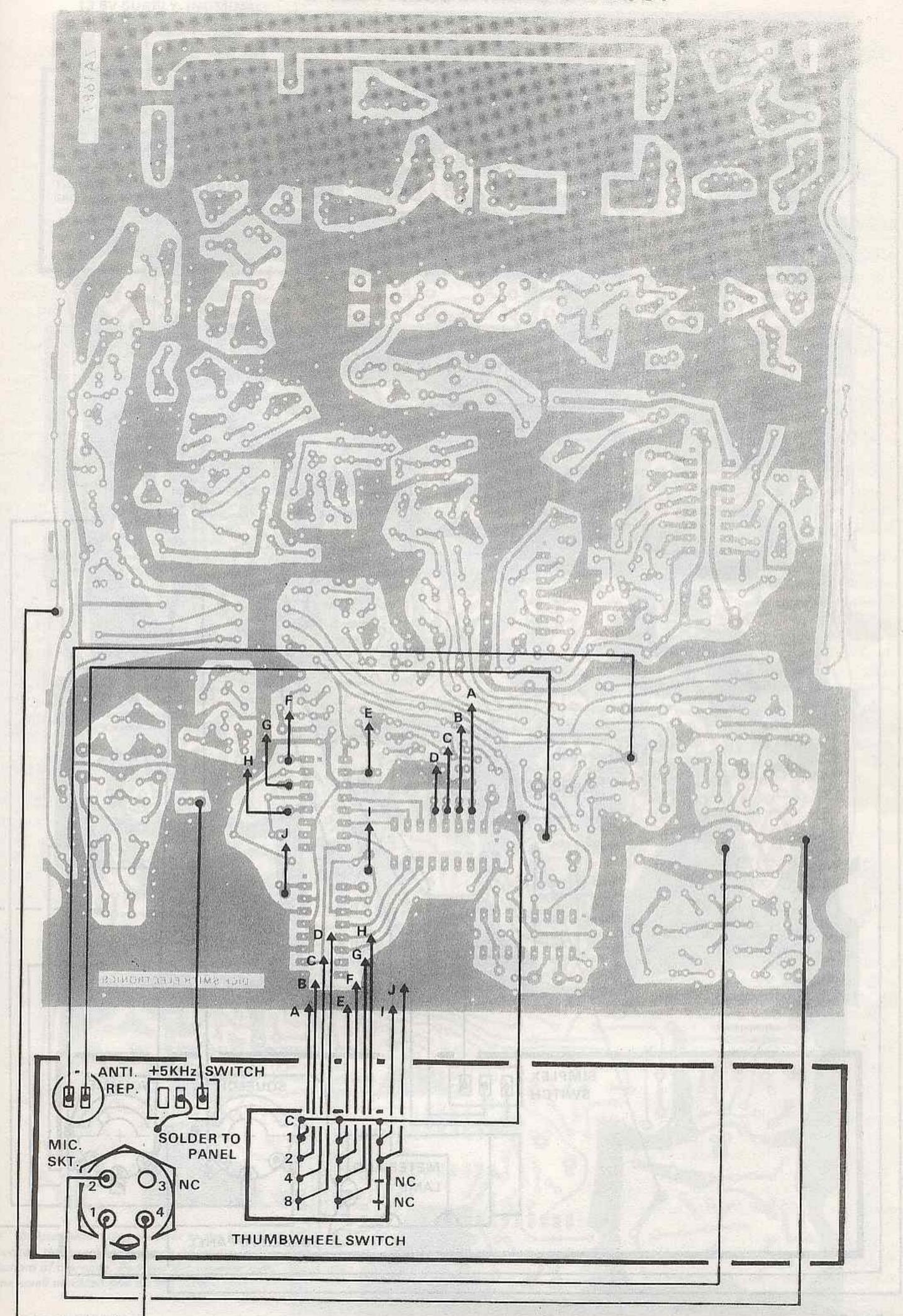
X1 M	Hz DISPLAY	FREQUENCY
	DIGIT	
	0	144MHz
	1	145MHz
	2	146MHz
	3	147MHz
	Γ4	144MHz
Normal	5	145MHz
	6	146MHz
Display	L ₇	147MHz
	8	144MHz
	9	145MHz
		The state of the s

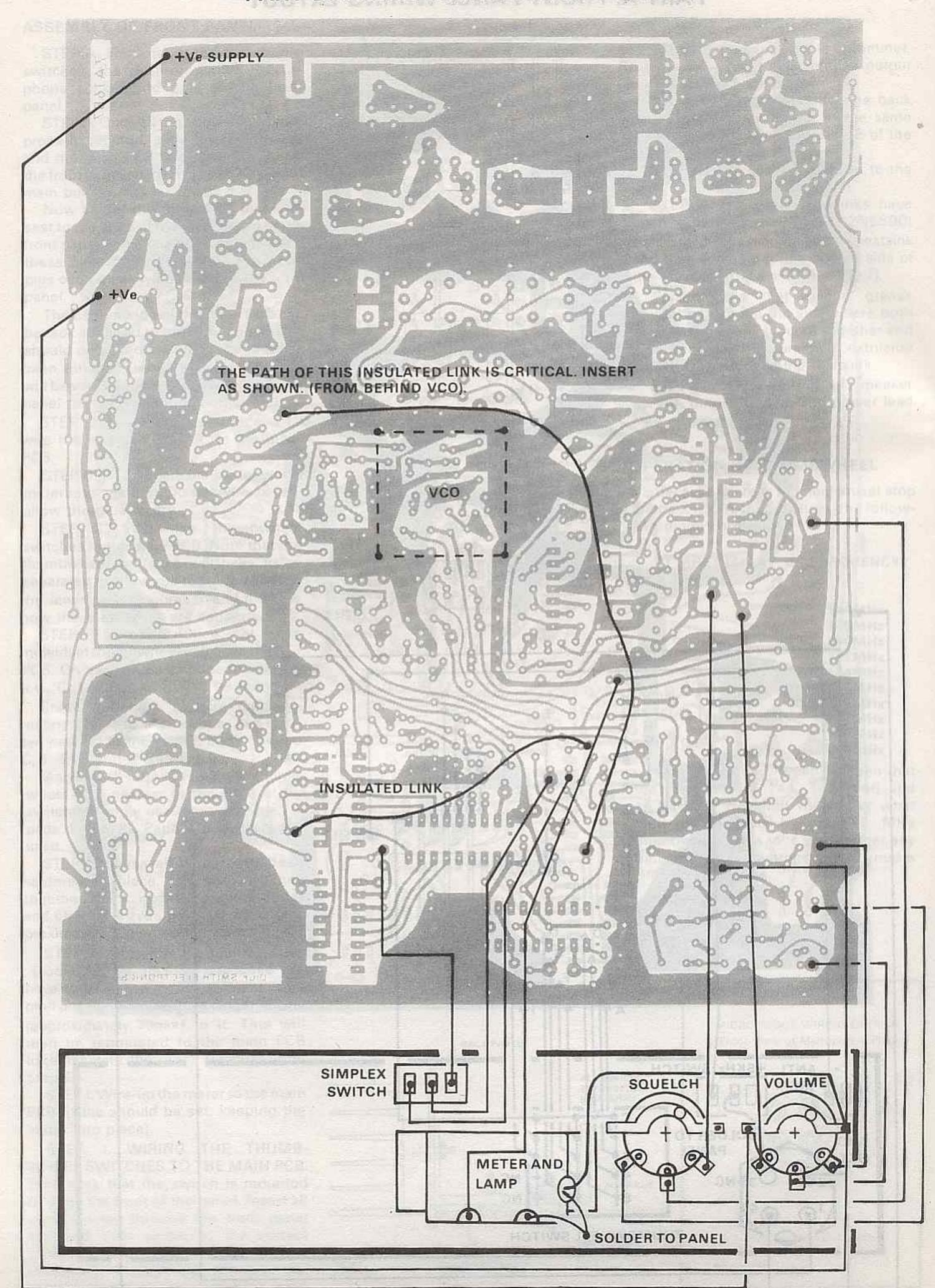
From the above, it can be seen that the sequence of 144, 145, 146 and 147MHz is repeated no matter what digit is selected by the X1 MHz thumbwheel. This is to ensure that any transmission is within the 2 metre Amateur Band.





PART A. FRONT PANEL WIRING LAYOUT





BACK PANEL WIRING LAYOUT 13.8V SUPPLY (NOMINAL) +Ve -Ve SOLDER TO PANEL (EARTH) **OUTPUT SOCKET** C175 KNOT POWER -15p CAP LEAD SO IT TO SPEAKER* SLOT TO FIT WILL NOT PULL ALUMINIUM THROUGH RUBBER 1 **EXTRUSION** SPEAKER GROMMET .-GROMMET SOCKET L31 COIL SOLDER TO EARTH ON SOCKET 2 T +Ve 000 Q=0=00 **MESS** (ICH) 600 **CESTRO** 00 0=0 0 O. 800 OØ=108 = ice or **αΩ=828** 6005~ -4CD 000 00-23 628-巴斯 153 839-ES Operation of the last 60-10 - C 100P * Before terminating speaker to the speaker 100 socket, the speaker needs to be glued to the 802 bottom of the case. Position the speaker over 6000 the small moulded grill on the case. 903

PARTS LIST

Please check all the parts in this kit against the parts list. In the unlikely event of a part being missing or incorrectly supplied, you MUST use the Quality Control

Card included with your kit. You can send the card directly to the Kit Department at Head Office or drop it in at your nearest Dick Smith store.

RESISTORS					22 C
			The same		.01uf
Resistor	2.2 ohm	1/4W			
Resistor	4.7 ohm	1/4W	X 1		.lufx 5
Resistor	10 ohm	1/4W	x 4		47uf 16V 3
Resistor	15 ohm	1/4W	x 1		100uf 16V 1
Resistor	18 ohm	1/4W	x 1	Electro	220uf 16V 1
Resistor	22 ohm	1/4W	x 1	Electro	470uf 16V 3
Resistor	47 ohm	1/4W		Tant Cap	.22uf 25V 2
Resistor	100 ohm	1/4W		Tant Cap	luf 25V 4
Resistor	150 ohm	1/4W	122	THE STREET STREET	3.3uf 25V 1
200000000000000000000000000000000000000			797 4		4.7uf 25V 3
Resistor	220 ohm	1/4W			10uf 16Vx 5
Resistor	270 ohm	1/4W			22uf 16V 1
Resistor	330 ohm	1/4W	-	ranc cap	2241 100
Resistor	470 ohm	1/4W			Second Side and front to account to the control of
Resistor	560 ohm	1/4W	1 6	TRANSISTORS	
Resistor	820 ohm	1/4W	x 1	THAIVSISTONS	
Resistor	lk ohm	1/4W	x 12	Transistor	BC547 2
Resistor	1.2k ohm	1/4W	x 4	Transistor	
Resistor	1.5k ohm	1/4w	x 7	Transistor	
Resistor	1.8k ohm	1/4W	x 1	Transistor	
Resistor	2.2k ohm	1/4W	x 11	Transistor	
Resistor	3.3k ohm	1/4W		Transistor	
Resistor	4.7k ohm	1/4W	1.44		
Resistor	5.6k ohm	1/4W	12	Transistor	
Resistor	6.8k ohm	1/4W	The state of the s	Transistor	
Resistor	10k ohm	1/4W	PT 746	Transistor	The state of the s
Resistor	15k ohm	1/4W	ALC: NO AND THE REAL PROPERTY AND THE PARTY	Transistor	
Resistor	22k ohm	1/4W		Transistor	
17.4551P(1) P5.67F(6) P3			72	Transistor	
Resistor	33k ohm	1/4W		Transistor	BFY90 1
Resistor	39k ohm	1/4W		Transistor	2N3948 2
Resistor	47k ohm	1/4W		Diode	OA95/IN60x 3
Resistor	56k ohm	1/4W		Diode	1N914 17
Resistor	82k ohm	1/4W	5.00	Diode	1N4002 1
Resistor	100k ohm	1/4W		Diode Zene	r 5.6V 400mWx 3
Resistor	120K ohm	1/4W		Diode	BA243/244/282x 5
Resistor	150k ohm	1/4W		Diode	BA122 2
Resistor	220k ohm	1/4W	x 4	IC	MC3357 1
Resistor	270k ohm	1/4W	x 1	IC	592H2 1
Trimpot	10k ohm		x 2	IC	4560B/14560BCx 2
Mini Pot	5k/10k		x 2	IC	TC9122 1
CAPACITORS				IC	TC5082 1
	antine	6771764	v 2	IC	TC5081 1
Greencap	.00luf		201	XTAL	47.801MHZx 1
Greencap	.0luf			XTAL	44.234 n+iZ
Greencap	.022uf			XTAL	10.245 or 11.155MHzx 1
Greencap				XTAL	
Greencap				XTAL Filter	10.240MHZ 1
Ceramic	lpf		x 3	Filter	
Ceramic	3.3pf NPO		x 2	riiter	455KHZ (FILTER)x 1
Ceramic	4.7pf NPO		x 4	HARDWARE	
Ceramic	5.6pf NPO		x 2	HANDWARE	
Ceramic	8.2pf		x 2	Round Heat	sink 2
Ceramic	10pf		x 3		x 2
Ceramic	EDENTAL SERVICE		x 5		H 1
Ceramic					mH 1
Ceramic					ex 1
Ceramic	THE RESERVE TO SERVE				
Ceramic	The second secon		-		Panel)x 1
Ceramic			0		(Line)x 1
Ceramic			-		t (Panel)x 1
(2.075 A.701 A			179		Switchx l
Ceramic					Coil 4
Ceramic					5Sx 1
Ceramic					Coil 2
Ceramic	STREET, SALL SALL				adx 2
Ceramic	THE RESERVE THE PARTY OF THE PA				4S 7
Ceramic					1
Ceramic	220pf				e 5uH (L208) 1
Ceramic					e .22uH (L2Ø9)x 2
Ceramic					x 1
Ceramic	.00luf				ocket (Panel)x l
Ceramic	.0022uf				rx 1
Ceramic	.0047uf		X 4	6 Hole Fern	rite Bead 1
Page 8					

TEST AND ALIGNMENT PROCEDURES

TEST EQUIPMENT REQUIRED

- A multimeter (preferably digital)
- A frequency counter (Dick Smith K-3439) or a 2 metre Amateur Transceiver.
- A dummy load (Dick Smith D-7027)
- A 5MHz oscilloscope or a shortwave receiver

ALIGNMENT PROCEDURES

Initial Physical Preset Adjustments

- Set the ferrite slug of L18 level with the top of the can.
- Set the ferrite slug of L9 down two
 turns from the top of the can.
- Set the ferrite slug of L10 down one (1) turn from the top of the can.
- Set L8 and L11 (red plastic coils) so that the ferrite slugs are one (1) turn down from the top of the coil.
- Adjust VR68 (R68 offset trimpot) to
 counter clockwise position.

VOLTAGE CHECK

Connect the transceiver to a 13.8 volt nominal power supply, observing the correct polarity.

Without switching the unit on, the collector of Q22 should have 13.8V. At switch on, 13.8V should be found at the emitter of Q1 and Q3. This is to confirm that the switch has been correctly wired and terminated. If the 10V regulator is working correctly, a 10V, ±0.5V reading should be found at the collector of Q1, with unit on.

PLL ALIGNMENT (RECEIVER MODE) Using Oscilloscope:

- 1. Check TP1 (Test Point 1), located at J20, for 10KHz clock frequency at 6V P/P (approx). Measurement for TP1 can be easily taken from under the PCB at Pin 7 of IC6.
- Check TP2 (output from L18), located at E15, offset oscillator for RF output. Use a sensitive RF probe or test probe as shown in Fig.8.
- 3. With oscilloscope on TP4 (mix down frequency), located at IC4, and the DC meter with the positive probe to TP3, located at H13, adjust L8 (VCO coil) for 2.5 2.7V) at 144MHz.
- TP4 should show a signal of 600KHz at approximately 2V P/P (simplex - 144MHz). (Minimum level of 1V P/P and maximum level of 2V P/P nominal).
- Adjust L18 (offset oscillator), located at E14 for maximum amplitude at TP4.
- 6. Select 147MHz. The DC volts at TP3 should increase to approximately 5 to 6 volts. The oscilloscope on TP4 will show a level greater than 1V P/P at 3.6MHz

7. Select 146MHz (simplex). Con nect a dummy load to the output. The DC volts at TP3 should be 4 - 4.5 volts. Now press the PTT button for a short period and adjust VR68 (R68 offset trimpot), located at M16, for 4 - 4.5 volts as measured above.

RECEIVER ALIGNMENT

- With no signal input, adjust L7 for maximum noise in speaker.
- 2. With suitable signal source (i.e., signal generator or a hand-held transceiver held near a radio, etc.), adjust L2, L3, L4, L5 and L6 for maximum reading on the signal meter, reducing input as required to obtain ½ scale reading. This should be performed at 146MHz (centre band). Your local repeater, slow morse beacon or propagation beacon can be used.
- 3. With a known input frequency, adjust L6 and L7 for best sound (best audio quality).
- 4. With an accurate input frequency of 146.005MHz and the +5KHz switch on, adjust L14 for best audio quality. (A separate 2 metre transceiver using a dummy load and in close proximity can be used).
- With an accurate input frequency (146.000MHz), now select switch from +5KHz to normal and adjust L15 (receiver frequency adjustment) for best audio quality.

Please note that the +5KHz must be adjusted first, and then the normal frequency, as these adjustments will interact.

 At this point, with a calibrated signal, the sensitivity of the receiver should be better than 0.5uV for 12dB sinad.

If minor receiver instability is experienced, change R12 from 10K to 12K. This is due to the variation in gain of the RF amplifier, Q6.

TRANSMITTER ALIGNMENT

- 1. Align at 144MHz simplex.
- With a suitable load and frequency counter connected to the output socket,

- press the PTT button and monitor the input current. RF output should be available.
- At 144MHz simplex, adjust L9 for peak (maximum RF output). Note that this is a critical adjusment, once adjusted, do not alter it.
- 4. Then adjust L10 and L11 for maximum RF output (still at 144MHz simplex).
- At this point, the RF output should exceed 10 watts.

Approximate current drain at:

10W - 1.9A

15W - 2.2A

6. Now select 147MHz and press PTT. RF output should be the same as that in Step 5, and no adjustment is required. (No tuning is required due to broad band power amplifier).

TRANSMITTER FREQUENCY

- 1. Set normal/+5KHz switch to the +5KHz position. Set frequency to 146MHz, then press PTT, making certain that both frequency counter and dummy load are connected to the output. Then adjust L16 for 146.005MHz.
- 2. Switch the normal /+5KHz switch in the normal position and adjust for correct frequency (i.e., 146.000MHz). Note that the +5KHz must be adjusted first and then the normal frequency, as these adjustments will interact.

TRANSCEIVER MODULATION

1. With a suitable modulation meter or monitor receiver, adjust VR61 (R61) for 5KHz peak deviation. The setting for 5KHz peak deviation should be approximately ½ rotation of VR61.

This should be adjusted at 146MHz simplex (centre of band range).

2. ADJUSMENT OF TWIST CAP C169. With dummy load connected to output, press PTT and adjust C169 by tightening or loosening turns to achieve 90% FSD on signal/power meter in transceiver.

TRANSFORMER WAX

Once all test and alignment procedures have been done, melt transformer wax into VCO shielded area. It will be necessary to re adjust L8 for correct T/P volts at T/P3.

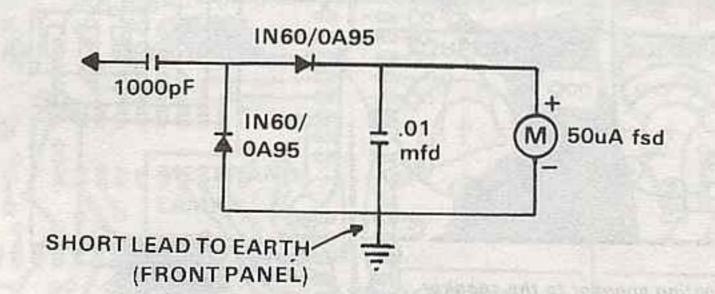


FIG.8 TEST PROBE SCHEMATIC

TC 9122 PROGRAM

9122 Divider			MSD * 100's			LSD ** 10's 1's		7100					
Prog.	"N"	400	200	100	80	40	20	10	8	4	2	1	w:
9122 Pin Number	Code	13	12	11	10	9	8	7	6	5	4	3	Mix Down Freq. MHz.
Freq. MHz.	one bero	aug by	BIDH	a sm	They a	ent ins	SV PERO SULL SUCK	M. AVE	epoi q enbes	un nej Office un had	beeti	iui ei	Savita
144.00	60		TES S			X.	Х	1000	Protes	ALC: N	15.75.31	odel	0.60
144.01	61	1	lines.		(January	X	X	6200 EU	Neis of	ello roll	sail s	Х	0.61
144.02	62					X	X	e 00.0	613	105 PH	X	8 58	0.62
144.03	6.3		in the	SCIE SU	1110/15	X	Х	BULL VO	5 10 Kg	1775 114	Х	X	0.63
144.04	64					X	Х		W	Х	125		0.64
144.05	65	La se	1.099.3		i ulcu	Х	Х	izh be	trive with	X	18-41	X	0.65
144.06	66					Х	Х	P BON	naz II	X	Х	102	0.66
144.07	67				h 2	Х	Х			Х	Х	Х	0.67
144.08	68					Х	X		Х				0.68
144.09	69					Х	Х		Х			Х	0.69
144.10	70		be			Х	X	X					0.70
144.20	80				X	Em							0.80
144.30	90				X	harris	11171 7	Х	N 255	12:01	de Land	0.03	0.90
144.40	100			X				BEIL					1.00
144.50	1.10		T. Y.	X	SA: -		SER	Х		Yas:	(2)3		1.10
144.60	120	1753	FFSX	X		201	X	A. 31	82.114			Popul.	1.20
144.70	130			Х			Х	X					1.30
144.80	140			Х		Х				- 175	Sec. 9		1.40
144.90	150			X	N S	Х	ERI	X					1.50
145.00	160		A STATE OF	х		x	x	180					1.60
146.00	260	U E	х			x	х						2.60
147.00	360		х	х		х	х	11 2= 1					3.60
147.99	459	х	244			х		х	х		. ZIE	×	4.59

^{*}MSD - Most Significant Digit

To find "N" code (simplex frequency) use formula:

 $N = 100 \times (Freq. MHz - 144) + 60$

Eg. If frequency is 145.62 MHz

Then $N = 100 \times (145.62 - 144) + 60$

 $N = 100 \times 1.62 + 60$

N = 162 + 60

N = 222

To find Mix Down Frequency (MHz) use formula:

Mix Down Freq. (MHz) = "N"/100

Eg. If "N" Code is 222

Then Mix Down Freq. (MHz) = 222/100

M.D. Freq. (MHz) = 2.22

OFFSET

Note: For +600 KHz add 60 to "N" code.

For -600 KHz subtract 60 from "N" code.

^{**}LSD - Least Significant Digit

When cool cut the leads off flush with the solder.

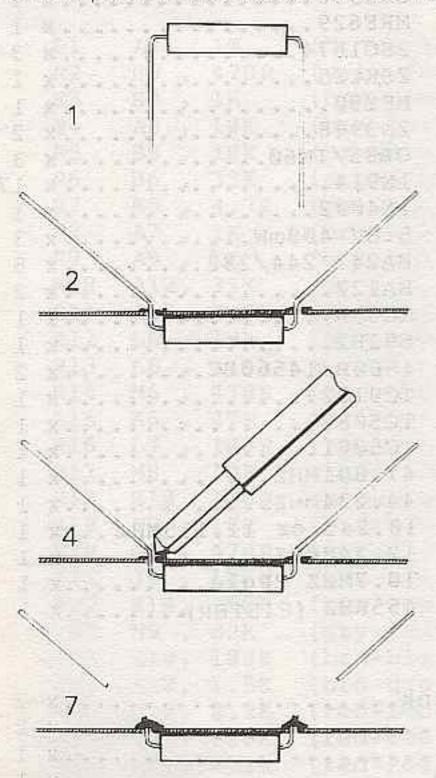
The printed circuit boards are connected to the other components using hookup wire. Usually PC pins will be used to simplify connection. To connect to these first strip 5mm of insulation from the wire, tin the end (tinning is simply coating with solder) and the PC pin. Hold the wire against the pin and re-melt the solder. Hold still until the joint is solid.

When connecting wires to switches, potentiometers and terminals first strip and tin them as above; put a 900 bend in the stripped end and hook it through the terminal. Do not wrap it around the terminal or it will be difficult to remove if necessary.

COMPONENT DRESS

Dress is the name given to the neat layout of parts. Whilst it is not essential, neat consistent layout and construction makes any fault-finding much simpler, as well as producing a more professional and reliable finished product.

Bend leads to fit their PCB holes accurately, using long-nose pliers. This means easier installation and less strain on the point where the lead enters the



component. All components except transistors should sit right on the board. Line up all resistors so that their colour codes can be easily read. Position capacitors so that their values can be read (except polarised types, which must go in the direction indicated).

USING A MULTIMETER

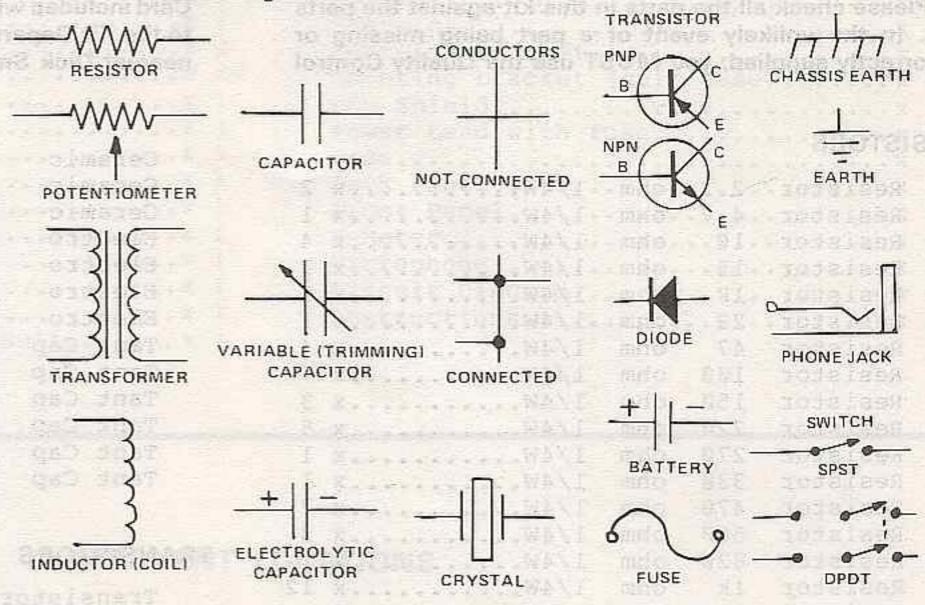
notes will help you to use it effectively.

& DC), resistance and DC current.

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SCHEMATIC DIAGRAMS

These are the commonly used symbols for components on schematic diagrams.



To measure voltages, set the multi- GENERAL RULES meter's range switch to the next voltage - Check the position of the range switch range higher than the voltage you want before every measurement. Multimeters to measure. For example, to measure six will NOT take much abuse (such as volts, set the switch to ten volts. If you connecting to the mains on the ohms don't know what the voltage should be, range!) set the switch to the highest voltage - Make sure that you're reading the right range (AC or DC) and measure the scale of the meter. These will be identified voltage. If it barely moves the needle, similarly to the range switch. move the switch to the next range down. Do this until the needle falls around the middle of the scale.

Always make sure that you have set the meter to AC or DC as needed. Transformers and mains wiring are AC, transistor circuits are DC. When measuring DC, the red lead must be connected to the positive side, and the black to the negative. If the needle swings to the left, you have them the wrong way around.

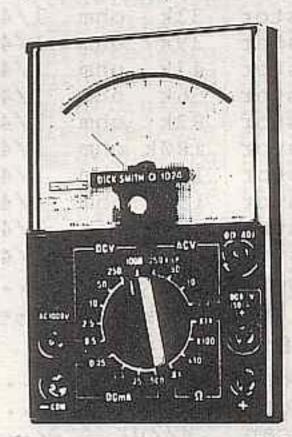
RESISTANCE MEASUREMENTS

When measuring resistance always make sure that no power is applied to the circuit or you will damage the meter or get a false reading.

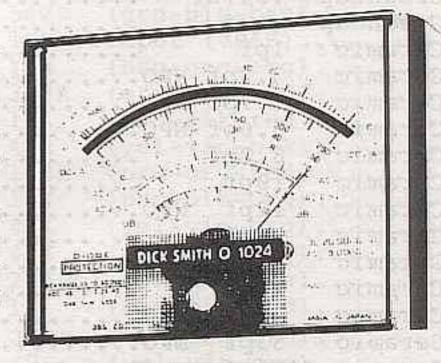
The most important thing to remember when measuring resistance is to make sure the meter is properly 'zeroed'. To zero the meter, set it in the appropriate range ('ohms x 1') and hold the two probe tips together. Now adjust the knob labelled 'ohms adjust' until the meter needle is sitting over the zero mark on the right hand side of the meter scale. Notice that the ohms scale reads from right to left.

CURRENT MEASUREMENTS

To measure current, the point you wish to measure will have to be separated, as A multimeter is indispensable for test- the meter will only measure current in ing and troubleshooting circuits. These series with the circuit. Adjust the range switch as for voltage measurements -A typical multimeter measures volt (AC start with the highest range and work down.



A TYPICAL MULTIMETER



A MULTIMETER CORRECTLY ZEROED FOR MEASURING RESISTANCE.

- Keep the meter flat when measuring, and read the scale from directly above if your meter has a mirrored scale, line the needle up with its reflection. This will minimise reading errors.
- Re-zero the needle every time you measure resistance.

PARTS LIST

Please check all the parts in this kit against the parts list. In the unlikely event of a part being missing or incorrectly supplied, you MUST use the Quality Control

Card included with your kit. You can send the card directly to the Kit Department at Head Office or drop it in at your nearest Dick Smith store.

no retain a mai	DISTRICT SERVICE							
RESISTORS				Ceramic .	Øluf 33			
Bogistor	2.2 ohm	1 / 4 101	2		047ufx 9			
Resistor	2.2 ohm 4.7 ohm	1/4Wx 2	20		lufx 5			
Resistor	10 ohm	1/4Wx	721		7uf 16V 3			
Resistor	15 ohm	1/4Wx	201	- I June Applied December 50	00uf 16V 1			
Resistor	18 ohm	1/4Wx			20uf 16V 1			
Resistor	22 ohm	1/4Wx	20		70uf 16V 3			
Resistor	47 ohm	1/4Wx		200 M. S. M. S. M.	22uf 25V 2			
Resistor	100 ohm	1/4Wx	AND THE RESERVE OF THE PARTY OF		uf 25V 4			
Resistor	150 ohm	1/4Wx	20		.3uf 25V 1			
Resistor	220 ohm	1/4Wx	2	Tant Cap 4	.7uf 25V 3			
Resistor	270 ohm	1/4Wx		Tant Cap 1	Øuf 16V 5			
Resistor	330 ohm	1/4Wx	22.	Tant Cap 2	2uf 16V 1			
Resistor	470 ohm	1/4Wx			authorized and inspection of the second of t			
Resistor	560 ohm	1/4Wx	404		Design deat to Allenia Strategic land of San			
Resistor	820 ohm	1/4Wx		TRANSISTORS	HERE TOO OF THE PERSON AT THE OWNER.			
Resistor	lk ohm	1/4Wx		Transistor	BC547			
Resistor	1.2k ohm	1/4Wx		Transistor	BC547x 2 BC548x 8			
Resistor	1.5k ohm	1/4wx	7	Transistor	BC557 1			
Resistor	1.8k ohm	1/4Wx	1	Transistor	BC558 x 2			
Resistor	2.2k ohm	1/4Wx	11	Transistor	BD140 x 1			
Resistor	3.3k ohm	1/4Wx	3	Transistor	3SK40/MFE131x 3			
Resistor	4.7k ohm	1/4Wx	7	Transistor	BC337/BC639x 2			
Resistor	5.6k ohm	1/4Wx 2	2	Transistor	BC327/BC640 2			
Resistor	6.8k ohm	1/4Wx	20 1	Transistor	2N559Ø			
Resistor	10k ohm	1/4Wx	9	Transistor	MDE629			
Resistor	15k ohm	1/4Wx 6	6	Transistor	MRF629 1			
Resistor	22k ohm	1/4Wx 2	2	Transistor	2SC1674 3			
Resistor	33k ohm	1/4W 5	5	Transistor	2SK125 1			
Resistor	39k ohm	1/4Wx	1	Transistor	BFY90x 1 2N3948x 2			
Resistor	47k ohm	1/4Wx 9	9	Diode	OA95/IN60			
Resistor	56k ohm	1/4Wx	11	Diode	1N914 17			
Resistor	82k ohm	1/4Wx 2	2	Diode	1N4002 x 1			
Resistor	100k ohm	1/4Wx	4	Diode Zener	5.6V 4ØØmWx 3			
Resistor	120K ohm	1/4Wx	1	Diode	BA243/244/282 5			
Resistor	150k ohm	1/4Wx	1	Diode	BA122 2			
Resistor	220k ohm	1/4Wx		IC	MC3357 1			
Resistor	270k ohm	1/4Wx]	1	IC IC	592H2			
Trimpot	10k ohm	x 2	2	IC	4560B/14560BC 2			
Mini Pot	5k/10k	x 2	2	IC	TC9122 1			
CAPACITORS				IC	TC5082 1			
and the second and th	aalue	x 2		IC	TC5081 x 1			
Greencap			SV III	XTAL	47.801MHZx 1			
Greencap		x 2		XTAL	44.234 n+(Zx 1			
Greencap		x 3		XTAL	10.245 or 11.155MHzx 1			
Greencap		x 4		XTAL	10.240MHZ 1			
Ceramic		x 3		XTAL Filter	10.7MHZ 2Polex 1			
Ceramic	The state of the s	x 2		Filter	455KHZ (FILTER)x 1			
Ceramic		x 4						
Ceramic	THE PERSON NAMED IN COLUMN TWO IS NOT THE OWNER.	x 2		HARDWARE				
Ceramic		x 2		Pound Hooks	ink			
Ceramic		x 3			inkx 2			
Ceramic		x 5			x 2			
Ceramic	NEW THE ST	x 8	The second second		H X 1			
Ceramic	ANY CONTRACTOR OF THE PARTY OF	x 3	• 10		x 1			
Ceramic		x 6			anel) 1			
Ceramic	W104111-0775 143-143-	x 3			(Line)x 1			
Ceramic		x 2	•		(Panel) 1			
Ceramic		x 2		Thumbwheel Switchx 1				
Ceramic		x 7	-	1.5uH Adj.Coil 4				
Ceramic		x 3	_					
Ceramic		x 3		Can 10MA015S				
Ceramic		x 2			d			
Ceramic	PARTICIPATION AND ADMINISTRATION	x 2			S 7			
Ceramic		x 2						
Ceramic	DECEMBER AND SERVICE AND SERVI	x 1	THE REAL PROPERTY.	The state of the s	5uH (L208)x 1			
Ceramic		x 1			.22uH (L209) 2			
Ceramic	THE PARTY OF THE P	x 1			(L205) 2			
Ceramic	100 Carlo 100 Ca	x 1			cket (Panel) x l			
Ceramic		x 3			x 1			
Ceramic		x 4	2		ite Beadx l			
Page 8	- Control of the Control							

MISCELLANEOUS Fuse 3 Amp 3 AG...........x Switch SPDT C/Off.....x 1 VHF Transceiver P.C.B...... x 1 Switch P/On....x 1 Speaker....x 1 Mounting Bracket Supp...... 2 Heatsink..... x 1 Wing Nuts..... 2 Heatsink Bracket...... 1 P.C.B. Pins..... x 40 Mounting bracket (suit case) x 1 Solder....x VCO Shield..... 1 12 Core Telephone cable 1 Power Lead with fuse..... 1 2 Col. H/U Wire.....x 1 Case..... x 1 ... SC1 Shielded Cable..... 1 Back Panel....x 1 Silicon Grease..... 1 Front Panel.....x 1 En/Cu. Wire 18B&S..... 1 S-Meter....x 1 En/Cu. Wire 25B&S..... 1 Microphone x 1 Tin/Cu.Wire 25B&S..... 1 Circuit Diagram 1 Transformer Wax...... l Instructions.....x 1 Set of Nuts & Screws to suit x 1

COMPONENT LOCATIONS

All components in this parts list are listed as follows: component number, location on PCB, value and colour code or type, respectively. Please note that all resistors are 1/4W unless specified otherwise.

K18, 560R

J18, 10K

J15, 10K

R92 E9 , 4.7K

J19, 1.5K

R88

R89

R90

R91

(grn-blu-brn)....□

(brn-blk-org).....□

(brn-grn-red).....□

(brn-blk-org).....□

(yel-vio-red).....□

					On Alex		Ad Abel	BOD SELICOTE ASIA	
RESISTOR	S		THE RESERVE OF THE PARTY		R46	N19,	18R	(brn-gry-blk)□	
			30 40 8 11 7 760		The state of the s	M18,		(red-red-gld)□	
R1	A7 ,	1K	(brn-blk-red)	П	R48	N19,		(red-red-gld)□	
R2	В8 ,		(yel-vio-brn)		R49	M20,		(red-red-brn)□	
R3	В9		(brn-blk-red)		R50	N16,		(brn-blk-yel)□	
R4	A8 ,		(brn-blk-org)	The second secon	R51	N15,	PACKS STATES	(gry-red-org)□	
R5	в8 ,		(brn-blk-org)	The state of the s	R52	N15,	THE PERSON NAMED IN	(grn-blu-red)□	
R6	В6,		(org-org-org)		R53	M15,	S-130-31	(grn-blu-brn)□	
R7	B5 ,	12/3/19/2014	(yel-vio-gld)		R54	015,	Control of the Contro	(red-red-org)□	
R8	A7 ,		(brn-blk-red)	4-3	R55	P15,	Service Control of the Control of th	(org-wht-org)□	
R9	A9 ,		(brn-blk-red)	The second secon	R56	017,		(brn-grn-org)□	
R10	A12,		(org-org-org)		R57	P16,		(brn-blk-yel)□	
R11	A12,		(org-org-red)		R58	015,	Company of the Compan	(grn-blu-org)	
R12	L6 ,	2000	(brn-blk-org)		R59	014,		(grn-blu-org)	
R13	L6 ,		(brn-grn-red)	The second second second	R60	N14,		(yel-vio-brn)	
R14	M6 ,		(yel-vio-brn)		R61			impot (VR61)□	
R15	K6 ,	The state of the s	(yel-vio-blk)		R62	K14,	7211221101	(brn-grn-org)	
R16	L7 ,	E-10/11/20	(brn-blk-brn)		R63	112,	Victoria Control	(brn-blk-red)□	
R17	M8 .	Classic to the control of the contro	(brn-blk-blk)		R64	111,	4	(yel-vio-org)□	
R18	KlØ,	EUPPLE	(brn-blk-brn)		R65	H11,		(yel-vio-red)□	
R19	F7 ,	Control of the contro	(brn-blk-org)			113,		(yel-vio-org)□	
R20	G8 ,		(yel-vio-brn)		R67	L15,		(grn-blu-brn)	
R21	J9 ,		(brn-blk-brn)		R68			impot (VR68)□	
R22	K14,		(brn-grn-brn)		R69	H14,		(brn-grn-org)	
R23	N9	A CONTRACTOR OF THE PARTY OF TH	(gry-red-org)		R7Ø		3.3K	(org-org-red)	
R24	LIØ,	2((33))28:70	(brn-blk-yel)		R71	E10,	EV.	(brn-blk-red)□	
R25	MlØ,		(brn-grn-red)	and the second s	R72	Н9 ,		(yel-vio-blk)□	
R26	M12,		(red-red-red)		R73	G10,		(brn-gry-red)□	
R27	L12,	E SHARWAY	(red-red-yel)		R74	G9 ,		(brn-blk-org)□	
R28	Lll,		(red-red-red)		R75	F10,	100 (P25) 42 P21	(yel-vio-org)	
R29	M11,		(yel-vio-org)		R76	F10,	C. A. Land	(yel-vio-org)□	
R30	010,		(brn-blk-red)		R77	7	220R	(red-red-brn)□	
R31	N11,	ATTION TO ANY AND ADDRESS OF	(red-vio-yel)		R78	F10,	PLANTED COMPANY	(brn-blk-red)□	
R32	011,		(brn-grn-org)		R79		330R	(org-org-brn)□	
R33	N12,	LITTER OF THE PARTY OF THE PART	(brn-blk-org)		R80	H13,	THE PLANT OF THE PARTY OF THE P	(yel-vio-org)□	
R34	011,		(brn-grn-red)		R81	G13,	And the second	(yel-vio-org)⊔	
R35	P10,		(yel-vio-red)		R82	G12,		(brn-blk-red)□	
R36	M13,		(org-org-org)		R83	A CONTRACTOR OF THE PARTY OF TH	22ØR	(red-red-brn)	
R37	P18,	200	(yel-vio-brn)		R84	CE PULL DE	THE STANFARDS		
R38	M12,		(red-red-org)		47 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	H12,	150R	(brn-grn-brn)□	
R39		5K/10K			R85	H12,	Total Park	- [설명(전문) 10명 - 프라이트 (전문) 10명 - 1	
R40			Mini Pot (VR40)		R86		On the second	(brn-blk-org)	
247	030	JULY TOK	// FOC (VR90)		R87	I14,	1.20	(brn-red-red)⊔	

(brn-red-yel).....□

(red-red-yel).....□

(red-red-brn).....□

(grn-blu-red).....□

(yel-vio-org)....□

R41

R42

R43

R44

R45

018, 120K

P19, 220K

020, 220R

N19, 5.6K

018, 47K

