

WIA Tas Southern Branch Activities Centre

Tassie Devil QRP CW transceiver kit

1.2 watt transmitter and direct conversion receiver.

The original owner of this circuit board is unknown.

The kit was released in 1986. The accompanying information shows that the kit construction was not for the inexperienced.

The completed circuit board required a number of additional wires.

External components required were the normal controls.

The resulting transceiver had a number of problems, most of which were found and corrected by the constructors. The problem I found most annoying was that it produced horrendous key clicks. The clicks were caused by the oscillator switching from receive frequency to transmit frequency and back at the start and end of each dot and dash.

I did a modification to the one I built to improve the clicks which resulted in only one click at the start of each transmission.

Richard Rogers VK7RO February 2018

LO-KEY

NEWS BULLETIN



PUBLISHED QUATERLY

"WE DO MORE WITH LESS"

RAI TAYLOR 25 TWELFTH AVE WEST MOONAH TASMANIA 7009

THE "TAS-DEVIL" 80W CW QRP TRANSCIVER

Having had the pleasure of working "QRP" for nearly 12 months using a Drew Diamond design DSB/CW Tx I decided to build the SCD CW transceiver. However, whilst SCD in concept, I did incorporate a standard Colpitts VFO and a home brew transmit section! The performance of the receiver was very impressive and good reports gained from the transmitter. The VFO was made to tune over a frequency range of 3.50 to 3.80 MHz so I had the additional pleasure of listening to the DX window. RIT and the audio filter were considered to be a must on this rig.

Circuits were constructed entirely on "strip board". Three were made - VFO, TX and RX/filter/audio amplifier. Each part was "proved" and the lot put together. The VFO and battery holder were placed in one aluminium box 100X100X50 and the Rx/Tx in another, the idea being to go portable on camping holidays etc.

Good news travels fast, even with low power, and before I had time to oil the key, requests were being received for a single p.c.b. design suitable for easy home construction.

Using the experience gained, it was decided to incorporate all the perceived desirable features. This, of course, is very much an individual thing! The circuits are fairly conventional and mainly borrowed. However, the p.c.b. was designed from scratch and is the end result of much midnight oil. I don't think I can look tram tracks in the face again! The layout is such that sections can be removed and joined up to make a separate receiver, transmitter, VFO etc.

The following is an attempt to highlight the few unique aspects of the circuits.

The VFO is supplied from a 5 volt voltage regulator as it is felt that the regulation is superior to a simple zener. The aim being to improve stability. A 1N4001 power diode is used as a varicap as it was found to give both a greater capacitance variation and better linearity than a Ba102. R5 and R6 set the d.c. voltage across D1 and hence, the transmit frequency. Q3 switches on during key-down. Q4 switches on during receive and a variable voltage from VR3 gives receive-incremental-tuning. VR1 and VR2 set the (+) and (-) RIT limits.

Circuit design for the receiver is straight out of the SCD manual. However, the audio-amplifier is a little different. This incorporates a 4007 digital i.c. biased to linear working conditions. Many of these amps have been built and they give high gain, low noise amplification. The output power is about 150 mW which is more than adequate. Also, being in three stages, it was convenient to provide mute and side-tone functions.

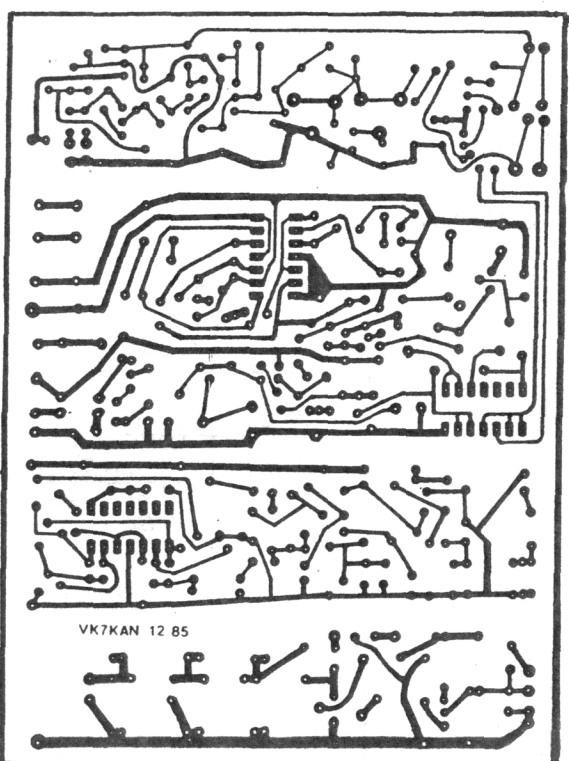
The transmitter uses a PNP driver and this appears to improve both sensitivity and stability. L2 and L3 are wound on a readily obtainable T.V. balun former type 1050/2/P14. RFC3 comprises 3 turns on a Phillips 6 hole ferrite bead. This section is subject of a separate article. (see the "upside-down" QRP P.A.)



THE TAPPER

Probably the most surprising circuit is the d.c. switching. Semi-breakin was considered the best compromise and in order not to reduce receiver sensitivity a relay, rather than diodes was used to switch the aerial from Rx to Tx. VR5 adjusts the release delay time of RL4 to allow for different keying speeds. The idea being to prevent the relay releasing between characters. As ones speed increases, the delay can be reduced. PB1 allows the VFO to be set to zero-beat without having to turn the RIT control to zero position.

I.Smith VK7KAN



VK7KAN 12 85

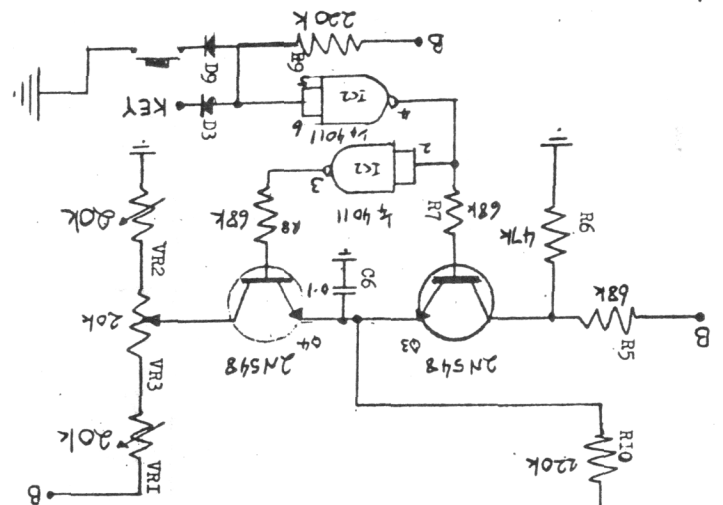
NOT TO SCALE.



THE NIBBLER

FIG 1
COMPONENTS LISTING

RESISTORS	POTENTIOMETERS	SEMICONDUCTORS	CAPACITORS
R1 100K	VR1 20K	Q1 2N548	C1 68pf
R2 1K	VR2 20K	Q2 2N548	C2 68pf
R3 470ohm	VR3 20K	Q3 2N548	C3 68pf
R4 470ohm		Q4 2N548	C4 47pf
R5 68K		Q5 2N548	C5 47pf
R6 47K		Q6 2N548	C6 47pf
R7 68K		Q7 2N548	C7 47pf
R8 68K		Q8 2N548	C8 47pf
R9 220K		Q9 2N548	C9 47pf
R10 220K		Q10 2N548	C10 47pf
R11 220K		Q11 2N548	C11 47pf
R12 220K		Q12 2N548	C12 47pf
R13 220K		Q13 2N548	C13 47pf
R14 220K		Q14 2N548	C14 47pf
R15 220K		Q15 2N548	C15 47pf
R16 220K		Q16 2N548	C16 47pf
R17 220K		Q17 2N548	C17 47pf
R18 220K		Q18 2N548	C18 47pf
R19 220K		Q19 2N548	C19 47pf
R20 220K		Q20 2N548	C20 47pf



VFO / KIT

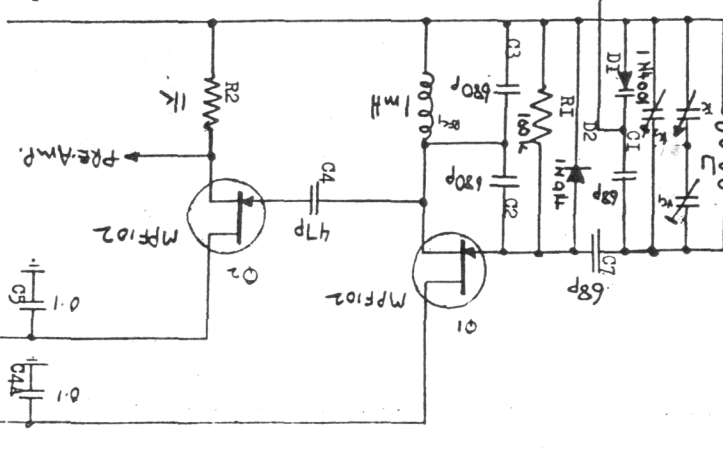
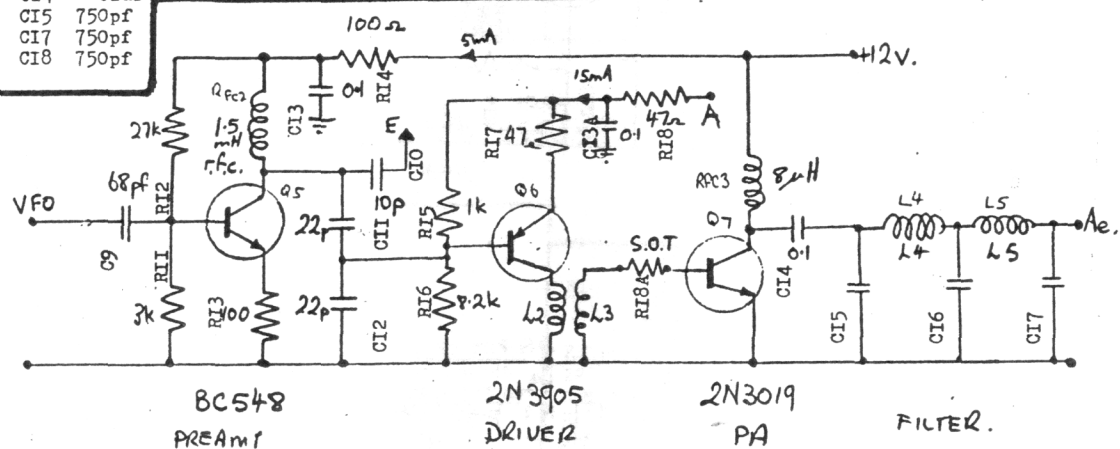


FIG 2
COMPONENTS LISTING

RESISTORS	CAPACITORS	SEMICONDUCTORS	INDUCTORS
R11 3K	C9 68pf	Q5 BC548	L2 8T 28G BALUN FORMER
R12 27K	C10 10pf	Q6 2N3905	I050/I/FI4
R13 100ohm	C11 22pf	Q7 2N3019	L3 3T 22G on above
R14 166ohm	C12 22pf		RPC3 3T 22G 6 hole F/B
R15 1K	C13 .1uf		L4 22T 22G T50-2
R16 8.2K	C13A .1uf		L5 22 22G as above
R17 47ohm	C14 .1uf		
R18 47ohm	C15 750pf		
R18A SELECT	C17 750pf		
	C18 750pf		



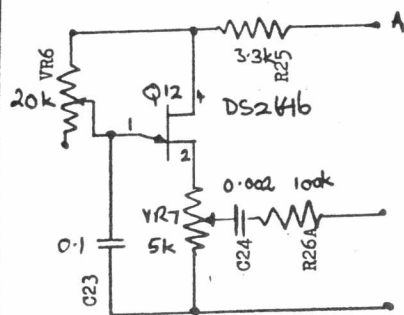
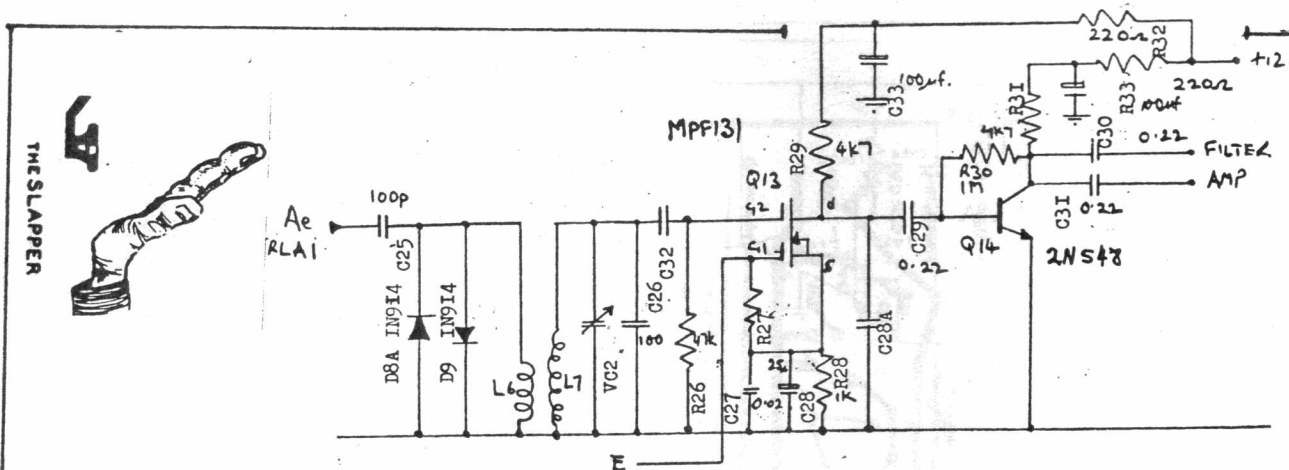
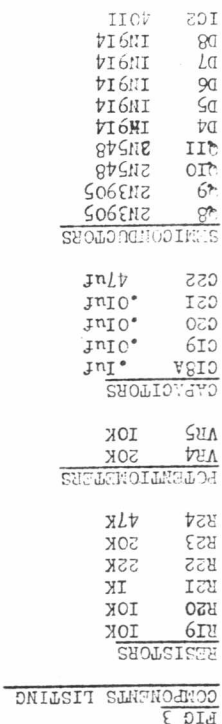


FIG 4
COMPONENTS LISTING

FIG 5.
COMPONENTS LISTING

RESISTORS	
R25	3.3K
R26A	100K

SEMICONDUCTORS	
QI2	IN2646
POTENTIOMETERS	
VR6	20K
VR7	5K

CAPACITORS
C23 .1uf
C24 .002uf

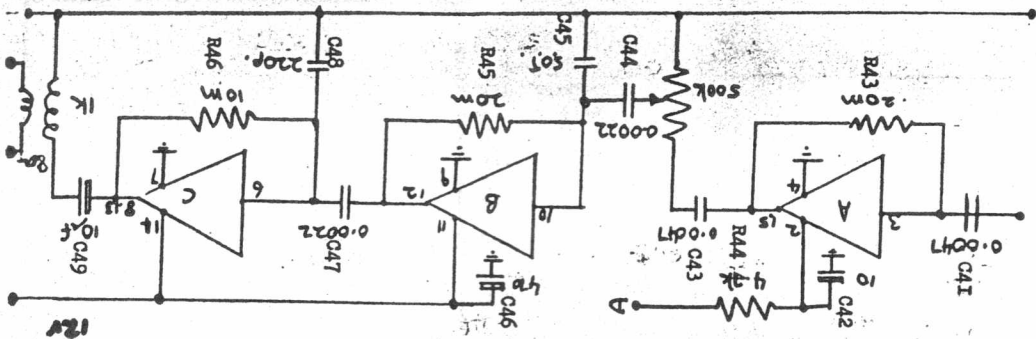
RESISTORS

R26	47K
R27	SELECT
R28	1K
R29	4.7K
R30	1M
R31	4.7K
R32	220ohm
R33	220ohm

CAPACITORS	
C25	100pf
C26	100pf
C27	.02uf
C28	25uf
C29	SELECT
C29	.22uf
C30	.22uf
C31	.22uf
C33	100uf

SEMICONDUCTORS	
Q13	MPS131
Q14	2N548
D8A	IN914
D9	IN914

IC 4 4007 AUDIO AMP FIG 7



Audio AMP FIG 7

COMPONENTS LISTING		PART	
RESISTORS	DIAPACFORS	R43	20M
		R44	4.7K
		R45	20M
		R46	10M
		IC4	
47007		C45	SELECT
		C46	470uF
		C47	0.0022uF
		C48	220uF
		C49	10uF

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60042 Filt. 9

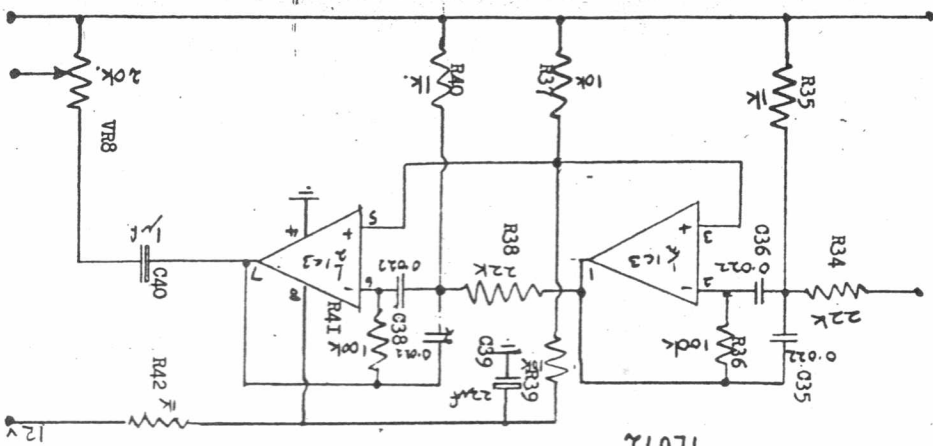
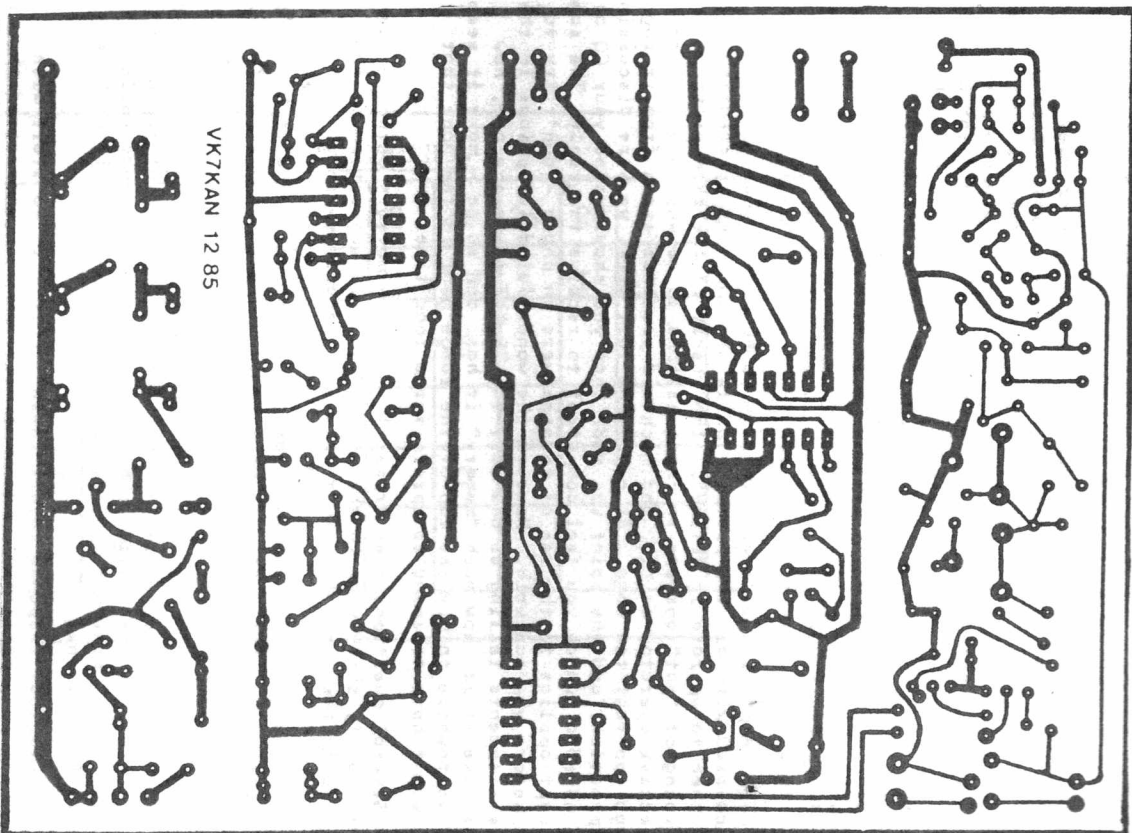


FIG 6

CAPACITORS		RESISTORS	
C35	0.022uf	R34	22K
C36	0.022uf	R35	1K
C37		R36	100K
C38	0.022uf	R37	10K
C39	0.022uf	R38	22K
C40	1uf	R39	10K
		R40	1K
	POTENTIOMETER	R41	100K
	V83	R42	1K
	IC3		
	TL072		

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VK7KAN 12 85

TAS DEVIL

FULL SCALE.



THE CLUTCHER

TASSIE DEVIL

"THE SAGA OF A TASSIE DEVIL"

Firstly I must apologise to the many members that I had to disappoint because I just could not supply them with kits for the 80M QRP CW transceiver. When Ian VK7IF first built the prototype it was obvious that at last here was a project ideally suited to the home brewer. Not to complex, technically very interesting, and innovative in some areas.

I was genuinely surprised how well it performed and naturally only to pleased to make up a kit. The Southern Branch of the W.I.A. do have an activity centre and it was decided to investigate the component availability and price ect.

This I did and from information that I received from local supply houses, together with components already on hand offered the kits to anyone interested for a total cost of \$35.00. The original target of 12 kits was decided on.

Thinking that it would be a sufficient amount we began to order the PC boards and components ect. In the first week the orders came flooding in at about the same time some of the components began to arrive and further price lists ect.

It became obvious that the original prices quoted were no where near the current prices and it was decided to make a target of 30 kits, to do this we had to increase the price to \$45.00 per kit. I personally wrote or contacted the first 12 people whose orders had been accepted, explaining the increase price. Fortunately no one objected, in fact quite a few did not know how on earth we could of provided the kit for such a low price in the first place. Of course the components that I had on hand that had been bought years ago, help to off set the cost.

The point is that in excess of 70 people showed their interest in the kit. This response is very encouraging, it does prove that a lot of people still want to home brew their own equipment, it is a pity that most of the major component suppliers have, or are reducing the quantity, and limiting the range of ham radio components, true, computer buffs are being catered for very well, but I do fear for the future, of the humble ham radio home brewer, eventually even my immense junk box will run dry.

I must get off my soap box (full of junk) and get on with the question in hand. No cater for those unfortunates who missed out, we are making available a printed circuit board, parts list and information so that you can build your own "Tas Devil" and chase up your own parts, the only real difficult components are good quality air spaced variable capacitors, and slow motion dials. Buying new parts today the estimated cost would be around \$75.00.

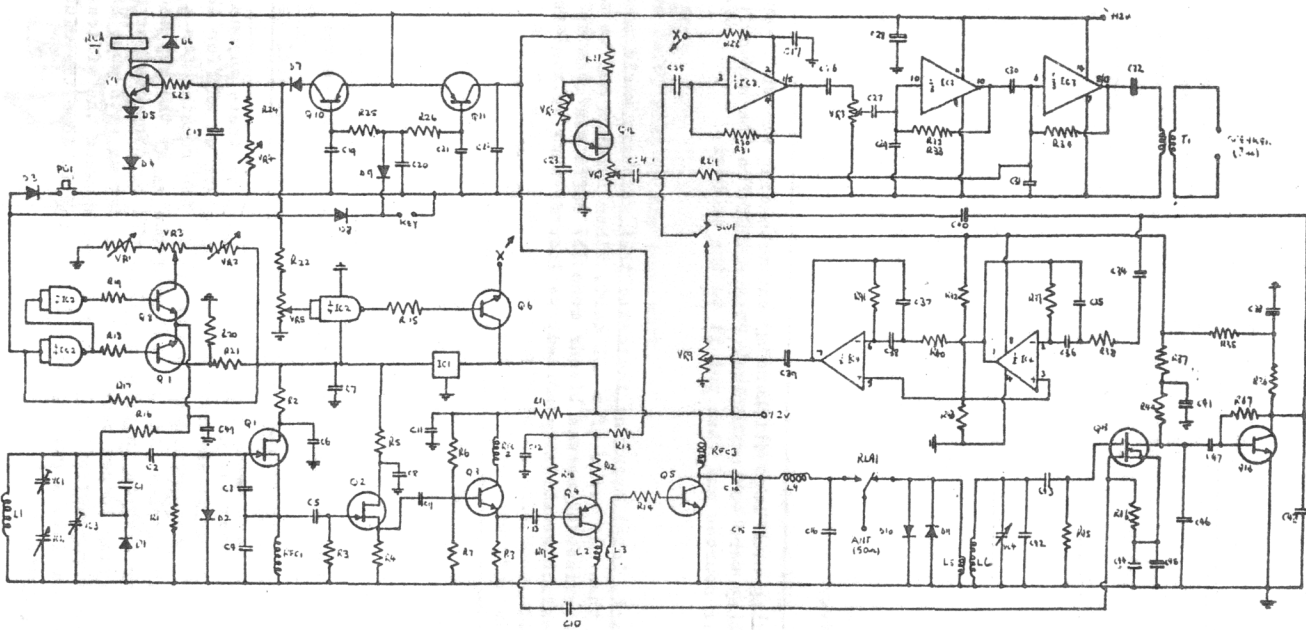
So again I repeat if you would like a P.C.B. board and construction information, write to me VK7VW, as soon as possible. This will make the ideal project during the coming winter months. The cost which includes postage within Australia and Newzealand is \$16.00. Cheques made payable to "Tasmanian W.I.A. Southern Branch."

USING A MULTIMETER TO FIND PNP OR NPN:

1. Clip meter -ve lead onto centre lead of transistor.
2. Set multimeter to high ohms (x1k range)
3. Positive lead to outer pins reads:
HIGH-HIGH IT'S PNP
LOW-LOW IT'S NPN

"TAS DEVIL" 80M CW QRP TRANSCEIVER

7.17 12-85



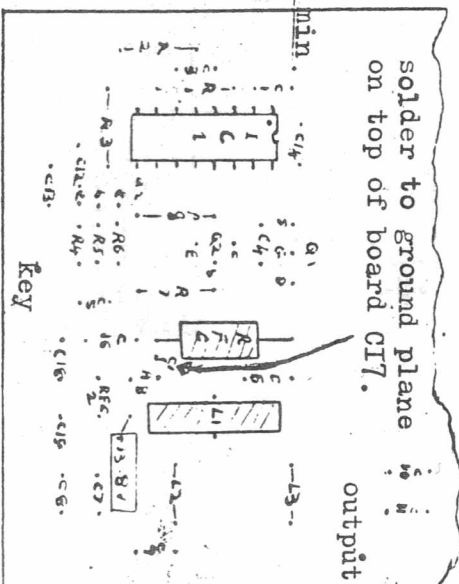
MAK 86

PARTS LIST.

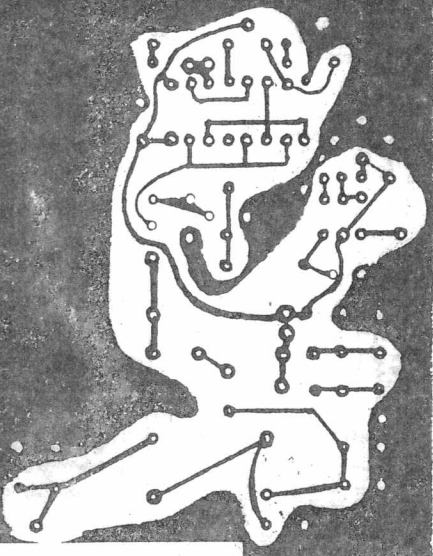
R1, R3, R5	100K	Q1	VB88AF	RS	COMPONENTS	295135
R2	10K PRESET FCT	Q2	BC478	"	"	293612
R4	4.7K	Q3	2N3053	"	"	293661
R6	330ohm	IC.1	4049B	"	"	306667
R7	82ohm	Heatsink-Q3	"	"	"	401548
R8	10K	Heatsink-Q1	"	"	"	"
C1, C3	33PF NPO CERAMIC	PC Board double sided 3"x3" (75x75)mm	"	"	"	"
C2	0.01uf ceramic	refcl 4.7uf RS COMPONENT	228135	"	"	"
C4, C6, C12, C14, C16	0.1uf ceramic					
C5, C15	10uf 15v electrolytic					
C17	4.7uf tantalum					
C7	390PF polystyrene					
C8, C9	1500PF polystyrene					
C10	680PF polystyrene					
C11	68PF polystyrene					

solder to ground plane
on top of board C17.

output



Key



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The large area of vacant copper is to bolt on a piece of aluminium heat sink sheet. I used a piece of 20x20mm aluminium right angle, bolted to the top of the board Q1 is then bent over and bolted to it with a mica washer and associated standard hardware Q1 is in a 70202 case and the tab must be insulated from earth. The vertical part of the right angle heatsink can be used to bolt the unit to the case.

TAS DEVIL UPDATE

A continuing story by Ian VK7JJ



I guess I now understand the meaning of the statement "We reserve the right to improve the design". Wishing to finalise the design I decided to add a few improvements and in so doing unearthed an unexpected barrel of worms, having recovered from my red face I will share the knowledge. Two features were destined for improvement: To run IC2 from 12V to overcome the low voltage problem associated with the muting of IC3 and to change VRI and VR2 to provide better setting capability for the RTT circuit, the modifications proceeded thusly:-

The lead supplying 5volts to IC2 was disconnected from IC1 and reconnected to the 12volts supply.

The wipers of VRI and VR2 were connected to the track ends of VR3 (the PC tracks need to be cut). The 5volts was applied to the track of both VRI and VR2 and the other track end of VR2 was taken to earth.

This arrangement allows a variable preset voltage to be applied to each end of VR3 thus allowing a far greater accuracy in the setting of the range of the RTT. So enter the red face:-

The mods to IC2 which, I should add, included strapping pins 12 and 13 to pin 14, worked perfectly, however the RTT did not work. On pushing PFI 5volts was present across DI instead of the 2volts as at the junction of R2/R21. The discovery-Q7 and Q8 are wired as emitter followers hence the voltage at the emitter equals the voltage on the base (less 0.6V). The base voltages had risen because of the 12volt supply to IC2 of R18, R19 and the base currents of Q7 and Q8.

There is a happy end to the story-Q7 and Q8 were replaced with PNP 2N3905 devices, R18 was connected to the base of Q8 and R19 connected to the base of Q7. This modification has improved out-of-sight the frequency stability, the reason for this is that the bias on DI was being determined by the base-emitter characteristics of Q7 and not by the voltage across R20 as was the intention of the design. These characteristics are very temperature dependant hence the drift.

The mod to VRI, VR2, VR3 was very worth while as it is now possible to set the range, negative limit and positive limit of the RTT independently and still allow a null at the mid mechanical position of VR3.

The mod to the unused gate of IC2 is recommended as, apart from conformable random switching due to the gate not knowing if its input is low or high. As far as IC3 goes the desired result was achieved, the gain increased by about 20db with the supply of 12V instead of 5V. It is necessary however to replace R22 with a short circuit to allow proper adjustment of the switching action via VR5. A modified circuit is provided and I must leave the implementation of the changes up to you.

They are well worth while, as has been verified by the comments received during QSO's after completing them on my own rig.

I do apologise for the "blunder" but ask you to bear with me on this the self-teaching aspects of our hobby, I guess that's the difference between the amateur and the professional. HI.

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79AS DEVIL RICH

Q5 over heating

No heatsink fitted

Output appears to be frequency doubled

I3/base Q5 incorrectly terminated

Fit heatsink (this is essential)

Remove R14 and replace with a link. Connect a resistor with value of 47 to 100Ω between link and earth (i.e. across I3). This mod. is recommended!

VFO not oscillating (no other faults)

Q1 high & thus reducing supply voltage via R2

Mute circuit ineffective due to low voltage on IC3-1

Q6 = emitter follower, output = 5-0, 6-4, 4v

Reduce R2 to 100Ω

Replace Q6 with PNP type transistor, emitter to 12v. Disconnect R15 from IC2 and reconnect to wiper of VR5. (this leaves IC2 o/p floating).

Check.

Side tone generator not working

Q12 faulty

NOTE: SOME MAY TRY TO ACHIEVE GREATER OUTPUT POWER. HOWEVER THIS IS NOT PRACTICAL WITHOUT A MAJOR REDESIGN VIZ. WITH A 12V SUPPLY AND 50Ω FILTER OUTPUT = $\frac{V}{2Z} = \frac{144}{2 \times 100} = 1.44$ Watts so save those output transistors!

I wish to express my appreciation to all who have helped compile this list and for all the encouraging reports about the design received so far.

Ian Smith VK7J3

VK5ZF

6-5-86

INFORMATION

3.620

EVENINGS

MODIFIED CIRCUIT

