

As the dial of the receiver turned, sounds of music floated through the small radio shack.

Some troubadours were entertaining their audience with "The Last of the Hillbillies".

On April 18, after the transmitter was revised, another attempt was made to contact the mainland.

Again no reply was received, but the men's disappointment would have been allayed had they known that their signals were picked up and passed on to Darwin.

All Australian stations were warned to keep off the air, and to listen for Timor on the following night.

A few days before April 19, "Sparrow force" HQ had given the operators two coded messages "just in case".

"Joe" Loveless tuned up the rig, and a group of soldiers bunched around the set.

The "brass was pounded" and the call was given highest priority.

Although the operator was prepared to continue for a number of hours, a strong signal replied almost immediately.

With suppressed excitement he tapped out his answer.

A tin of tobacco, kept for such an occasion, was opened in celebration and a toast in coffee was drunk to "Winnie".

On the following night, contact was established again, but this time Darwin was suspicious and demanded proof of the guerillas' identity.

Messages flashed across the Timor Sea:

"Do you know Jack Sargent?"

"Yes, he is here."

"What rank? Answer immediately."

"Corporal."

"Bring him to the transmitter."

"What is your wife's name, Jack?"

"Joan."

"What is your street and house number?"

The correct answer was given, and the Australian mainland knew that Aussies were alive and fighting in Timor.

On April 27 an Allied plane flew over and dropped parachutes with precious food and stores.

Bush wireless received the news and men who had been bare-footed to save their boots for active work were issued with new pairs.

"Winnie" had done her job.

No time was wasted in asking for bombing targets—which were promptly supplied.

Allied bombers passed overhead on their way to giving the Japanese a taste of their own medicine.

On one occasion a convoy of three enemy ships was sighted, and a message despatched to the mainland.

The RAAF sank all three ships.

As a fitting climax to her career, "Winnie" guided the rescue party which eventually took the guerillas out of Timor.

"Winnie" now resides in the Australian War Memorial, Canberra—a symbol of Australian ingenuity in the face of great difficulty.

A FIVE BAND VXO FOR THE FT 75

Ian Berwick VK3ALZ
107 Loongana Ave., Glenroy 3046

The FT75 is a handy little unit. On a watts per dollar basis it is hard to beat. The main disadvantage is its limited coverage with the internal VXO. An external VFO can be used, however this can be prone to vibration induced frequency excursions when mobile. The solution adopted by the author is a VXO with some novel features.

which is filtered before being presented to the transceiver.

The specification of the VXO is as follows:

Band (MHz)	VXO output (MHz)
3.5	8.6724 - 9.1724
7.0	12.1724 - 12.6724
14.0	8.8276 - 9.3276
21.0	15.8276 - 16.3276
28.0	11.4138 - 11.9138

Note that because the FT75 doubles the external VFO frequency internally for 28 MHz operation on this band the VXO covers 1 MHz in five 200 kHz sweeps. The output voltage is in the range of 250 to 700 mV RMS which matches the requirement of the FT75 mixer. The spurious product frequencies were calculated by Alan VK3ZHU and Ron VK3AFW, and only one of significance was predicted. This was in the 21 MHz band and is well attenuated in practise by the filters, and the screening employed.

The VXO was built in three separate compartments, one containing the VXO and associated doubler, one the carrier generator and the third the converter units. Each of these compartments are 7¼ in. x 3½ in. x 4¾ in. diecast boxes. The carrier filter units are built into small tinplate enclosures external to the main boxes. This makes the VXO rather bulky, however there is plenty of scope to make a more compact arrangement.

The VXO has been in use now for several years at home and in the vehicle while mobile with excellent results. The stability is excellent and no report of frequency shift has been received.

Compared to an LC VFO a VXO is several orders of magnitude better for frequency stability under all conditions. Experiments showed that the frequency swing I required—100 kHz—could be obtained using HC-25 crystals in the 26 to 28 MHz region if they were subsequently doubled to 53 MHz. For a 500 kHz range five crystals were required, plus one heterodyning crystal per band or ten in total.

Now since the frequencies for 3.5 MHz and 14 MHz are almost the same and the frequencies for 7 MHz and 28 MHz are reasonably close only, three frequency converters were used to cover the five bands.

The block diagram of the system is shown in Fig. 1. The basic VXO covers 26.550 to 26.800 MHz in five ranges. Then the output is doubled to give a continuous range of 53.100 to 53.600 MHz which is filtered to reduce spurious signals that could be generated. A switch is used to select a converter and associated heterodyne carrier generator. This provides the required signal frequency for the FT75

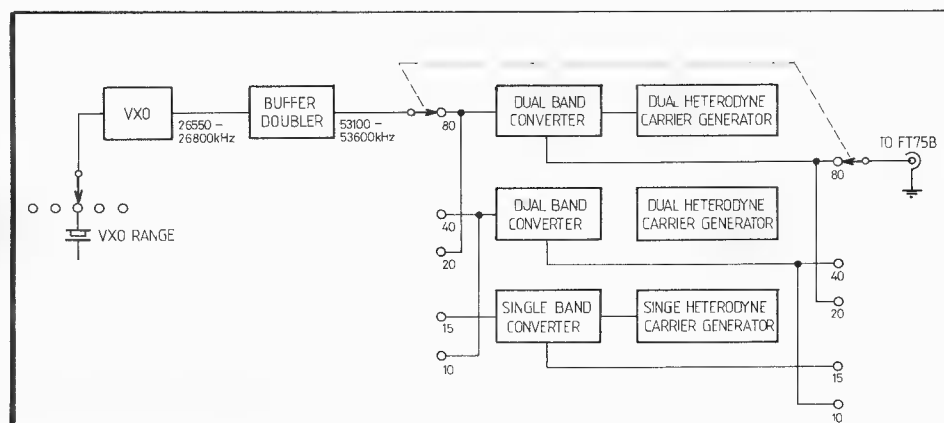


FIG. 1: FT75B VXO Block Diagram.

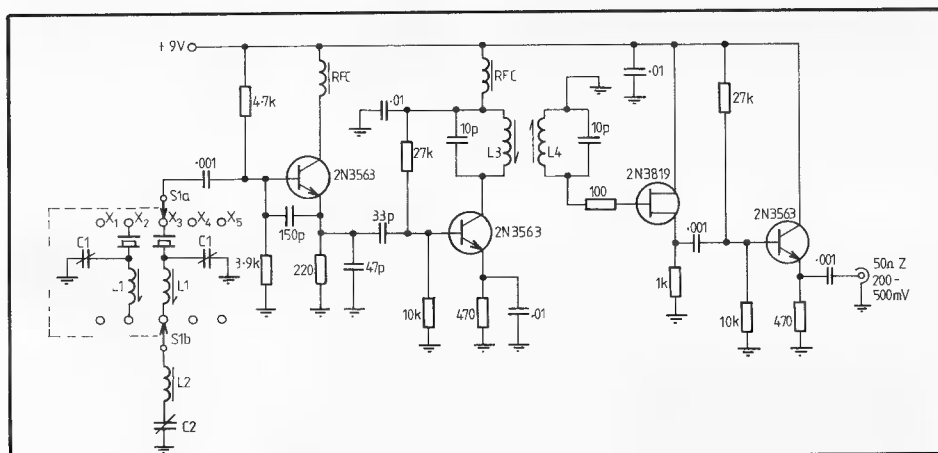


FIG. 2: 26 MHz VFO.

X1 = 26590 kHz
X2 = 26640 kHz
X3 = 26690 kHz
X4 = 26740 kHz
X5 = 26790 kHz
(All crystals HQ GC25A)
RFC = Single wire through F29 slug
L2 = 7.5 uH
L1 = 30t 32 B and S on single neosid F29 slug
C1 = 2-10 pF concentric ceramic trimmer
C2 = 5-100 pF polar single gang
L3 - L4 — dual neosid 20th each 32 B and S F29 slug

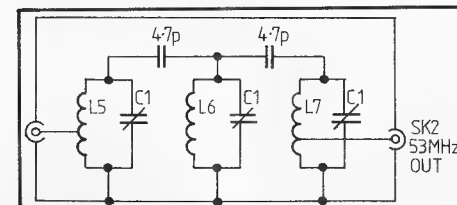
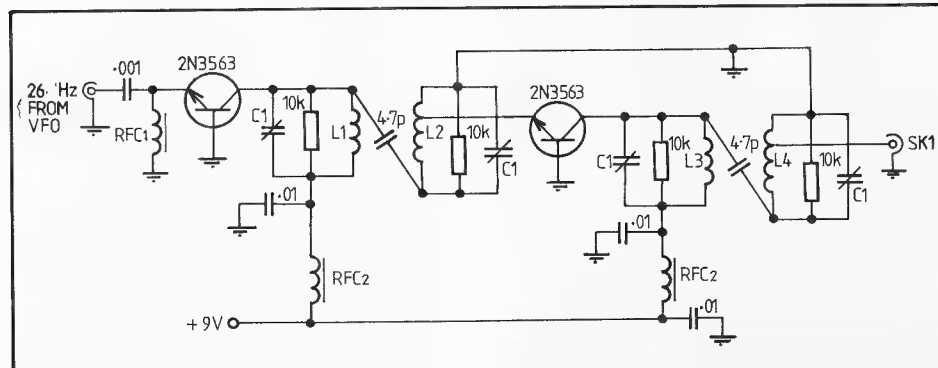


FIG. 3: VFO Doubler and 53 MHz Filter.

C1 = 2-14 pF Ceramic disk Trimmer.
RFC1 = 100 uH.
L3, L4, L5, L6, L7 7 turns ½ in. diam. 16 B and S.
L4, L5, L7 tap 1 turn.
L1, L2 11t on Aegris ⅝ in. slug tuned former.
L2 tap one turn from cold end.

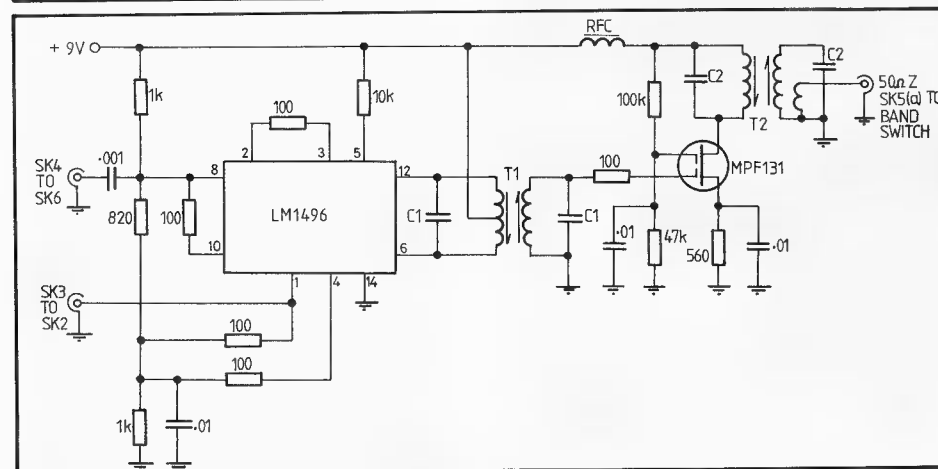


FIG. 4: Converter Unit.

NOTE:

One each converter for 80/20m.
One each converter for 40/10m.
One each converter for 15m.
RFC = Single wire through F16 slug.
T1, T2 dual neosid.

TABLE 1: Table of Values — Converter Unit.

Band	T1 Turns	T2 Turns	Tertiary	C1	C2	Slug
80/20	P 30t CT	P 30t		47 pF	47 pF	F16
	S 30t	S 30t	4t			
40/10	P 29t CT	P 29t		47 pF	47 pF	F29
	S 29t	S 29t	4t			
15	P 25t CT	P 25t		33 pF	33 pF	F29
	S 25t	S 25t	4t			

Wire Gauge 32 B and S enamel.

* If output volts for converter is not in the range 300-700 mV change number of turns on tertiary winding of T2.

This Tertiary winding is over the cold end of T2 Secondary.

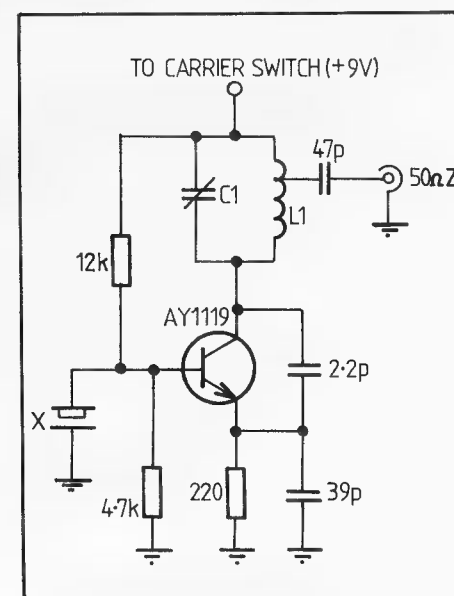


FIG. 6: Single Carrier Generator.

X = 3723.0 kHz (QC 25A3 — HiQ)
L1 = 6 turns ½ in. ID tap 1 turn 16 B and S.
C1 = 2-14 pF ceramic disk trimmer.

NOTES ON THE CONSTRUCTION AND ALIGNMENT

VFO

The 26 MHz VFO should be built first and aligned as follows:

(1) Tune L3 and L4 to give 200-500 mV RF output at the emitter of the 2N3563 with any crystal selected. If no oscillations occur set C2 mid-range and tune L1 for

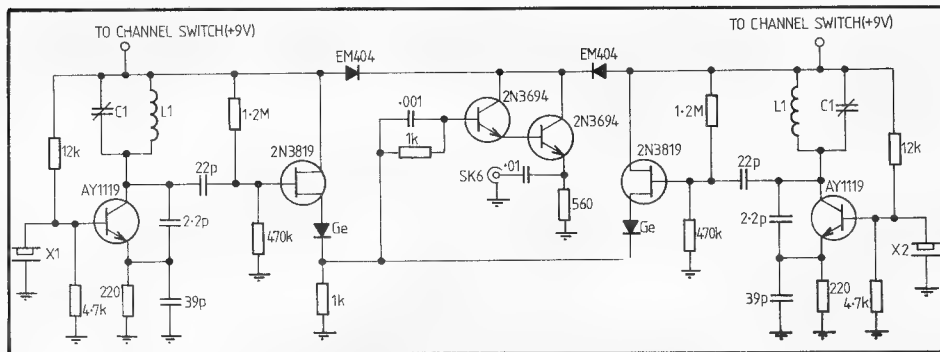


FIG. 5: 2 Channel Carrier Generator (2 off required)

xtal	Band
X1 = 44428.0 kHz	80m
X2 = 40928.0 kHz	40m
X3 = 44273.0 kHz	20m
X5 = 41686.0 kHz	10m

(All crystals — QC25A3 — HiQ)

C1 = 2-15 pF Trimmer (Ceramic).

L1 = 6 turns 1/2 in. ID 16 B and S enamel.

the appropriate crystal until oscillations are obtained.

(2) Connect a frequency meter and check that approximately 50 kHz tuning range can be obtained. Adjust L1 and C1 until a linear sweep of 50 kHz is obtained for 0 to 95 per cent of the dial sweep.

The dial can then be marked for, say, 10 kHz steps or a tabulation made of frequency against the dial's arbitrary scale.

Repeat the procedure for the remaining ranges.

VXO DOUBLER

Tune the various capacitors C1 to obtain a constant output at skt 1 over the range 53.1 to 53.6 MHz.

53 MHz FILTER

Adjust the capacitor C1 for constant output from 53.1 to 53.6 MHz at skt 2. The output should fall rapidly outside this range.

CARRIER GENERATORS

There is only one adjustment for each crystal — tune C1 for maximum level of oscillation at skt 6.

CARRIER FILTERS

Align the filters for maximum throughput of carrier energy by adjusting C1.

CONVERTER UNITS

With appropriate carrier generator plus filter connected and the VXO doubler and filter also connected attach a sensitive RF detector to the output of the converter. Adjust T1 and T2 to give a constant output over the range applicable. An output of 250-700 mV should be obtained.

FREQUENCY CALIBRATION

The VXO setting up procedure has already been described. If five scales are provided these can be used for individual calibrations for each 100 kHz range. With a good dial, readout accuracy to 1 kHz is achievable. The next step is to set the carrier oscillators so that the VXO readout is accurate for each band. Select 3.5 MHz and set the VXO dial to 0 (53.100 MHz) and check the output frequency. If it is not 8.6724 MHz adjust the 44.428 MHz crystal by adding shunt C or series L. It is assumed that the carrier generator in the FT75 is on 5.1724 MHz. It would be wise to check the CW output frequency of the rig. The adjustments for the other bands are made in a similar manner. Note

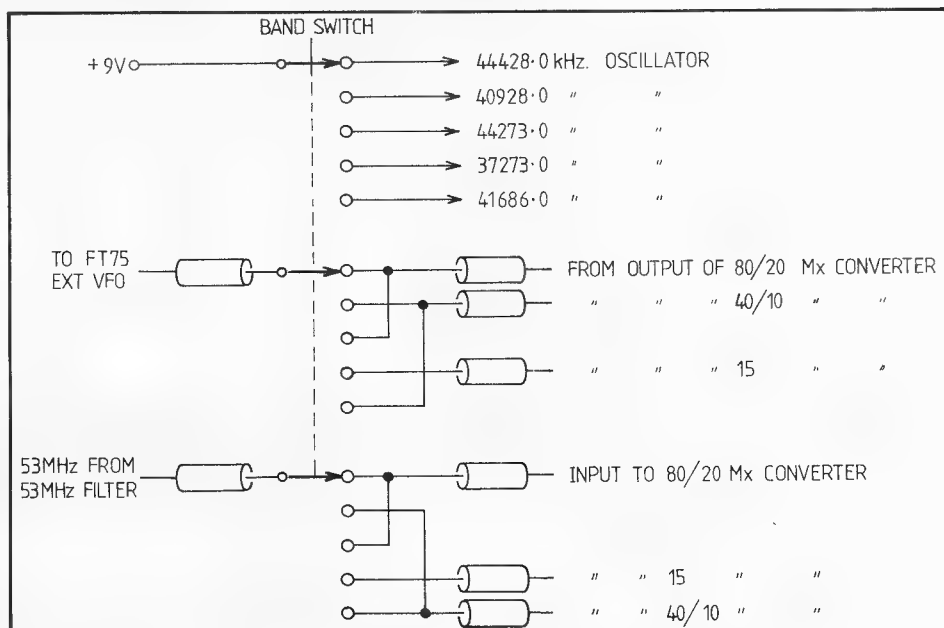


FIGURE 7: Band switching

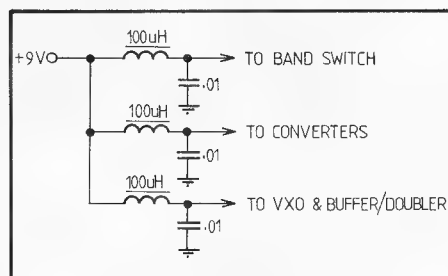


FIG. 8: Supply filters

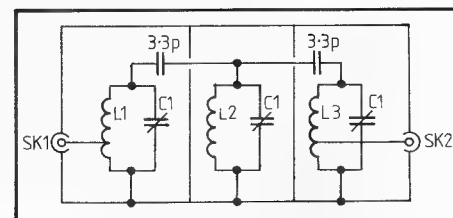


FIG. 9: Carrier filters

L1, L2, L3, 7 turns 5/8 in. ID tap L1, L3 one turn C1 2-14 pF ceramic disk trimmer. One filter required between each carrier generator and band switch.

that 500 kHz needs to be added to the dial reading for 3.5 MHz only.

The band-switched heterodyne VXO principle of frequency synthesis is, as far as the author is aware, a new development and therefore copyright is reserved on the following circuits and drawings:

1. 26 MHz VXO unit.
2. Block diagram.
3. Two band carrier generator circuit.

No restriction is placed on use of these by groups or individuals for hobby purposes.

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