The 1 2 3 QRP Transceiver

By Roger Davis ZS5L,
Caldwell House,
14 Caldwell Road,
Durban 4001.

This transreceiver has been in use in the ZS5L shack for the past four years. In the 1991 SARL CW contest, 19 contacts were made with six call areas over a ninety minute period on one crystal controlled frequency. It has worked over 2000 km to Mayotte as well as hundreds of local contacts around the continent.

I have been asked so many times to publish an article on it in RADIO ZS. So here it is. I claim no originality for the design.All the circuits are normal practice. All I have done is to simplify to the minimum and hang it all together.

The crystal controlled oscillator runs both on RX and TX. The output of the oscillator is fed to a pair of germanium diodes used as a balanced mixer. This is very critical, as the use of a normal mixer will allow the very strong local broadcast transmissions to roar through. The potentiometer VR1 is the balance control, and this is adjusted to remove any such breakthrough. The antenna is fed through the TX/RX switch and is fedto an untuned RF Amplifier. The output being inductively coupled to the mixer. The output from the mixer is the difference between the incoming signal and the crystal frequency. If an incoming signal is on 7010 KHz. and the variable crystal oscillator is tuned to 7010,8 KHz., the difference between the two signals is 0,8 KHz or 800 Hz.. This audio frequency is now filtered by the LC Network of T3, C8, and C9, to remove unwanted audio frequencies above 2 KHz, and the wanted signal is then amplified by the integrated circuit amplifier for connection to headphones or even a loudspeaker.

On transmit, the 12 volts is switched off the receiver section and is fed to the power amplifier stage via the morse key. Fortunately, it was found that when the morse key was depressed,the loading of the P.A. stage caused the crystal oscillator to pull some 800 Hz low in frequency. I say fortunately as should this not have occured, a station calling back on your exact transmit frequency would not be in the headphones as the difference in the two frequencies would be 0 Hz.

There are many improvements that could be added to the basic design, such as variable frequency oscillator to cover the whole band. Sidetone oscillator for transmit monitoring. OP AMP filter for 800 Hz.. Audio derived automatic gain control. Receiver incremental tuning. One could go on, but I have only given you the basic design, which works well and is all that is required to get started. I hope that this simple project will put many back on the road to the meaning of Amateur Radio. Home construction, experimentation, and especially QRPING.

For information, the transmitter will run happily at one watt output at 12 volts DC, or about 0,5 watts at 10 volts, which is where I use mine. The receiver is outstanding and a signal of 1 microvolt is receivable on CW in the headphones.

C1 ..... 0.047uF	R1 ..... 6.8K	TR1 ..... 2N2222A
C2 ..... 0.001uF	R2 180	TR2 ..... 2N3553
C3 ..... 100uF	R3 ..... 3.9K	TR3 ..... BC108C
C4 ..... 0.01uF	R4 220	D1 ..... AA112
C5 ..... 820pF	R5 47	D2 ..... AA112
C6 ..... 0.001uF	R6 ..... 4.7K	Z1 ..... 1N4751
C7 ..... 0.001uF	R7 ..... 2.2M	VR1 ..... 1K Lin
C8 ..... 0.1uF	R8 150	VR2 ..... 5K Log
C9 ..... 0.1uF	XT 7020kHz	IC1 ..... LM 386
C10 ..... 0.047uF	L1 ..... 10uH	VC1 ..... 5-50 pF Variable
C11 ..... 0.01uF		VC2 ..... 8-80 pF Preset
C12 ..... 0.047uF	L3 ..... 1mH	VC3 ..... 8-80 pF Preset
C13 ..... 10uF		
C14 ..... 10uF	T1 ..... 27 Turns 32 swg on T50-2. Secondary 3 turns.	
C15 ..... 0.047uF	T2 ..... Same as T1	
C15 ..... 250uF	T3 ..... Primary winding of transistor transformer.	
C17 ..... 500uF	L2 ..... 13 turns 32swg on T50-2 toroid.	

All capacitors in uF unless otherwise specified.All resistances in ohms.Transmit/Receive switch. Double pole change over.