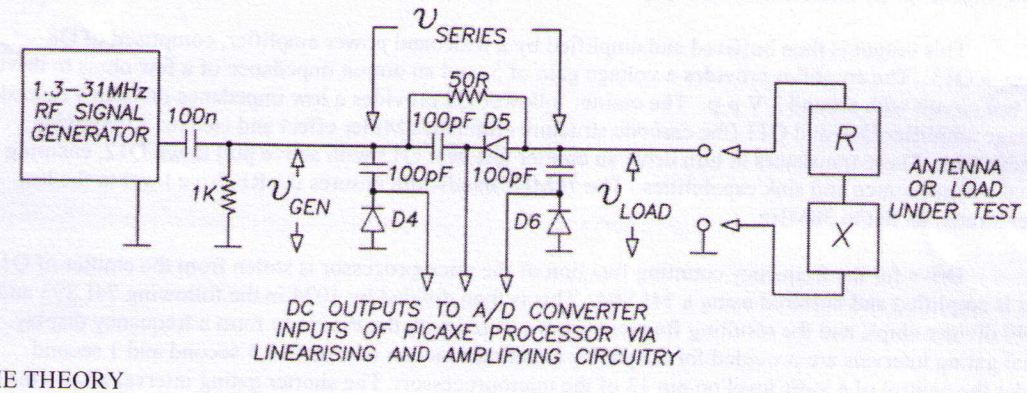
PLEASE NOTE THAT THESE INSTRUCTIONS ARE THE MINIMUM NEEDED TO COMPLETE THE KIT. MUCH GREATER DETAIL (AND OTHER GOODIES) INCLUDING COMPREHENSIVE DIAGNOSTIC DATA AND ADDITIONAL SOFTWARE ARE TO BE FOUND ON THE WEB SITE OF VK5JST (http://www.users.on.net/~endsodds)

IMPORTANT.....The Picaxe chip and LCD display are static sensitive devices. Avoid damage by using correct handling procedures. Essentially this means bringing everything to earth potential so that no discharges can occur. This means you, the chip being unpacked or handled, the solder, soldering iron and mainboard.



THE THEORY

Before starting construction, it is worth briefly considering the principles of operation so that construction can proceed logically. Heart of the unit is the test circuit shown above (please also see main circuit). To enable measurement of the full characteristics of the load, a 50 ohm resistor is placed between it and the variable frequency RF generator feeding the test circuit. Three AC voltages are then measured, by rectifying them to form DC. The peak value of each ac voltage is stored in a capacitor and the resulting dc passed on to the Picaxe processor. The three voltages are the generator output voltage (v_{GEN}), the voltage across the 50 ohm series resistance (v_{SERIES}) which represents the load current, and the voltage across the load (v_{LOAD}). From these three outputs, the SWR, the series load resistance, and the magnitude (but not sign) of the series load reactance can be calculated, and the mathematics for this is detailed in the original article to be found on the home page shown above. This leaves the question of how to determine whether the load reactance is capacitive or inductive. To answer this, the user simply changes the generator frequency slightly. If the magnitude of the series reactance increases as the frequency is increased then it is an inductor. And vice versa for a capacitor.

Note that if the load resistance is a pure 50 ohm resistor, then exactly half of the ac generator voltage applied to the test circuit will appear across the 50 ohm load, and half across the 50 ohm resistor in the test circuit. This comment also applies to the dc voltages derived from these ac voltages, and this handy fact is used to calibrate the instrument to read 50 ohms and an SWR = 1 when it is being set up.

HOW IT WORKS

The process starts with an RF signal generator. This must provide a stable, flat, high level sinusoidal output into the test circuit, combined with a low output impedance. The need for frequency stability is obvious, while the low output impedance and flat output characteristic guarantee the largest possible signal into the microprocessor analog to digital converter inputs from the test circuit detectors. This ensures that independent of the load applied to the test circuit, the calculations will have maximum accuracy. The sinusoidal output ensures that the measurement occurs only at a single frequency and is not upset by what happens at harmonics of the generator frequency.