Diagnostic Data for The Aerial Analyser

All measurements are taken with the analyser frequency set to 2MHz, the main supply rail fed from a regulated power supply of 12.00VDC, and a 50 ohm non inductive load connected to the instrument test terminals. A DVM is used for all DC voltage measurements (input resistance = 10 megohms), while all AC data is measured with a 100MHz oscilloscope fitted with a properly compensated X10 passive probe (giving a scope input impedance of around 10megohm// 15pf). All voltages published are indicative only and will vary slightly from unit to unit due to component tolerances.

Current Drains

With everything working correctly, the total current drain of the analyser is typically 142 milliamps in total.

This gives you a battery life of around 3 hours if 8 el cheapo zinc carbon 400 milliamp hours cells are used for your 12 volt battery supply -which is a long time on any roof ☺. Rechargeable cells are a much better proposition, and usually have capacities of from 800 to 2700 milliamp hours (19 hours on a roof??). However you will need 10 cells (1.2 volts each) to get the required 12 volt supply.

With all the IC's removed except for IC1 which provides oscillator AGC, but with the LCD still connected- which draws around 1 milliamp, the total drain is typically 120mA, and most of this current drain is caused by the wideband output amplifier which drives the test circuit and the high speed frequency divider circuitry..

If you get current drains which differ widely from these values, then you are going to have to start looking for incorrect dc voltage levels. These will be caused by such things as solder bridges, incorrect resistor values, transistors and ICs inserted upside down etc. Use the data in the following table.

Oscillator and Following Power Amplifier

The purpose of this section of circuitry is to supply 1 volt rms into the test circuit. For a full description of operation, please see the text of the full article.

TR1	source	4.30VDC	0.67 V p-p
	Gate	0VDC	0V p-p
	Drain	8.0VDC	2.85V p-p
TR2	source	4.30VDC	0.67V p-p
	Gate	0VDC	1.7V p-p
	Drain	8.0VDC	0V p-p
TR6	emitter	0VDC	0V p-p
	Base	0.53VDC	0V p-p
	Collector	4.3VDC	0V p-p

TR3	source	1.38VDC	1.0V p-p
	Gate	0VDC	1.7V p-p
	Drain	8.0VDC	
TR4	emitter	6.72VDC	
	Base	6.09VDC	
	Collector	2.50VDC	
TR5	emitter	0.86VDC	0.9V p-p
	Base	1.58VDC	0.95V p-p
	Collector	6.72VDC	2.9V p-p
IC1	pins 1,2,3	1.19VDC	
	Pins 5,6	1.18VDC	
	Pin 7	0.65VDC	
	Pin 4	0VDC	
	Pin 8	8.0VDC	
TR7	emitter	5.0VDC	
	Base	4.37VDC	
	Collector	4.95VDC	
TR8	emitter	0VDC	
	Base	0.66VDC	
	Collector	0.05VDC	

N.B. J310 fets have very wide characteristic spreads and so the published source voltages can be out by up to 50%.

Detector System

This system produces dc voltages which allow the microprocessor to calculate SWR, load resistance and reactance. An output from this system is also used to produce an analog meter display of the magnitude of total load reactance.

IC5A	
Pin 8	8.0VDC
Pin 4	0VDC
Pin 1	3.09VDC
Pin 2	0.51VDC
Pin3	0.51VDC
TR11	
Emitter	2.50VDC
Base	3.09VDC
Collector	8.0VDC
IC5B	
Pin 5	0.55VDC
Pin 6	0.55VDC
Pin 7	2.04VDC
IC6A	
Pin 8	8.0VDC
Pin 1,2,3,4	0VDC

IC6B

Pin 5	1.18VDC
Pin 6	1.18VDC
Pin 7	4.35VDC

Frequency Prescaling

This section takes the sinusoidal output of the oscillator/power amplifier and transforms it to a "square" wave suitable to drive a prescaling divider chain which either divides by 128 (up to 30MHz) or by 1280 (30-170MHz). This output is then fed to the microprocessor for counting.
Note that IC2 may not operate correctly at the 2MHz test frequency (it did in the prototype but is not specced to operate at a frequency this low) and so the frequency may have to be increased to say 5MHz temporarily to check that IC2 and the TR9, TR10 stages do work correctly. Also note that these tests do not check switching between division ratios of 128 and 1280. Switching between the 13.4-31MHz and 50-96MHz ranges should cause pins 2,4 and 5 of IC3 to switch from logic low (<0.8VDC) tp logic high (>2.2VDC).

IC2

Pins 2,3,6,7	5.00VDC	
Pin 1	2.65VDC	0.7V p-p
Pin 8	2.59VDC	
Pin 5	0VDC	
Pin 4	3.2VDC	"square" wave 2.6V low 3.8V high

Tr10

Emitter	3.75VDC	
Base	3.3VDC	
Collector	1.27VDC	"square" wave 0.05V low 2.5V high

TR9

Emitter	3.75VDC
Base	3.3VDC
Collector	0VDC

IC3

Pin 14	5.0VDC	
Pin 7	0VDC	
Pin 1	1.27VDC	"square" wave 0.05V low 2.50V high
Pins 2,4,5	0.05VDC	
Pin 6,9	4.45VDC	
Pins 8,12	1.19VDC	0.5uS "square"0.05V low 2.4V high rounded tops
Pins 3,13	4.45VDC	
Pin 10	1.27VDC	0.5uS 250mV p-p swinging around 1.27VDC
Pin 11	2.02VDC	0.5uS "square 0.05V low 4V high rounded tops

IC4

Pin 14	5.0VDC	
Pins 13,6	2.42VDC	8us "square" 0V low 5V high
Pins 2,7,12	0VDC	
Pin 9	2.42VDC	64uS "square" 0V low 5V high
Pin 1	As for pin 11 IC3	

Microprocessor and LCD

Picaxe 28X2

Pins 1,20,23	5.0VDC	
Pin 2	4.40VDC	
Pins 3,4	2.06VDC	
Pin 5	2.40 VDC	
Pin 9	2.17VDC	Use a radio receiver on 16MHz to check oscillator.
Pin 10	1.54VDC	Even light capacitive loading from the cro probe will stop the oscillator!!
Pin 13	0.05VDC	
Pin 14	2.42VDC	64uS square 0-5VDC
ALL OTHER PINS	0VDC (pins 6,7,8,11,12,15,16,17,18,19,21,22,24,25,26,27,28)	

LCD

Pins 2,4	5.0VDC
Pin 3	0.8VDC (this level will depend greatly on the particular LCD being used, but for visible characters should be near 0VDC).
All other pins (1,5-14)	0VDC