Diagnostics- HF/6Meter Antenna Analyser

Important…….. All of the following measurements are done on the lowest frequency range with the frequency set to 2MHz and with the unit powered from a well regulated and filtered 12 volt dc supply.

All dc voltages are measured with a digital voltmeter with an input resistance of 10 megohms.

All AC measurements are done using an oscilloscope with a bandwidth of at least 10MHz fitted with a properly set up (compensated) X10 passive probe providing an input impedance of 10 megohms in parallel with a capacitance of around 12-20pf.

All voltages published are indicative only, and can be expected to vary by up to 10% due to supply voltage and component tolerances.

Power Supplies

As a first step in diagnosing a fault, check the output of both the 8 volt and 5 volt regulators. The output of both regulators should be within +/- 5% of the specified voltage and the total current drain of the unit should be 115mA +/- 10%.

Signal Generator Section- TR1 to TR11

The purpose of this circuit section is to produce a very clean sine wave of amplitude 1 volt rms (2.8 volts peak to peak) at the emitter of TR9, to drive the test circuit (R20,R21,R22 and output connector). The amplitude of the sine wave at TR9 emitter should be flat within +/- 2%, independent of the output frequency and load connected to the analyser. The overall performance of this circuit section is best checked by measuring the voltage at TP1 with a DVM, and this dc voltage should stay constant within 2% and lie within the limits 1.10- 1.25 volts.

Start any diagnosis of the oscillator and following amplifier by checking the dc voltage at the centre pin of IC1. The oscillator and following amplifiers are dc coupled, and if this reference voltage is incorrect, nothing will work correctly. This voltage should be 1.53 vdc plus/minus 0.1v. Then work your way through the rest of the structure checking dc voltages at each collector base and emitter.

An open circuit switch will show up when TR3 collector is not at 1.53 volts.

TR1 and TR2

The voltage variable collector base capacitance of these two transistors is used to fine tune the oscillator tank circuit. With P1 wiper set to a voltage of 4.0 volts dc, 800 millivolts p-p of a clean 2MHz sine wave should appear at TR1 base sitting on top of an average dc level of 0Vdc. TR1 and TR2 collectors and TR2 base should all be at 0VDC.

TR3		
Base	1.53VDC	
Emitter	1.03VDC	400mV p-p of half wave rectified 2MHz sine wave
Collector	1.53VDC	800mV p-p of 2MHz sine wave (0.5uS period)
TR4		
Base	1.53VDC	800mV p-p of 2MHz sine wave
Emitter	1.03VDC	800mV p-p of 2MHz sine wave
Collector	8.00VDC	
TR7		

Base	1.52VDC	800mV p-p of 2MHz sine wave
Emitter	0.80VDC	780mV p-p of 2MHz sine wave
Collector	4.75VDC	2900mV p-p of 2MHz sine
TR8		
Base	4.75VDC	2900mV p-p of 2MHz sine
Emitter	4.02VDC	2800mV p-p of 2MHz sine
Collector	8.00VDC	
TR9		
Base	4.02VDC	2800mV p-p of 2MHz sine
Emitter	3.36VDC	2800mV p-p of 2MHz sine
Collector	8.00VDC	
TR10		
Base	1.29VDC	
Emitter	0.62VDC	
Collector	3.36VDC	2800mV p-p of 2MHz sine
TR11		
Base	0.62VDC	
Emitter	0.0VDC	
Collector	1.29VDC	
TR6		
Base	0.59VDC	
Emitter	0.0VDC	
Collector	0.96VDC	
TR5		
Base	0.54VDC	
Emitter	0.0VDC	
Collector	1.0VDC	400mV p-p of half wave rectified 2MHz sine wave
IC1		
In	8.00VDC	
Common	0.27VDC	
Out	1.53VDC	

Common problems---transistors in backwards, open circuit rotary switch SW1 due to overexposure to heat of soldering.

Frequency Prescaling

IC5		
Pin 1	2.5VDC	2800mV p-p 2MHz sine
Pins 2,7,12	0.0VDC	
Pins 6,13	2.5VDC	5V p-p square wave period 8uS
Pin 8	2.5VDC	5V p-p square wave period 128uS
Pin 14	5.00VDC	
IC4		
Pin 1	2.5VDC	5V p-p square wave period 128uS
Pins 2,7,12,13	0VDC	
Pin 3	2.5VDC	5V p-p square wave period 256uS
Pin 4	5.00VDC	

Test Circuit, Detectors, and Linearisation

Test Points	
TP1	1.14VDC

TP2	4.40VDC	
TP3	2.12VDC	
TP4	2.12VDC	
IC2		
Pin 1	2.70VDC	
Pin 2	0.53VDC	
Pin 3	0.53VDC	
Pin 4	0.0VDC	
Pin 5	0.53VDC	
Pin 6	0.53VDC	
Pin 7	2.12VDC	
Pin 8	8.00VDC	
IC3		
Pins 1,2,3,4	0,0VDC	
Pin 5	1.13VDC	
Pin 6	1.13VDC	
Pin 7	4.40VDC	
Pin 8	8.00VDC	

Microprocessor System

IC7		
Pin 1	5.00VDC	
Pin 2	4.40VDC	
Pin 3	2.12VDC	
Pin 4	2.12VDC	
Pin 5	2.39VDC	
Pin 6	0.0VDC	
Pin 7	1.00VDC	
Pin 8	0.0VDC	
Pin 9	2.20VDC	20MHz Clock- or 16MHz clock with Picaxe 28X2
Pin 10	2.20VDC	20MHz Clock- or 16MHz clock with Picaxe 28X2
Pin 11	0.0VDC	
Pin 12	0.0VDC	
Pin 13	Either 0.00 or 5.00vdc set by SW3	
Pin 14	2.50VDC	5V p-p square wave- period 256us
Pin 15	0.0VDC	
Pin 16	0.0VDC	
Pin 17	0.0VDC	
Pin 18	0.0VDC	
Pin 19	0.0VDC	
Pin 20	5.00VDC	
Pin 21	5.00VDC	
Pin 22	0.0VDC	
Pin 23	5.00VDC	
Pin 24	0.0VDC	
Pin 25	5.00VDC	
Pin 26	0.0VDC	
Pin 27	0.0VDC	
Pin 28	0.0VDC	

Check the dc voltages above ensuring that ground and +5VDC are present on the actual PINS of the microprocessor (as distinct from the socket). To avoid stopping the clock due to test equipment

loading, connect a 4.7pF capacitor in series with your cro probe tip and use this to check the clock circuit (pins 9 and 10) for the presence of a clock signal. Alternately, use a radio receiver with a very short antenna tuned to 20 (or 16)MHz. With the correct dc voltages appearing at pins 2,3,and 4, correct displays should be produced if the micro is undamaged.