

INSTRUCTION MANUAL
Model Xtal-1



Xtal-1 (assembled)

Assembly Instructions

This kit assumes that the purchaser is familiar with soldering and electronic assembly techniques.

The board has been designed to make assembly rather simple. All capacitors are chosen to be 5mm lead spacing and the resistors are 0.3 inch lead spacing. These spacing allow the user to prepare the leads for insertion into the board without any special tools. You will need wire cutters to trim the leads.

1: Insert all the resistors first. Use the board silk-screened nomenclature and the parts list to locate the proper placement of each component. Bend the leads at the body of the resistor and insert them into the appropriate holes. You make “tack solder” them on the top to make soldering easier, or you can hold them in place and solder from the bottom.

2: Next insert the capacitors. No tool will be necessary to form the leads. Since the frequency is low, it is not necessary to mount the capacitors tight to the board. C6, a yellow box capacitor, naturally sits flush.

3: Insert the remaining components (T1, S1-2, Q1, CR1, J1 and Y1). Make sure that the metal body of Y1 does not short the traces on the board. Do not mount the battery holders.

4: Solder all the components and trim the leads. The battery holders mount on the back side of the board. You will find that trimming the leads flush with the board in the area of the holders allows them to seat better.

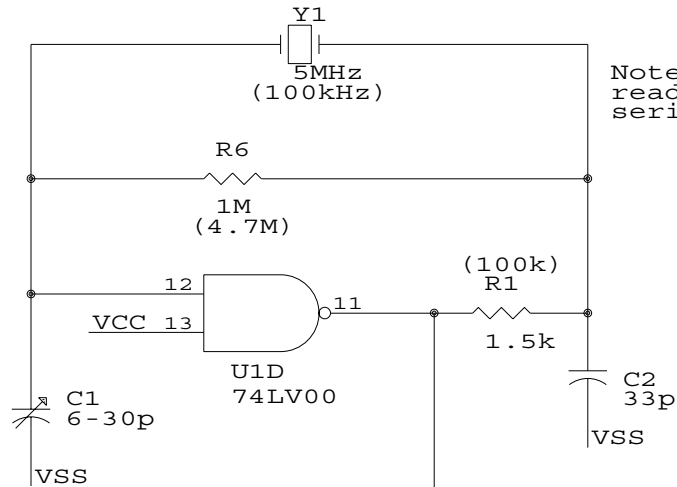
5: Install the battery holders. The plus of each holder is marked by a + sign and a square pad. You may use double stick foam tape under the holders if you wish.

6: To test, make sure that S1 and S2 are off (slide toward J1 end of board) and install fresh AAA (LR03) alkaline batteries. Slide S1 to the “on” position (away from end of the board). CR1 should illuminate. If not, check your parts loading. You will need to adjust C1 for final calibration. This can be done by “zero-beating” to WWV, using a frequency counter, or comparing to a known good frequency source. C1 might not allow exact setting due to the lack of “pullability” with cylinder crystals, so set it as close to 100kHz as you can obtain. The Modulation switch inserts an approximately 400Hz tone on the carrier to allow use with radios without CW capabilities.

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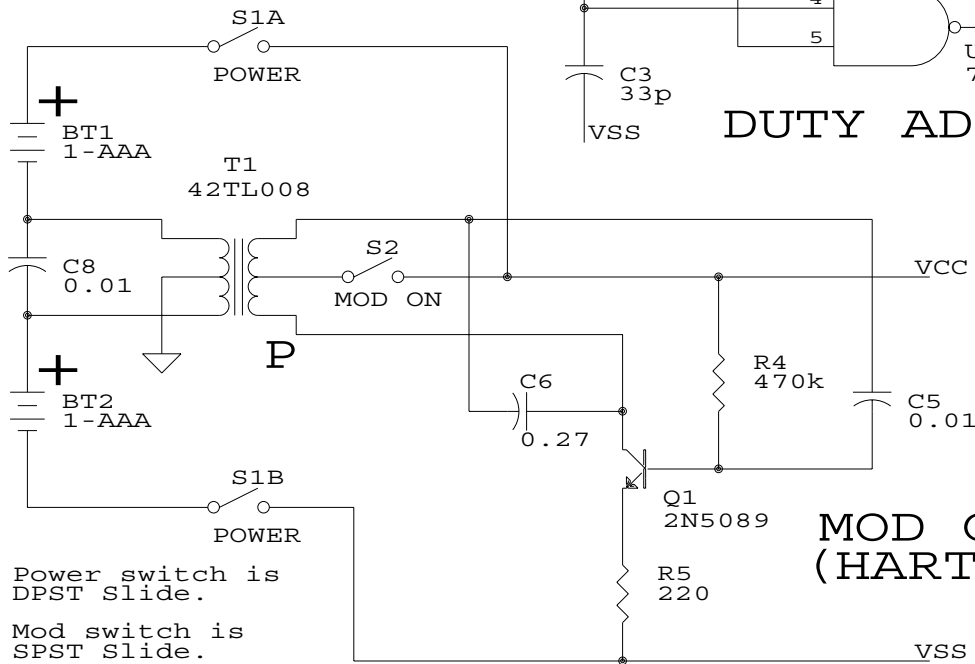
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Note: 2.5MHz can be used, but readily available crystals are series mode.

PIERCE OSC.

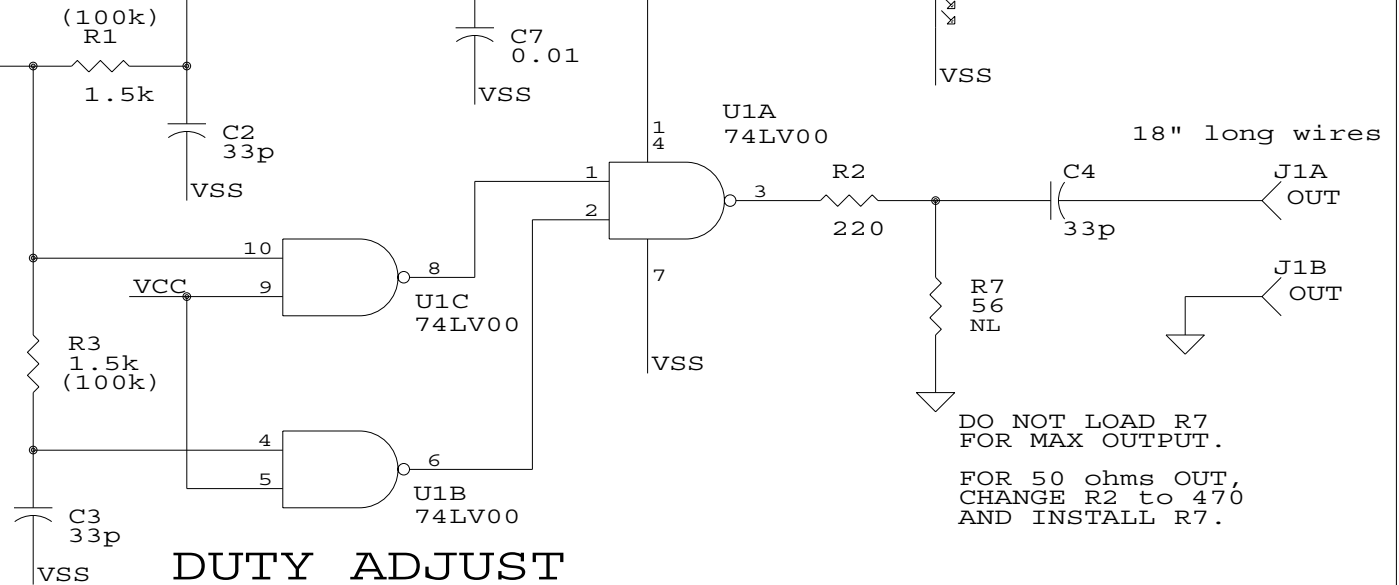
Replace R3 with a pot if you wish to maximize harmonics.



Power switch is DPST Slide.

Mod switch is SPST Slide.

BT1 and BT2 holders are mounted on back of board.

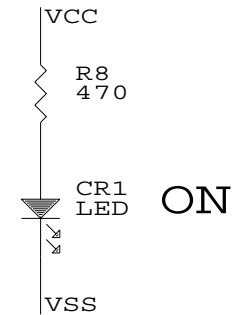


DUTY ADJUST

This modulates the power rails for the CMOS IC, hence its amplitude. The transformer is a small audio output of about 1H primary and 8:1 turns ratio. Not critical. Select C6 to give about 400Hz with your chosen transformer.

The '00 is any low voltage CMOS version of a quad NAND gate. The 74LV00 is preferred (works to lower voltage).

DO NOT LOAD R7 FOR MAX OUTPUT.
FOR 50 ohms OUT, CHANGE R2 to 470 AND INSTALL R7.

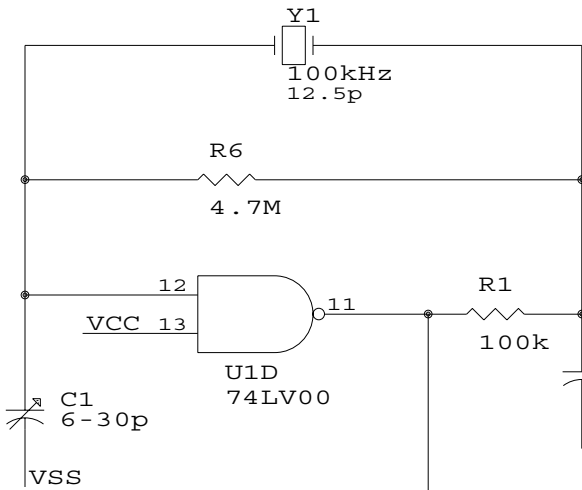


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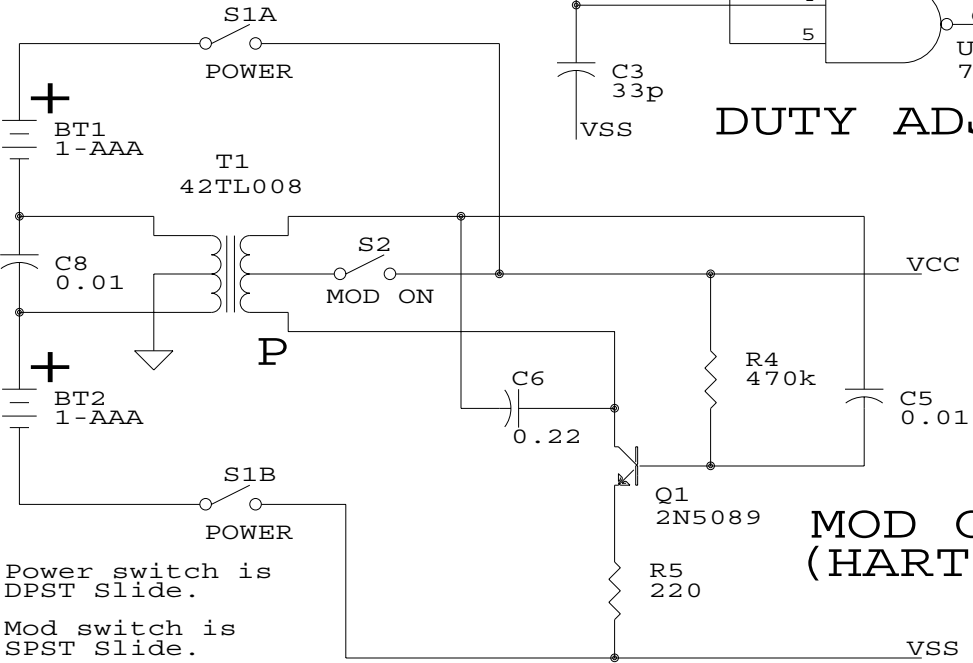
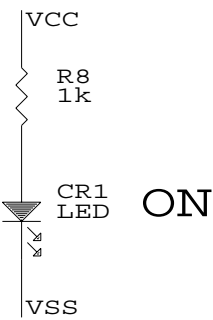
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WWV Spotter - Mark 2.		
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Date:	March 19, 2008	Sheet 1 of 1



PIERCE OSC.

Replace R3 with a pot if you wish to maximize harmonics.

Note: Cylinder crystals do not have much "pull" range so it might not be possible to put it exactly on frequency. Max error will be +/-3Hz.



MOD OSC (HARTLEY)

Power switch is DPST Slide.
 Mod switch is SPST Slide.
 BT1 and BT2 holders are mounted on back of board.

DUTY ADJUST

This modulates the power rails for the CMOS IC, hence its amplitude. The transformer is a small audio output of about 1H primary and 8:1 turns ratio. Not critical. Select C6 to give about 400Hz with your chosen transformer. The '00 is any low voltage CMOS version of a quad NAND gate. The 74LV00 is preferred (works to lower voltage).

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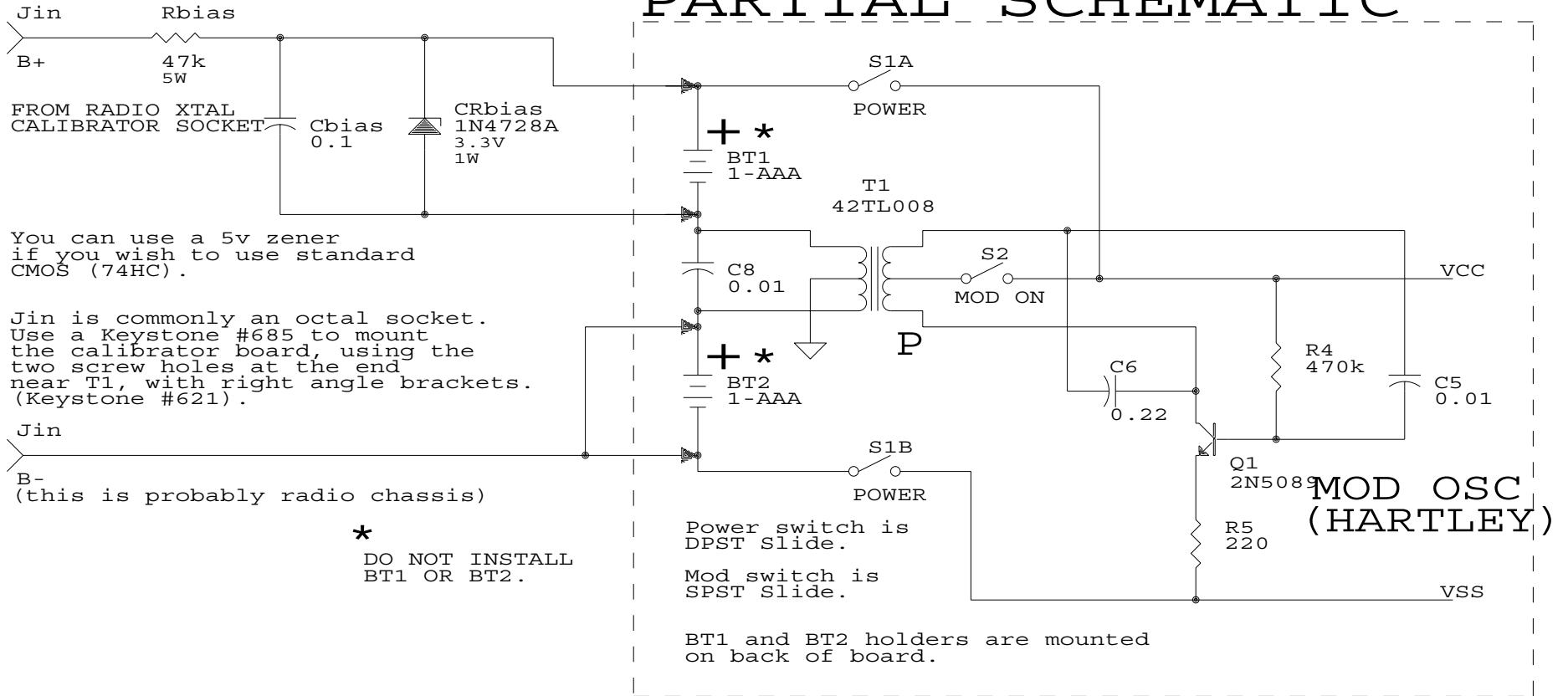
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Title 100kHz Crystal Calibrator		
Size A	Document Number	REV A
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Sheet1

Description	Ref Des	Vendor PN	QPA	LOC
Battery Holder, 1-AAA	BT1, BT2	12BH412-GR	2	MO
Variable Capacitor, 6-30pF	C1	GKG30015	1	MO
Capacitor, Ceramic, 33pF	C2, 3, 4	140-50N5-330J	3	MO
Capacitor, Ceramic, 0.01uF	C5, 7, 8	140-50Z5-103M	3	MO
Capacitor, Film, 0.22uF	C6	BQ014D0224K	1	MO
LED, Red, T1	CR1	WP7104SRD/D	1	MO
Terminal Block, 2-pin, 5.08mm	J1	P02EK508A2-E	1	MO
Transistor, NPN, high gain, TO-92	Q1	2N5089BU	1	MO
Resistor, 1/4W CF, 100k	R1, 3	291-100k-RC	2	MO
Resistor, 1/4W CF, 220	R2, 5	291-220-RC	2	MO
Resistor, 1/4W CF, 470k	R4	291-470k-RC	1	MO
Resistor, 1/4W CF, 4.7M	R6	291-4.7M-RC	1	MO
Resistor, 1/4W CF, 1k	R8	291-1k-RC	1	MO
Switch, slide, DPST, miniature	S1	SSSS922500	1	MO
Switch, slide, SPST, miniature	S2	SSSS912500	1	MO
Transformer, audio miniature	T1	42TL008	1	MO
IC, CMOS, Quad Nand, 14pin DIP	U1	74LV00N	1	DK
Crystal, cylinder, 100kHz, 30ppm	Y1	CFV206 100.000KAZF-UB	1	DK
Socket, 14-pin DIP	XU1	4814-3000-CP	1	MO
PCB, Crystal Calibrator	-	1700-0100	1	NTI
March 10, 2008. Rev A Board.				

Rbias depends upon the B+ from your radio. Design for approximately 4mA. Value shown is for 180VDC.

CALIBRATOR: PARTIAL SCHEMATIC



DO NOT CONNECT RADIO GROUND TO CALIBRATOR GROUND.

CHANGE C4 ON CALIBRATOR TO MATCH YOUR RADIO. APPROX 10pF IS APPROPRIATE FOR MOST RADIOS.

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