

D.I.Y FREQUENCY COUNTER/CRYSTAL TESTER

Level: Intermediate

AK-130

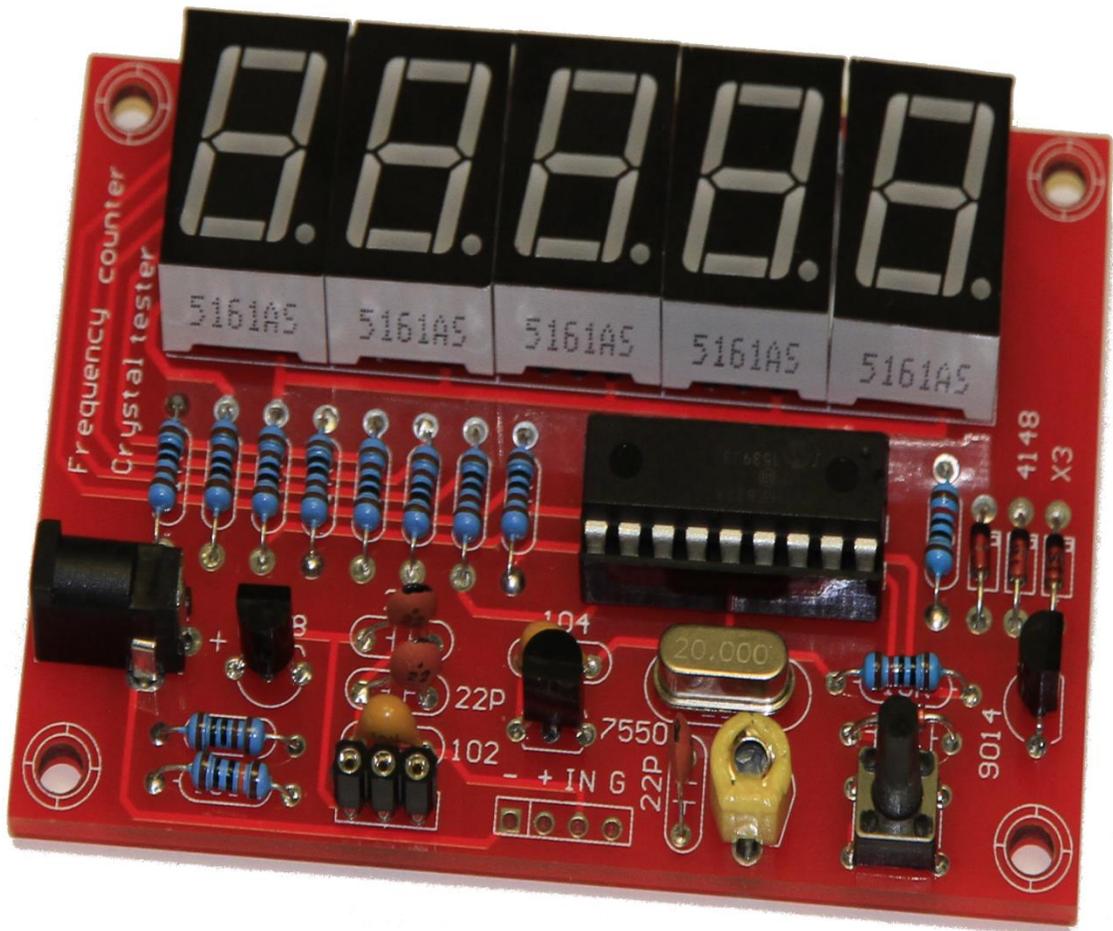


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PARTS LIST

Please make sure that the following pieces are included in your kit

Components	PCB Reference Number	Quantity
1k Ω ¼ Watt Resistor	1K Markings	9
10k Ω ¼ Watt Resistor	10K Markings	2
100k Ω ¼ Watt Resistor	100K Markings	1
Custom P.C.B	N/A	1
7-Segment L.E.D Display	D1, D2, D3, D4, D5	5
PIC Micro Controller	PIC16F628	1
18 Pin IC Socket	TB-2447476	1
22 pF Ceramic Capacitor	22P	3
104 μ F Capacitor	104	2
Female DC Barrel Jack	DC5-9V	1
1N4148 Switching Diode	4148 X3 and the single 4148	4
Crystal Oscillator	20M	1
3 Pin Headers	3 Hole Rectangle next to 100K Resistor Schematic	1
4 Pin Switch	4 Hole Rectangle next to the single 4148	1
Transistor NPN 9018	9018	1
Transistor NPN 9014	9014	1
Transistor NPN 7550	7550	1
Capacitor with Step	On the left side of the Switch's schematic	1

REQUIRED TOOLS

Soldering Iron	SI-9600	1
Solder 60 Tin / 40 Lead	4890-18G	1

SOLDERING GUIDE

1. Turn on the soldering iron to 360° F - 370° F (182° C - 188° C) using Tin-Lead 60/40 solder.
2. Flip the board on the side where all the schematics are shown. Then, place the IC socket on the board where the white rectangle marked TB-244746/PIC16F628 can be seen. Make sure the socket's notch faces the correct direction according to the schematic on the board.
Note: It is suggested to use the IC socket since soldering the Microcontroller directly could cause damage.
3. Insert the pins in the holes and begin the soldering process on the other side of the board.
4. After having soldered the IC socket, place all twelve resistors found in the kit according to their matching schematics named "1K", "10K" and "100K" on the board (Refer to Appendix for a guide on reading resistor values).
Note: Polarity is not an issue when placing the resistors on the board.
5. Insert the resistor leads in the holes, bend them in order to hold the resistors in the preferred position, flip the board and then, begin the soldering process for the resistors. Once finished, cut the remaining part of the resistors' leads.
6. Now, flip the board on the side with schematics and place the five 7-Segment LED Displays each on one of the five schematics found on the corners of the board, named "D1", "D2", "D3", "D4" and "D5".
7. Once again, insert the leads in the holes, flip the board, and begin soldering the leads.
8. Now, flip the board, place the crystal oscillator on the schematic named "20.000", insert the leads in the holes, flip the board again and begin soldering on the top side of the board. The remaining parts of the oscillator should be cut after soldering.
9. To solder the 22pF capacitors, flip the board to its bottom side, place these capacitors on the schematics named 22P and repeat the same instructions as in step 8 for this capacitor.
Note: Polarity is not an issue when placing these capacitors.
10. Next up, solder the two 104µF capacitors on the markings "104" found on either side of the oscillator, again on the bottom side of the board. Repeat the same instructions as in step 8 for these capacitors.
11. Next up, solder the switching diodes where its marked "4148 X3" and "4148" on the board. Repeat the same instructions as in step 8 afterwards.
12. Then, solder the Female DC Barrel Jack on the "DC 5-9V" spot on the board.
13. Now, solder the switch on the 4 Hole rectangle next to the single 4148 number on the board.
14. Next up, place all the NPN Transistors on their matching schematics on the board and begin soldering. Proceed just as in step 8 afterwards.
15. Finally, solder the 3 Pin Headers and the Capacitor with Step according to the PCB Reference Number mentioned on the previous page in the Parts List.

WIRING GUIDE

1. First, either plug in an adapter in the Female DC Barrel Jack or connect the power wire (red wire) of a battery holder (preferably 9V Battery Holder) to the positive sign on the board and the ground wire (black wire) of the battery holder to the negative sign on the board.
Note: It is suggested to use the adapter for the lights on the 7-Segment LED Displays to be brighter.
2. Then, insert the leads of the crystal you want to test the frequency for in the first two leftmost pins of the 3 Pin Headers starting from the “100K” resistor side and you will get the value of your frequency on the 7-Segments.

FEATURES GUIDE

These are the features that you can access by using the switch on the PCB. If you only press once on the switch, you will enter the programming mode and you will be able to toggle through these features by pressing on the switch again. When you find the desired feature, keep the switch pressed for more than a second and that feature will be applied.

1. “Quit”: Leave programming mode without modifications.
2. “Add”: Save the previously measured frequency so you can add it to another frequency later. If you insert a crystal in the header place and hold your hand on the switch while in the “Add” mode, the crystal’s frequency will be saved and it will be added to the frequency value of the next crystal you measure.
3. “Sub”: Save the previously measured frequency so you can subtract it from another frequency later. The same procedure as in “Add” mode applies here.
4. “Zero”: Frequency offset will be set to zero so that the next time you measure your frequency; no offset will be added to or subtracted from the value you wish to measure.
5. “Table”: This feature will allow you to choose a predefined offset value from a list (“455.0 kHz”, “4.1943 MHz”, “4.4336 MHz”, “10.700 MHz” and “3.9990 MHz”). Holding your hand on the switch for more than a second and then releasing while on “Table” mode will bring up the list. You will then be able to browse through this list, choose your desired offset frequency and then hold your hand on the switch again for a second and release. Now, you will be brought in the previous menu where you can choose to “Add” this offset value to the next crystal frequency measured or “Subtract” it from the latter. Afterwards, when you insert the crystal in the headers, the prechosen offset value will either be added to or subtracted from the frequency of the crystal.

If the frequency of the crystal you are testing for is in kHz, the decimal point on the 7-segment will flash and if it is in MHz, the decimal point will be steady.

Finally, please remember to not connect the battery holder to the positive and the negative sign while having an adapter connected to the Female DC Barrel Jack. Use only one of them.

APPENDIX

Resistor Table Values

	Black	Brown	Red	Orange	Yellow	Green	Blue	Purple	Grey	White
As digit	0	1	2	3	4	5	6	7	8	9
As Multiplier	X1	X10	X100	X1k	X10k	X100k	X1M			

In resistors, there is always the first digit followed by the second digit followed by the third that is called a multiplier. For example, if we have Brown, Black and Red, the value of the resistor will be 10 multiplied by 100 which gives 1k, which is the resistor in our case.

You can download the manual from abra-electronics.com and search for AK-130.

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