K3NG Keyer Instructions

1. Check for all materials. Mark off each one as you account for them. Most parts are jellybean and readily replaced. Please note the footprints on the TRS audio jacks and the MiniDIN6 for the Keyboard.

	Qty	**Description**	**Designation**	**Marking**
[ ]	1	K3NG PCB		
[ ]	3	10nF Ceramic Capacitor	C1, C2, C3	103
[ ]	1	100nF Ceramic Capacitor	C4	104
[ ]	3	100Ω ¼W resistor	R1, R2, R5	Brown-Black-Brown
[ ]	1	220Ω ¼W resistor	R17	Red-Red-Brown
[ ]	5	1kΩ ¼W resistor	R8, R9, R10, R11, R12	Brown-Black-Red
[ ]	3	10kΩ ¼W resistor	R7, R13, R14	Brown-Black-Orange
[ ]	2	2N2222 Transistor (TO-92)	Q1, Q2	PN 2222A
[ ]	1	3mm Blue LED	D1	
[ ]	6	6mm Tactile Switch	SW1, SW2, SW3, SW4, SW5, SW6	
[ ]	1	2.1mm DC Barrel Socket	PWR1	
[ ]	1	SPST Right Angle Switch	SW0	
[ ]	1	100uF Electrolytic Capacitor	C5	100uF 25V
[ ]	4	TRS Audio Jack	J1, J2, J3, J4	
[ ]	1	1602 LCD Display	DS1	
[ ]	1	Arduino Mega 2560	U1	
[ ]	1	10kΩ trimpot (3296W)	R15	103 (top)
[ ]	1	10kΩ Linear Pot (PTV09A)	R4	B 10k
[ ]	1	MiniDIN6 PCB Jack	J5	

[ ]	1	Buzzer	BZ1	
		Hardware		
[ ]	5	2.54mm 40pin single row male header		
[ ]	1	2.54mm 40 pin double row male header		
[ ]	4	10mm M3 Spacer		
[ ]	12	M3 Screws		
[ ]	1	Knob		

2. Most of the soldering is not sequence dependent (other than the optional Buzzer must be soldered AFTER the headers). However, the recommended sequence follows:
3. Solder the ceramic capacitors. They are low to the board, and the least numerous.
    a. [ ] C1 - 10nF (marked 103)
    b. [ ] C2 - 10nF (marked 103)
    c. [ ] C3 - 10nF (marked 103)
    d. [ ] C4 - 100nF (marked 104)
    e. DO NOT INSTALL THE ELECTROLYTIC AT THIS TIME (you'll be kicking yourself if you do)
4. Solder the ¼W resistors.
    a. [ ] R1 - 100Ω (marked Brown-Black-Brown)
    b. [ ] R2 - 100Ω (marked Brown-Black-Brown)
    c. [ ] R5 - 100Ω (marked Brown-Black-Brown)
    d. [ ] R17 - 220Ω (marked Red-Red-Brown)
    e. [ ] R8 - 1kΩ (marked Brown-Black-Red)
    f. [ ] R9 - 1kΩ (marked Brown-Black-Red)
    g. [ ] R10 - 1kΩ (marked Brown-Black-Red)
    h. [ ] R11 - 1kΩ (marked Brown-Black-Red)
    i. [ ] R12 - 1kΩ (marked Brown-Black-Red)
    j. [ ] R7 - 10kΩ (marked Brown-Black-Orange)
    k. [ ] R13 - 10kΩ (marked Brown-Black-Orange)
    l. [ ] R14 - 10kΩ (marked Brown-Black-Orange)
    m. After soldering R7, R8, R9, R10, R11, R12, it is highly recommended to check the resistance. With one end of the probe on the left-most lead of R7, check that the right-most lead of R7 and leftmost of R8 show close to 10kΩ. With the probe still on left-most lead of R7, check that the right-most lead of R8 and leftmost lead

of R9 shows 11kΩ. Keep checking across the line (each next resistor is 1k). These resistances are important to make sure the buttons work.

5. Solder the transistors and LED. Be sure to match the silkscreen outlines.
    a. [ ] Q1 - 2N2222 Transistor (TO-92)
    b. [ ] Q2 - 2N2222 Transistor (TO-92)
    c. [ ] D1 - Blue 3mm LED
6. Solder the tactile buttons. While they are (mostly) square, they should only mount in one direction. If you really want to test, they should be normally open (NO), shorting to ground (voltage is top two pins on the board, ground is bottom two pins). Check to make sure none melted / shorted during soldering (continuity test between top and bottom and a few pushes of each button makes this quite quick)
    a. [ ] SW1 - 6mm Tactile Switch (NO)
    b. [ ] SW2 - 6mm Tactile Switch (NO)
    c. [ ] SW3 - 6mm Tactile Switch (NO)
    d. [ ] SW4 - 6mm Tactile Switch (NO)
    e. [ ] SW5 - 6mm Tactile Switch (NO)
    f. [ ] SW6 - 6mm Tactile Switch (NO)
7. Solder the DC Power Jack (PWR1) and power jack (SW0). A fair bit of heat for shorter time does less damage than lower heat for longer. While this is quite low power, I prefer to heavily solder all power connections as a general rule.
    a. [ ] PWR1 - 2.1mm DC Barrel Socket
    b. [ ] SW0 - SPST Right Angle Slide Switch
8. Solder the electrolytic capacitor. Be careful of the heat, as too much can easily damage the component. There is enough clearance to mount both vertically or laying on its side, based on your choice. Proper polarity counts - double check before soldering!
    a. [ ] C5 - 100uF 25v Electrolytic capacitor
9. Solder the TRS (Stereo) jacks. Be sure of the footprint, and the contacts. The chosen ones are from Tayda. I'm sure there are tons that work - just be sure they have the same pinouts / footprints (these are NOT the ebay-ubiquitous low-profile 6pin).
    a. [ ] J1 - TRS Stereo Jack (Transmitter)
    b. [ ] J2 - TRS Stereo Jack (Key)
    c. [ ] J3 - TRS Stereo Jack (Audio OUT)
    d. [ ] J4 - TRS Stereo Jack (Audio IN)
10. Now's a good time to check everything. Check your continuity, check your solder joints. Take a break, clean your soldering iron. Up till now the parts are all easy to remove, and inexpensive to replace. The remaining parts are quite a bit harder to remove, and much more expensive to replace. (However, they're still not that expensive, should something go wrong).
11. Install the display. If the display didn't come with a female header, include soldering that in this step. The easiest way to accurately and easily install the display is to do as follows:
    a. Install the spacers (4) and screws (4) on the display board itself. This sets the distance needed. Next, cut a 16 pin strip of the single row male header (and

female header, if not installed on LCD already). Push the male and female headers together slightly - but not all the way. Now, line up the headers in the holes on the PCB and display, and sandwich them between the display and PCB. Install the (4) screws to hold the spacers to the PCB. You now have a perfectly aligned, perfectly spaced header for the display. Solder them in place.

b. NOW REMOVE THE DISPLAY!!!
c. [ ] DS1 - 1602 LCD Display

12. Install the arduino. If the arduino didn't come with female headers (I've never seen one, but some chinese clone possibly may), include that in this step. We're going to repeat the process we did for the display, but we're going to do it on the UNDERSIDE of the PCB, with the headers in the arduino.
    a. Cut the appropriate single row headers (five 1x8pin, one 1x10pin) and dual row headers (one 2x18) , and place them lightly in the female headers on the arduino.
    b. Gently place the PCB ON TOP of the arduino, and slowly nudge the pins into place. Once they are all through the holes, squeeze the boards together.
    c. Start by tacking the end pins of the headers, and check to make sure the board hasn't shifted / is still nice and level with headers tight against it. Solder the remaining pins.
    d. NOW REMOVE THE ARDUINO!!!
    e. [ ] DS1 - Arduino Mega 2560
13. Solder the trimpot that controls the 1602 display contrast. It's a 3296W trimpot. I prefer the 10 and 25 turn (easier for me to adjust), but any of this form factor will work. Once again, I find higher heat for shorter time as less damaging to the component. Orientation (may) matter - the screw should be towards the upper left corner of the board.
    a. [ ] R15 - 10kΩ trimpot (3296W)
14. Solder the speed potentiometer. I find it easier to tack one of the pins, then make sure it the device is flat to the board, and then proceed to solder the remaining pins and mounting tabs. Heavily solder the mounting tabs - this is likely going to be one of the most manipulated parts of the keyer!
    a. [ ] R4 - 10kΩ Linear Pot (PTV09A)
15. Assemble the keyer
    a. Put all the pieces together with the mounting hardware. There's not that many. Install the display first, since the arduino blocks those mounting holes on the bottom side.
16. Take the keyer for a spin!
17. So, you noticed you still had two blank spaces on the board, right? Well, once you've tested the keyer (and it appears to be working), it's time to put the last two (optional) components on the board. Since they're the most expensive (other than Arduino and possibly display), and since they're not necessary for the keyer to actually work, i've left them for the end. Carefully install both - the MiniDIN has a lot of pins (don't bend them!), and the buzzer has polarity (match it to the board!). Once they're installed, you're done!
    a. [ ] BZ1 - Piezo Buzzer - (NOTE PIN SPACING)
    b. [ ] J5 - MiniDIN6 PCB Jack (FOOTPRINT / PINOUT MATTERS)

!!!!SAVE THIS PAGE FOR REFERENCE!!!!

These lines are the configurations in the K3NG code that tell the arduino what is where, and are specific to this board! (most are default locations, though). You will need make sure these are correct fin the sketch to reflash (a functional) keyer. I've removed all of the #define statements, etc - just change the value, not the statement.

Input voltage - 7-15v DC - it uses the Arduino's voltage regulator, so be kind.

keyer_pin_settings.h

paddle_left 2
paddle_right 5
sidetone_line 4
potentiometer A0
analog_buttons_pin A1

FEATURE_LCD_4BIT
lcd_rs 38
lcd_enable 31
lcd_d4 33
lcd_d5 35
lcd_d6 37
lcd_d7 39

FEATURE_PS2_KEYBOARD
ps2_keyboard_data A3
ps2_keyboard_clock 3

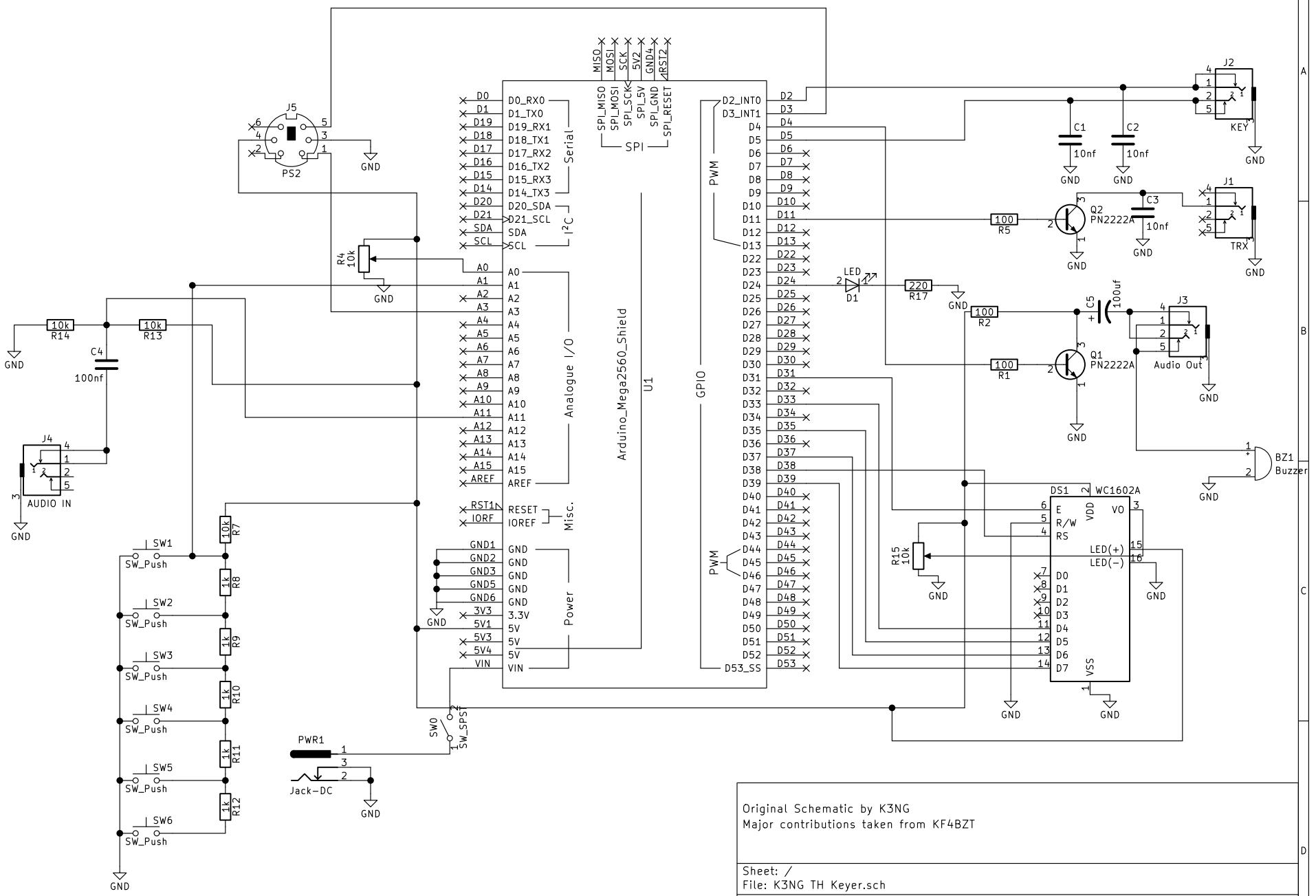
OPTION_CW_DECODER_GOERTZEL_AUDIO_DETECTOR
cw_decoder_audio_input_pin A11 // this must be an analog pin!
OPTION_CW_DECODER_GOERTZEL_AUDIO_DETECTOR
cw_decoder_indicator 24

Keyer_settings.h

FEATURE_COMMAND_BUTTONS
analog_buttons_number_of_buttons 6
analog_buttons_r1 10
analog_buttons_r2 1

These settings you actually don't need to change - but you most likely would want to, if you are reflashing, to set it to your comfortable range.

initial_pot_wpm_low_value 5 // Potentiometer WPM fully CCW
initial_pot_wpm_high_value 60 // Potentiometer WPM fully CW
wpm_limit_low 5
wpm_limit_high 60



Original Schematic by K3NG
Major contributions taken from KF4BZT

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File: K3NG TH Keyer.sch

Title: K3NG Keyer

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