KK1L Icom Band Decoder

Basic Assembly

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Features:

- ***RFI isolated inputs***
- ***Fully opto-isolated***
- ***Replaces one BCD band decode port on KK1L dual decoder***

Description:

Adapted from the venerable K6XX design the circuit converts Icom voltage level band data to decoded active-low signals (output of LM3914/NTE1508). These are optoisolated and inverted (active high drive) by PS2501-4 and fed to the KK1L 2x6 Antenna Switch Control Board by plugging this card into the empty CD4028 socket on the control board. The card may also be used as a standalone decoder for the Icom BAND voltage output.

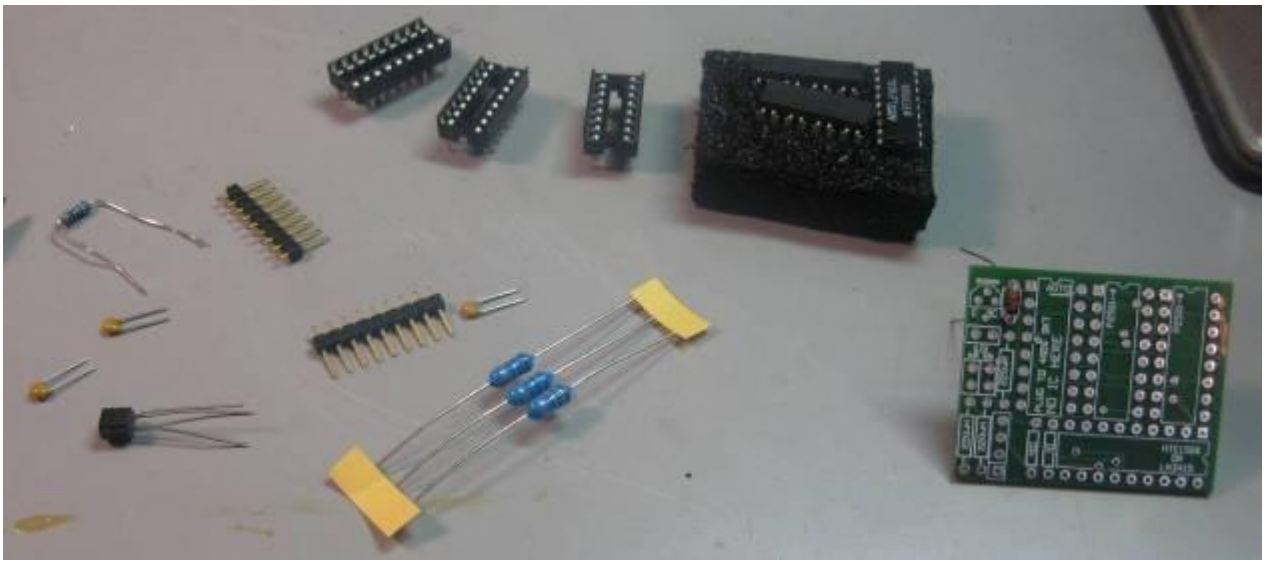
The 1k resistor at pin 7 of the LM3415 sets the LED drive current to 12mA. The 10k resistor at pin 5 biases the level shifter and can be any value from 10k to 50k. The diode at the base of the PNP can be any silicon switching type diode (even a 1n4001 will do). The inductors and caps on the inputs are for RF suppression and the values are not critical.

NOTE: Early testing identified a modification which needs to be made to the BAND input circuit for it to decode more accurately. A 1k / 8.2k Ohm voltage divider is added to the input. The 1k Ohm resistor goes in series with the BAND input and the 8.2k Ohm resistor is in parallel with the RF suppression capacitor. I will note this in the construction steps. For some Icom radios the 1k resistor value may need to be different. I have included a few reasonable values in the parts list in case you need to make an adjustment. This is a quirk of the Icom design.

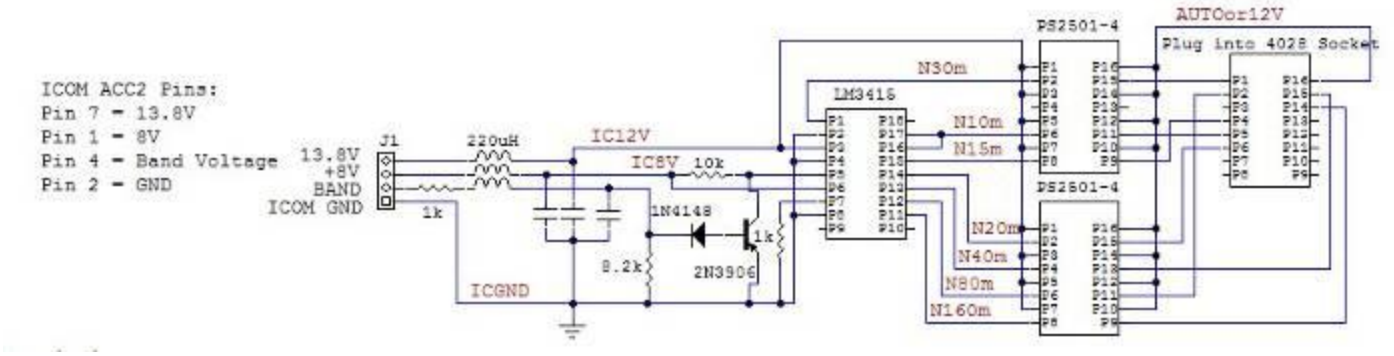
Parts List:

- 1 Diodes 1N4148
- 3 0.01uF ceramic capacitor
- 3 220uH radial inductor
- 2 1kΩ 1/8W 1% Resistor
- 1 8.2kΩ 1/8W 1% Resistor
- 1 10kΩ 1/8W Resistor
- 1 LM3415 or NTE1508 Dot/Bar Driver
- 1 2N3906 PNP transistor
- 2 PS2501-4 4Ch opto-isolator
- 3 16pin DIP socket
- 1 18pin DIP socket
- 2 9 position header 100mil pitch
- 1 each **optional** pad resistors 604Ω, 806Ω, 1.2kΩ, 1.4kΩ

The picture below is missing some resistors and a socket.



Schematic:

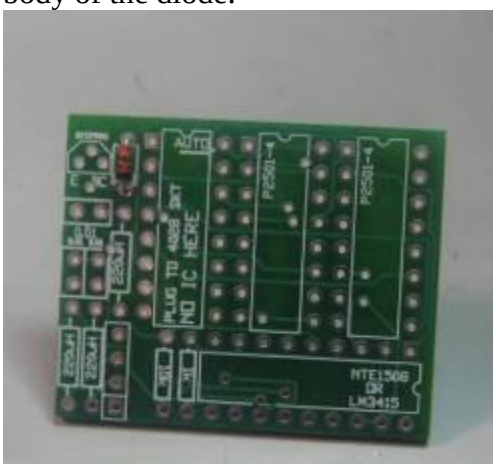


Construction:

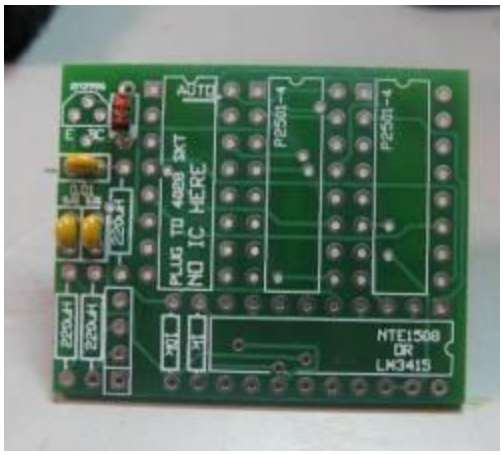
I recommend that you build this card FIRST if you have not yet build the Dual Decoder board.

Generally it is best to start with the smallest parts first. That way it makes them easier to keep flush with the board.

- ❑ Solder the 1N4148 diode in the location shown. The holes are spaced "just right" so you will need to bend the leads close to the body of the diode.

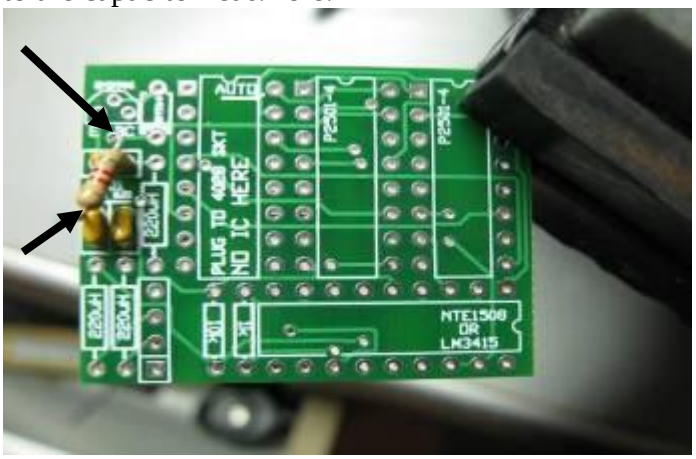


- ❑ Solder the three 0.01uF capacitors in place as shown.



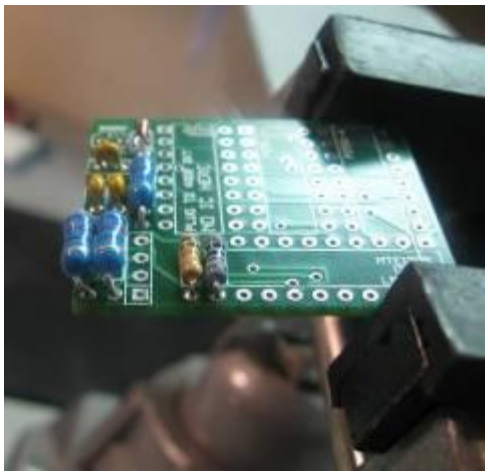
- ❑ Solder the 8.2k Ω resistor (gray-red-red) as shown with one end in the hole between the "E" and the "BC" and the other end tacked

to the capacitor lead/hole.



- ❑ Solder a 1k Ω resistor (brown-black-red) as shown next to the IC.
- ❑ Solder the 10k Ω resistor (brown-black-orange) as shown next.

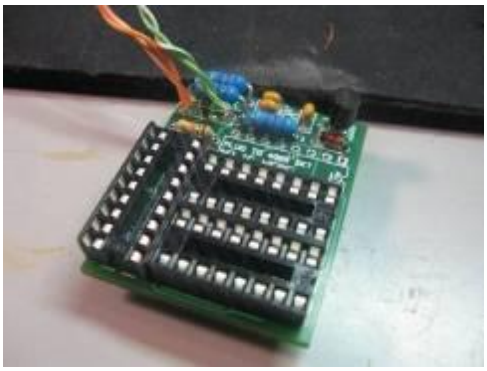
- ❑ Solder one inductor next to the capacitors.
- ❑ Solder the remaining two inductors in place as shown. Note how these inductors are raised off the board and pushed to the side a bit. This provides some clearance for the wires that will solder there later.



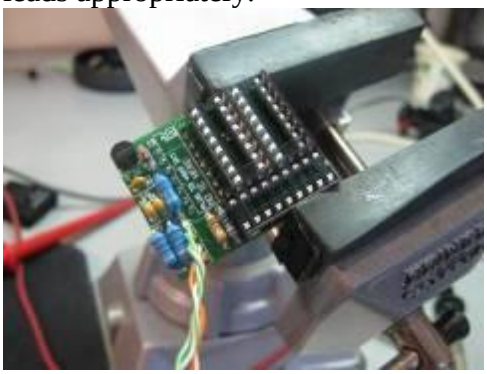
- ❑ Solder the 18 pin socket as shown where the LM3415 or NTE1508 will go. **Note the position of the notch.**

  It helps to use the technique shown where the pins in the opposite corner are soldered first to hold the socket in place. When the seating is correct then continue with the other pins. Did I say to note the position of the notch??

- ❑ Solder two of the 16 pin sockets on top of the board similar to the previous socket. **Note the position of the notch.**

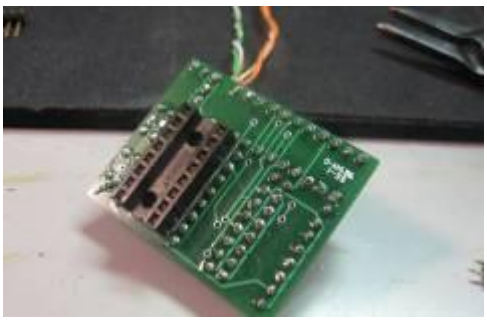


- ❑ Solder the transistor in the location shown. Pay attention to the orientation of the body to the outline on the board and bend the leads appropriately.

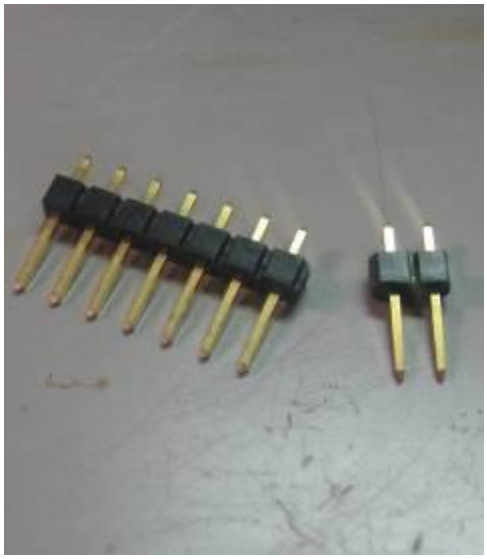


- ❑ If you are building this kit as a standalone board, then skip this step.
  Otherwise solder the remaining 16 pin socket to the UNDERSIDE of the board as shown. **Note the position of the notch.**

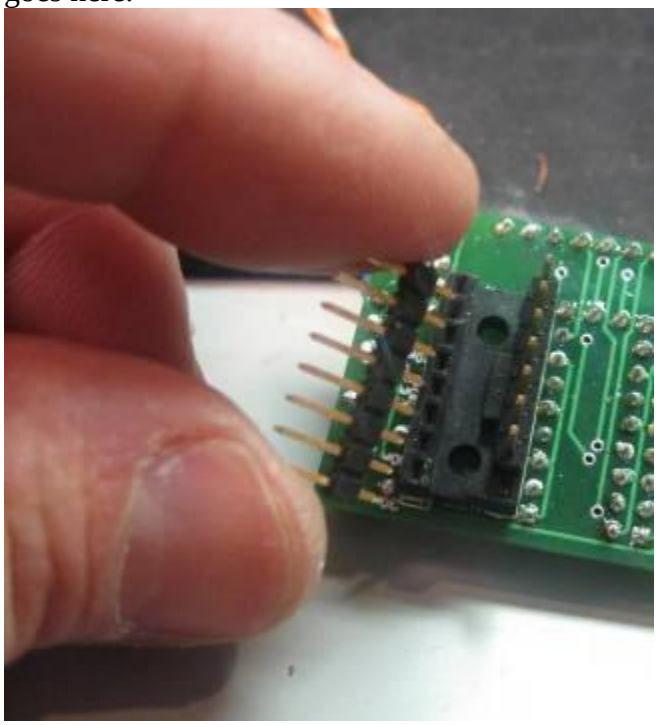
  This will be used to hold the header pins which connect this board to the main KK1L Dual Decoder board.



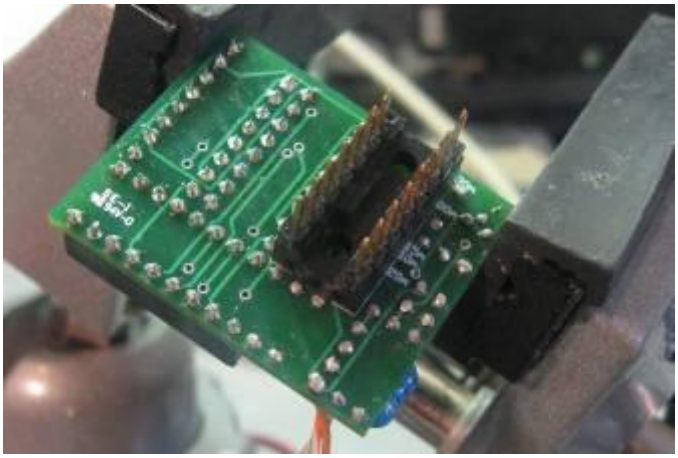
- ❑ If you are building this kit as a standalone board, then skip this step.
  Break off two pins on one of the 9 pin headers to make a 7 pin header as shown below.



- ❑ If you are building this kit as a standalone board, then skip this step.
  Break off one pin of the remaining 9 pin header to make an 8 pin header similar to the above picture.
- ❑ If you are building this kit as a standalone board, then skip this step.
  Insert the two headers as shown. Pin 16 marked auto will be open. No connection goes here.



When viewed from the bottom your board should now look like this…

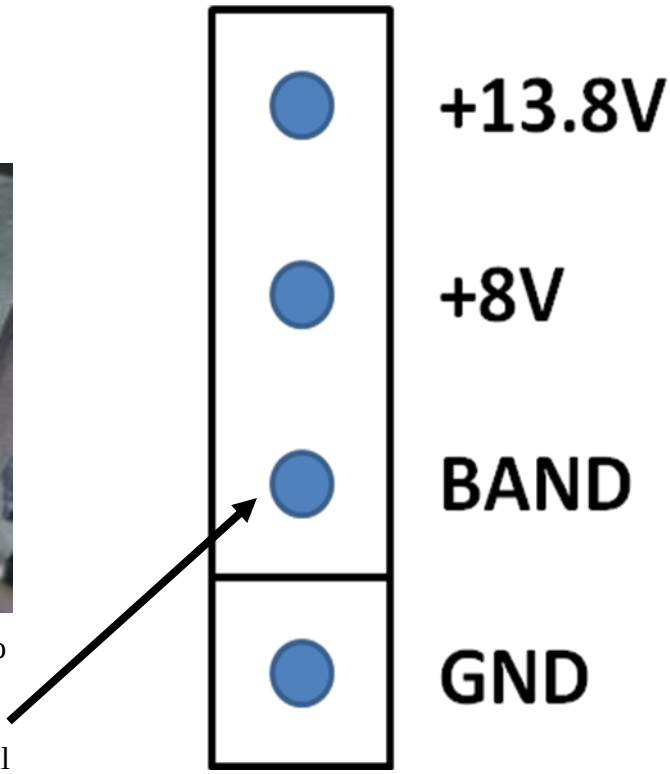


- ❑ Next solder one end of a 1k Ω * resistor into the BAND location shown in the diagram below. I do not have a picture for this step. Leave the other lead of the resistor. You will solder the BAND connection from the Icom radio to this point. Note: This resistance may need to be adjusted depending on your radio.

- ❑ Next attach the wires which will bring the signals from your Icom radio's ACC2 port.

  NOTE!: Attach the BAND lead to the unconnected lead of the 1k resistor you just soldered onto the board.

  Wire the Icom ACC2 connections to the four locations as shown below. Unfortunately the labels for the Icom connections did not get printed on the board.



Note: In order to maintain isolation between the radio and switching system the connections here should come exclusively from the radio. The outputs to the KK1L Dual Decoder board are opto-isolated.

When viewed from the top your board should now look something like this…

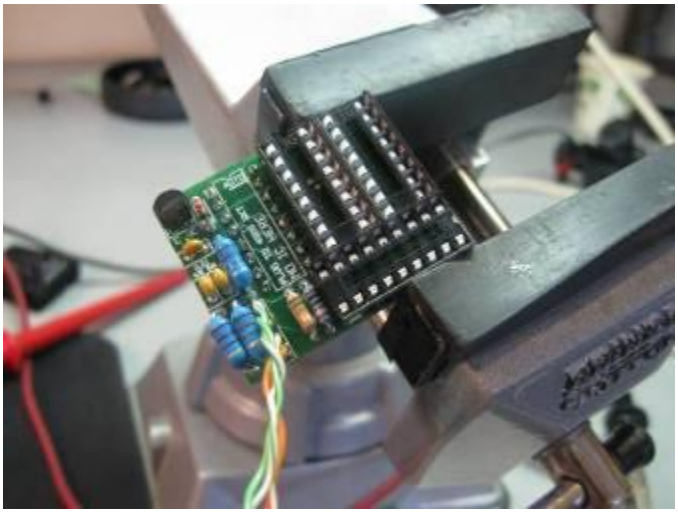
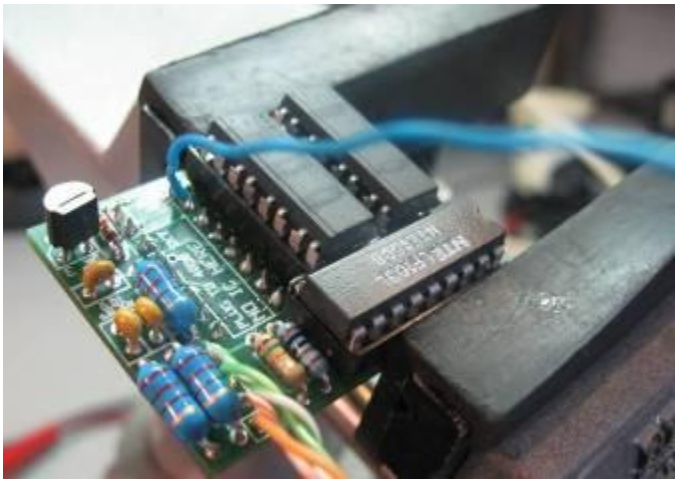


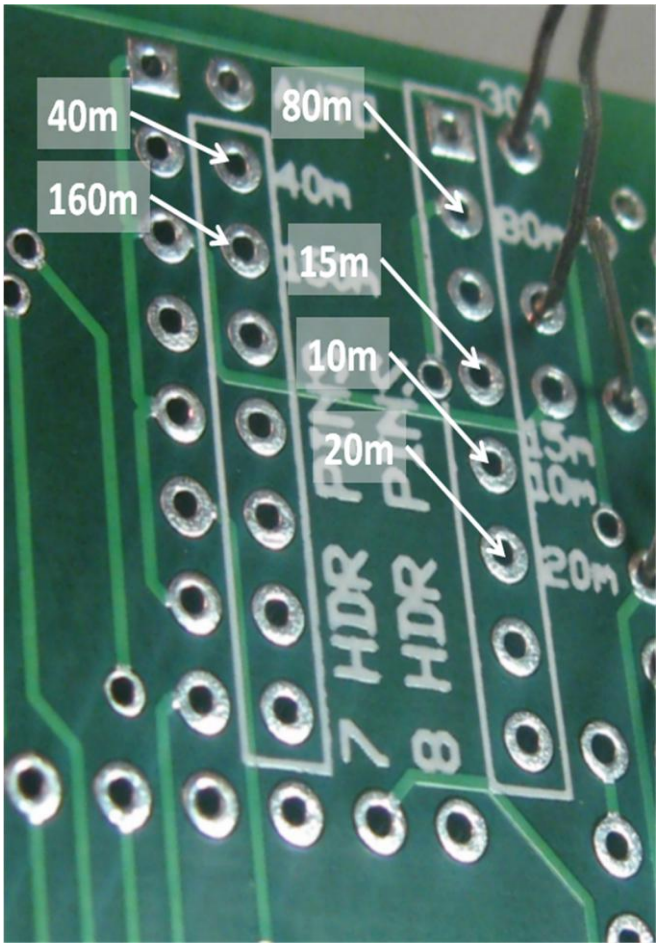
Figure 1: Top view

- ❑ Connect the last wire which powers the output stage. This is the "AUTO" signal/connection from the KK1L Dual Decoder radio port you will be using. You should "tack solder" to the pin 16 location

(opposite of pin 1 or on the top right). The other end of this wire goes to either the AUTO connection or pin 16 of the PS2501-4 socket on the KK1L Dual Decoder board.



- ❑ If you are **NOT** building this kit as a standalone board, then skip this step. Connect the decoded outputs as shown on the underside of the board to their destinations using wire of your choice. The outputs are sourced from the AUTO connection. This is where your +12V would be wired. The "return" path is through GND wherever the +12V comes from.

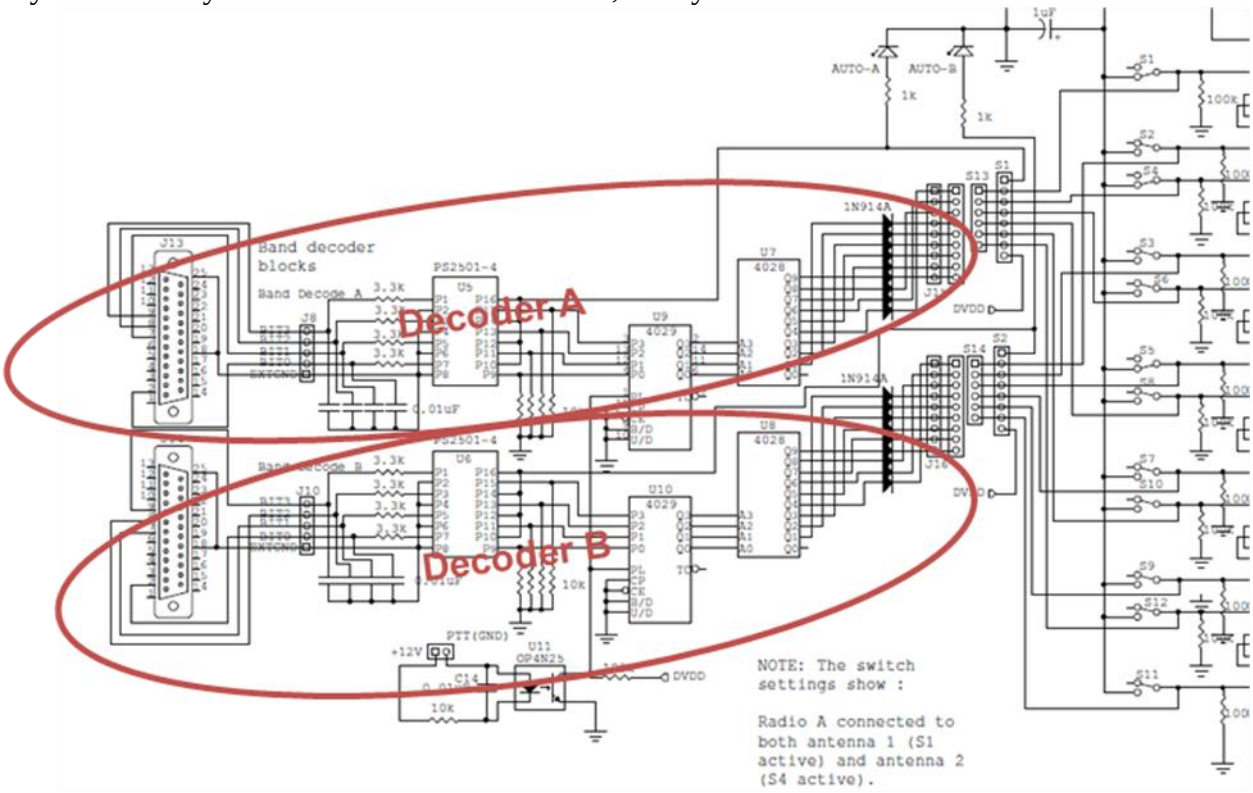


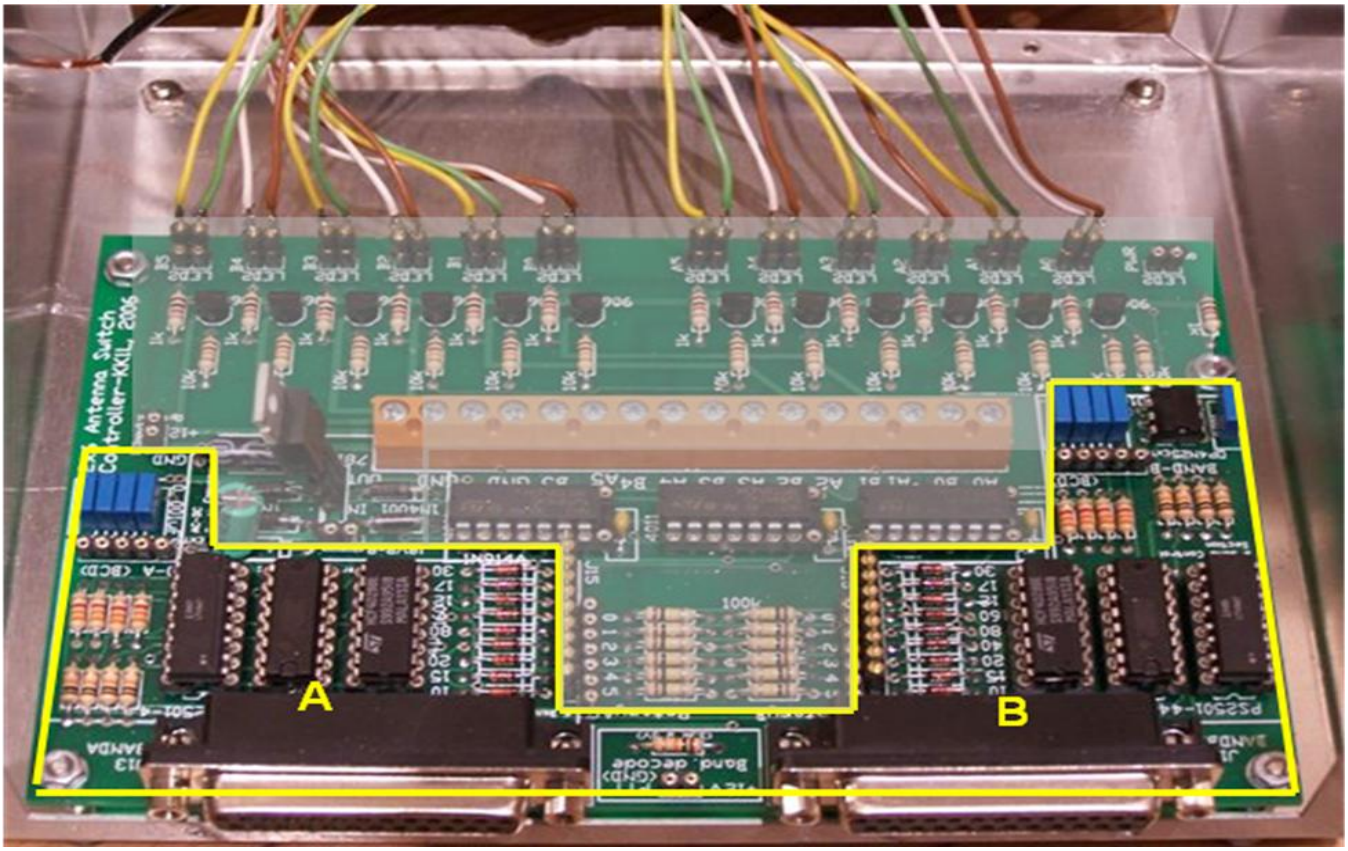
- ❑ The final construction step is to install the ICs. Please be careful to
  1. Not bend the pins…gently straighten them if needed.
  2. Follow static precautions.
  3. Pay attention to the notch and make sure it is toward the edge of the board. The PS2501-4 has a very faint "pin 1 dot". This is the notch end.
- ❑ If using the board as a standalone decoder please skip to the last steps in the next section. Otherwise continue to the next section.

Installation on the KK1L Dual Decoder board

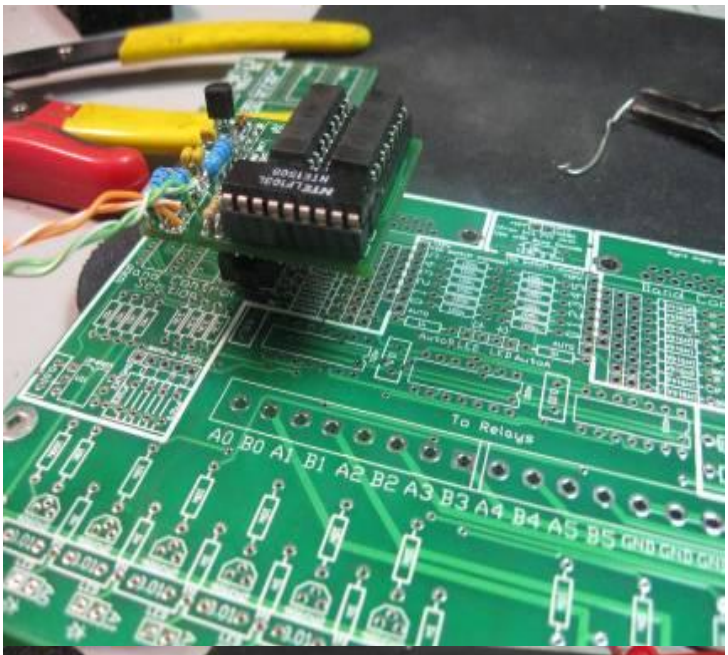
When installing this daughter card you are REPLACING the original set of BCD decoder components for a radio with the ones on the daughter card. The devices associated with the KK1L Dual Decoder A or B are shown below.

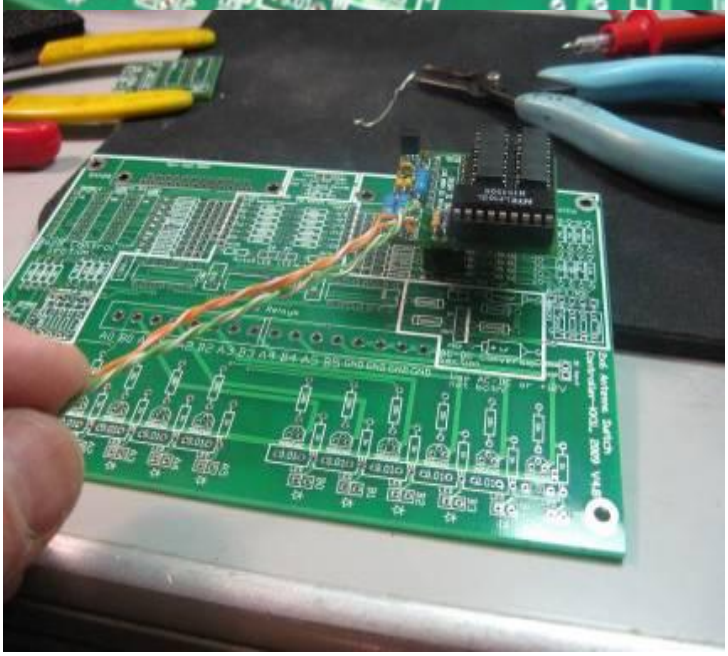
If you have not yet build the Dual Decoder card, then you should omit these devices.





- ❑ To install the daughter card remove the CD4028 from the decoder you will be replacing.
- ❑ You can also remove the PS2501-4 or any/all of the other ICs or components associated with the decoder. You can use the PS2501-4 on the daughter card.
- ❑ You need to leave the nine diodes on the board. These allow for you to tie outputs to choose the same antenna…for example a tribander.
- ❑ Check your work carefully.
- ❑ With the POWER OFF plug the daughter card in to one of the CD4028 sockets as shown below.





- ❑ Connect the Icom wires (+13.8, +8V, BAND, GND) to the ACC2 port.
- ❑ Connect the AUTO wire to the Dual Decoder board.
- ❑ Enjoy the new capability!
- ❑ **NOTE: The Icom band decode scheme is prone to error because of how Icom implemented it. There have been some folks who have had trouble decoding between 80m/160m, 10m/15m, and one person even 40m/80m.**

This can be overcome by adjusting the value of the series resistance (1k Ω) in the 1k Ω / 8.2k Ω pad circuit. If the intended band is higher than the decoded band, then raise the resistance. If the intended band is lower than the decoded band, then lower the resistance.

For example if the radio is set on 80m and the circuit is decoding 160m, then raise the resistance. This will move the decoder threshold higher. A reasonable range for the series pad resistor is 500Ω to 1800 Ω. I have included a few reasonable values in the Mouser parts list. You can contact me if you have trouble.