KK1L 2x6 Antenna Switch

Relay Controller / Dual Band Decoder Basic Assembly

Version 4.8 (new 24-Aug-2009)

Parts List updated 19-AUG-2016

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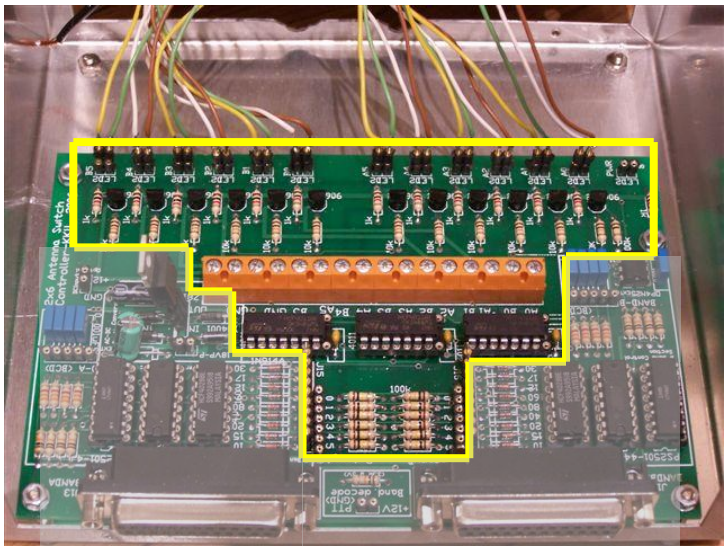
Design Features:

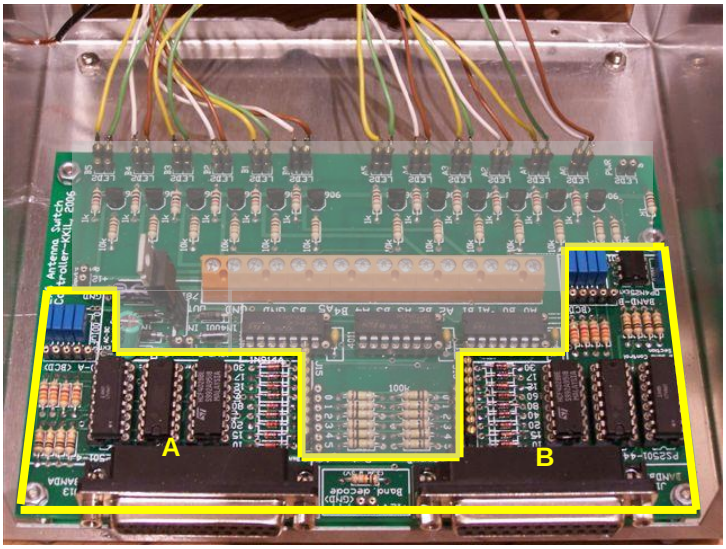
- ***Both radios cannot select the same antenna ports. The first radio to have the antenna keeps it until released. This prevents transmitting directly from one radio to another.***
- ***The switch outputs inputs are +12V active high logic and float when not selected***
- ***Many possible switching options.***
  - ***Can use rotary, toggle, or latched push button switches on the six +12V switch inputs***
  - ***Latched push button or toggle allow for multiple antennas per radio port (for stacking).***
  - ***A 7 position rotary switch will allow for an "auto" position to let the rig or computer control the selections through the BCD inputs***
  - ***Can drive the BCD inputs to the decoder with any 5V-16V active high source.***
- ***The band decoding follows the "standard" of NA, TRLog, and others.***
  - ***To wire the six contest band just short across from J15/J16 to the corresponding switch (relay control) connections.***
  - ***You can also "wire OR" bands to one port. For example to put a tribander on Port5 you can connect the 10, 15, and 20m decoded outputs to the port 5 switch position.***
  - ***The inputs are optically isolated and convert from 5V or 12V active high logic to relay (12V) levels.***
  - ***You can use BCD band data from your radio or logging program along with manual switching***
- ***CMOS devices (4028, 4011) take +12V VCC directly.***
- ***Quad optoisolators convert external 5V/12V interface to +12V.***
- ***Parts available from Mouser and other suppliers.***
  - ***Project file saved at Mouser.Com to make this easier***
  - ***Many parts will be in your junk box already***

Parts List:

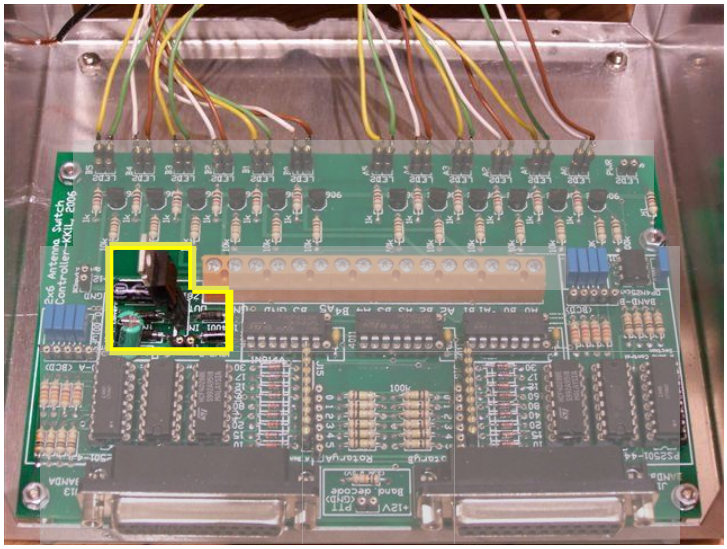
- Relay Control Section – This is all you need to build if you are going fully manual.
  - ❑ 3 CD4011 (sockets optional)
  - ❑ 2 Euro Connector (optional, but convenient)
  - ❑ 12 PNP Transistor MPSA92 (nearly any PNP will work. Location marked “2N3906”)
  - ❑ 13 100K Ohm 1/4W (not critical...47K to 150K is fine)
  - ❑ 12 5.6K Ohm 1/4W (board is marked 10K)
  - ❑ 15 1K Ohm 1/4W (can change to vary LED brightness)
  - ❑ 3 0.01uF ceramic (not critical!! 0.1uf & 0.001 uF are okay too)
  - ❑ 12 27V MOV (near transistors marked “0.01”)
  - ❑ 2 7 Position Rotary Switch
  - ❑ 1 72 pin 100mil SIP Header (optional)
  - ❑ 1 Green LED (power)
  - ❑ 12 Red LED
  - ❑ 13 LED Chassis Clip (drill 11/64”)



- Band Decode Sections – These can be used separate from the relay control section if desired
  - ❑ 1 4N25 1 Ch Opto-isolator
  - ❑ 2 PS2501-4 4 Ch Opto-isolator
    - Note: Can use PS2505-4 which can allow active 1 or active 0 BCD inputs
  - ❑ 2 CD4028
  - ❑ 2 CD4029
  - ❑ 18 Switching Diode 1N914
  - ❑ 8 3.3K Ohm 1/4W
  - ❑ 9 10K Ohm 1/4W
  - ❑ 9 0.01uF ceramic (not critical!! 0.1uf & 0.001 uF are okay too)
  - ❑ 2 DB25 PCB Mount Female
  - ❑ 2 Yellow LED (optional for Auto mode)
  - ❑ 2 1K Ohm ¼ W (optional for Auto mode)
  - ❑ 2 LED Chassis Clip (drill 11/64”)



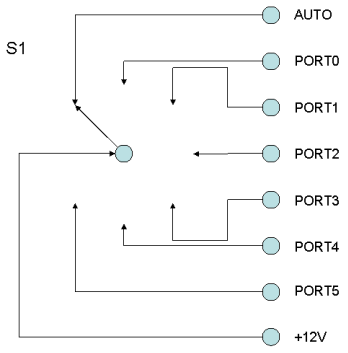
- AC-DC Converter Section
  - ❑ 1 12V Regulator
  - ❑ 4 Rectifier 1N4001
  - ❑ 1 100uF 50V
  - ❑ 1 1uF 50V
  - ❑ 1 SPST Switch



Construction:

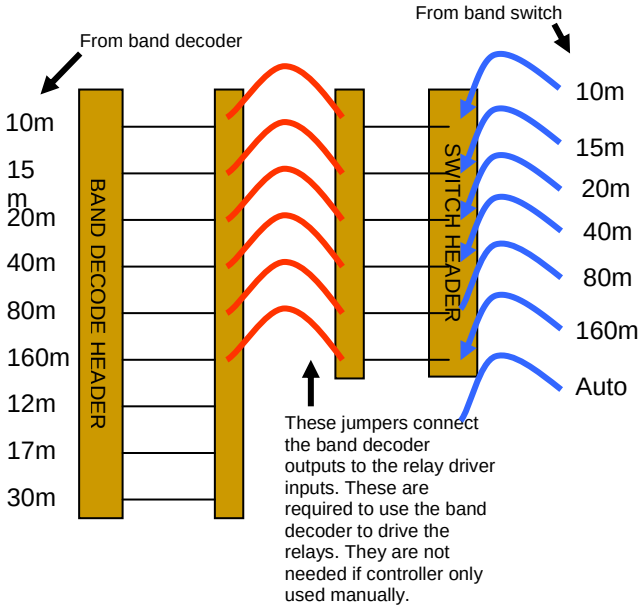
- The relay control and band decoders can be built and operated independently
- The AC-DC section is optional. You can feed the unit with 12V directly if you like.
- There is no particular order to the construction and no particular "gotchas" that I am aware of
  - All holes are plated through
  - Generally work from the smaller components to the larger components
  - I suggest soldering the euro connectors last
  - Some pad areas especially around the transistors are tight. Be careful of solder bridges.
  - Sockets may be used for the DIPs if you prefer. There are no circuits sensitive to lead length.
  - To fit the board in a chassis it is easiest to mount the card closest to the rear.
    - The DB25s will poke through the rear
    - The LEDs will mount in the chassis face and not be attached directly to the board. This also leaves more room for the rotary switches.
    - Hint: Only a single ground return is required from the LEDs. You can short all the LED cathodes together where the LEDs are mounted. Just bend all the cathode leads over like grass in the wind and solder them together. This is different than shown in the pictures.
    - Drill a 11/64" hole for the LED clips if you use them. Mount them in the hole first and the insert the LED until it clicks.
  - I have replaced the 12 0.01uF caps at the output of the drive transistors with 27V MOV devices to provide improved static / lightning discharge protection. Please note the board is marked with "0.01" where the MOVs go. These are right next to the transistors.
- To use the band decoder you must connect the decoder outputs to the relay control inputs. Examples are shown later in this document.
  - The headers allow you to configure many different combinations with single computer style jumpers
  - The band decoder outputs are feed through diodes so you can "wire or" them together
  - You can tap off the output of the band decoder to feed other units like a band pass filter.
  - 25mA source capable (enough to spare since it only feeds CMOS input on card)
  - CAT5 wire works fine to connect the relay control outputs to the relays at the tower.
  - 4 pair / 24ga costs about $0.10 per foot
    - I run over 250' to my switch with this cable
    - Easy to scrounge "leftover" runs if you are resourceful
    - Make two runs to the tower
    - Tie the four "spare" wires to GND
  - If you have extra long runs you can use up to 18VDC power supply to compensate for the IR drop in the cable. The devices on the board can handle this.
  - The schematic is a great source of information
  - Send me an email if you get stuck or have questions: KK1L@COMCAST.NET

Rotary Switch Wiring



Antenna Selection Example #1 Monobanders

- Figure at right shows
  - 10m on port 5
  - 15m on port 4
  - 20m on port 3
  - 40m on port 2
  - 80m on port 1
  - 160m on port 0
- The “Auto” switch position is to allow band decoder to drive relays without interference.
- This version includes circuitry which will disable the band decoder when manually selecting antennas. In this case the “Auto” position is +12V.



Antenna Selection Example #2 Tribander

- Figure at right shows
  - Tribander on port 5
  - 40m on port 4
  - 80m on port 3
  - 160m on port 2
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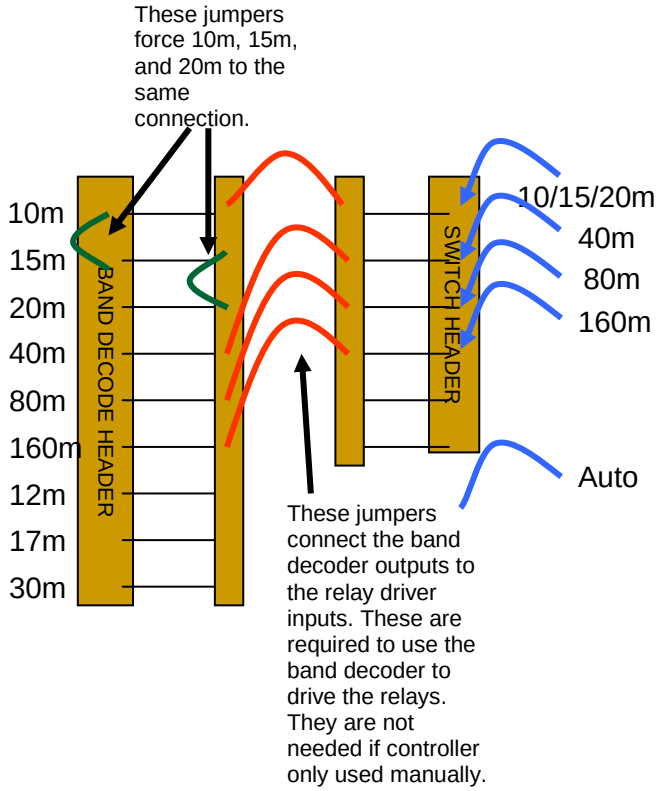
- This version includes circuitry which will disable the band decoder when manually selecting antennas. In this case the “Auto” position is +12V.



2x6 Antenna Switch Controller

* Only one radio port selectable per antenna. The first one to have the antenna keeps it until released.

* Can use rotary, toggle, or latched push button switches. Latched push button or toggle allow for multiple antennas per radio port (for stacking). The inputs are +12V active high logic and float when not selected. You might consider a 7 position rotary switch if also using the BCD inputs. This will allow for a "no select" position for the rig or computer to control the selections.

* Along with manual switching you can use BCD band data from your radio or logging program. The decoding follows the "standard" of NA, TRLog, and others. To wire the six contest band just short across from J15/J16 to the corrosponding switch connections. You can also "wire OR" bands to one port. For example to put a tri-bander on Port5 you can connect the 10, 15, and 20m decoded outputs to the port 5 switch position. The inputs are optically isolated and convert from 5V or 12V active high logic to relay (12V) levels.

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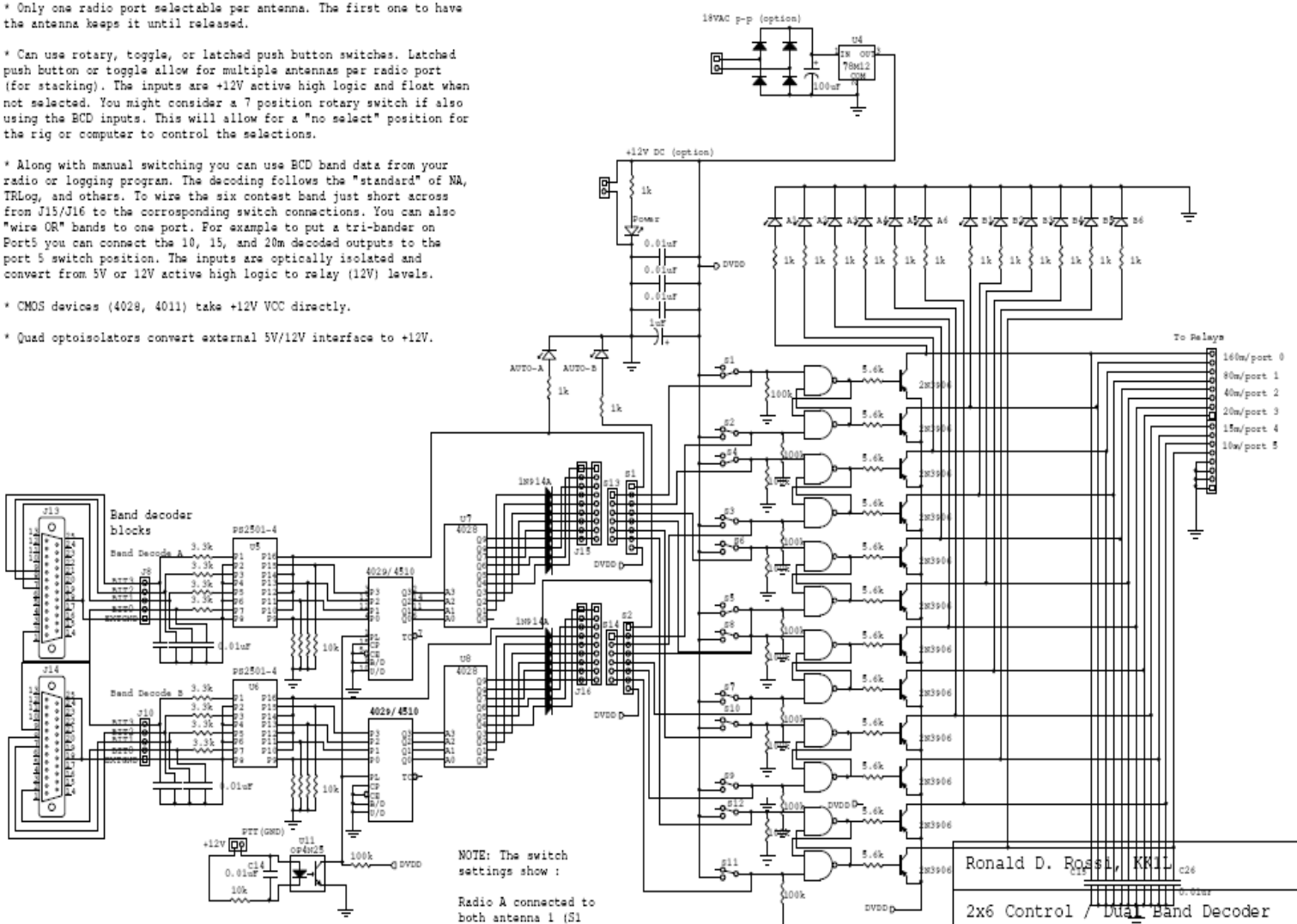

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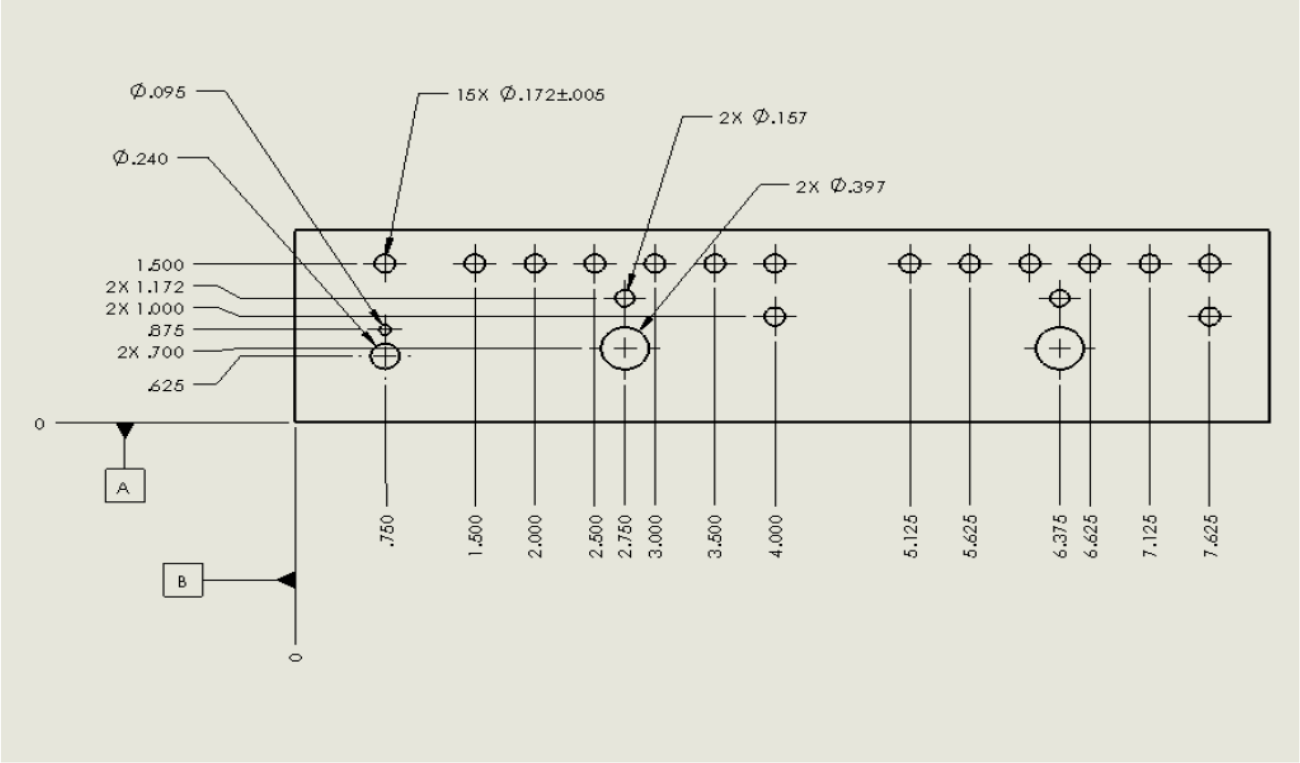
Front panel of KK1L 2x6 Controller



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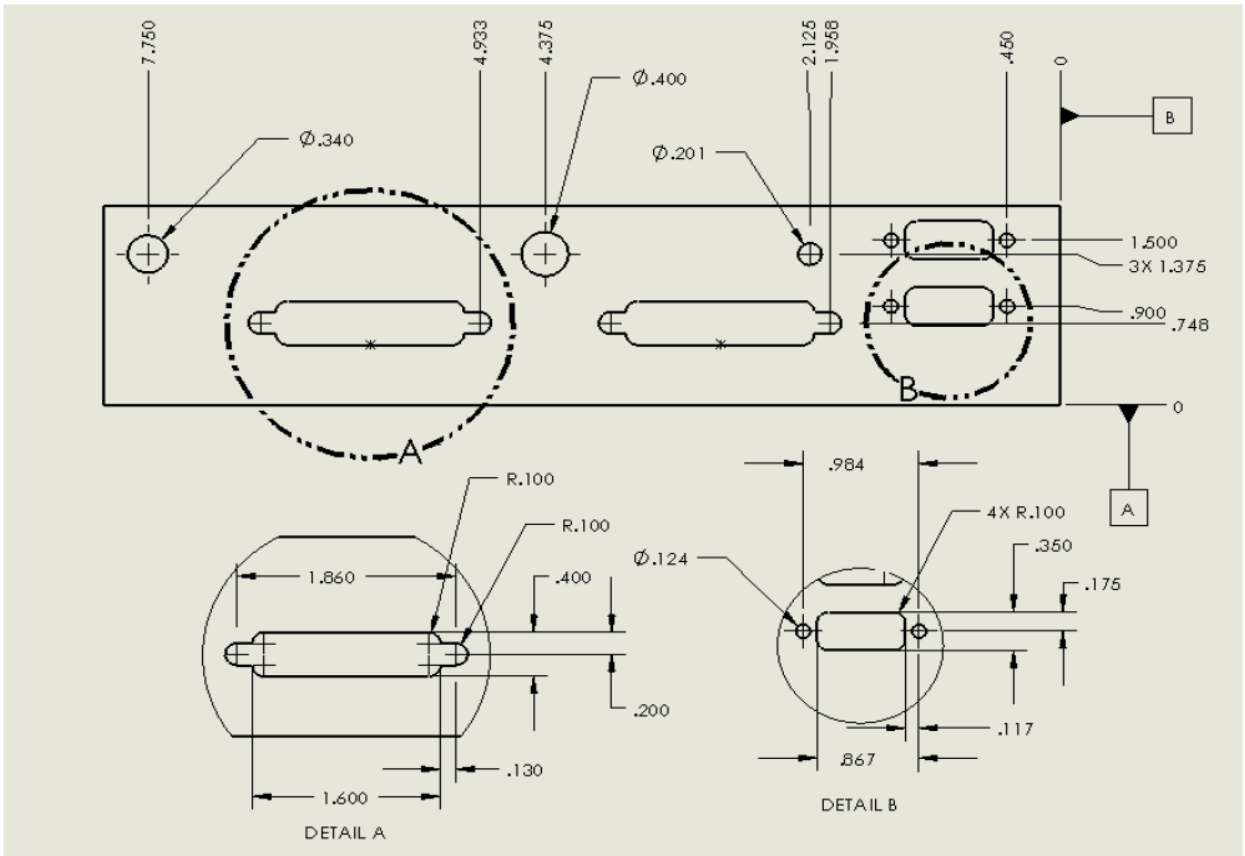
Rear panel of KK1L 2x6 Controller



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