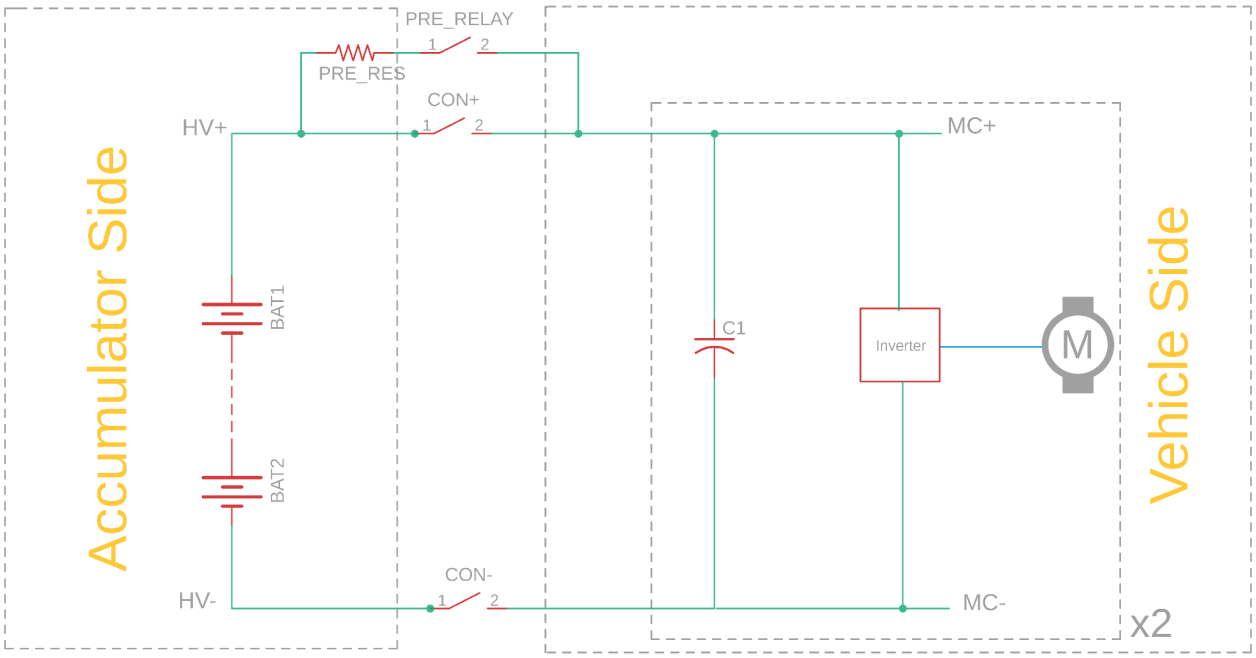
PART 1: ANALOG

Precharge circuitry protects the motors, motor controllers, cables, connectors and any other component from high-inrush current in high voltage path, during initial process of activating TS (TS active means High Voltage reaches the Vehicle Side). Below is a schematic of the precharge circuitry



We have discussed the circuit a lot of times in the session and we hope you all are familiar with the order of contactor switching but the magic doesn't happen on its own, this HV circuit needs a LV control circuitry to operate, while following the Formula Student rules. Your task would be to design a LV control circuitry to activate TS while ensuring safety of all HV components, which is in accordance with the rules. Below are the requirements.

- Accumulator of 378V and you need to precharge the system till 95%.
- Have a voltage source of 12V for the LV circuit. Would be preferable to keep the maximum voltage of any signal in your designed circuit to be 12V.
- You have a safety signal(LV),which dictates the opening and closing of contactor. Whenever any error occurs in our car, this circuit opens up, this in turn opens up the contactor.
- After error doesn't persist for 10s, the safety circuit will close automatically again.
- Even after the safety circuit is closed Tractive System(TS) can't be activated automatically. You need an additional action to achieve it.
- You need to also specify which components you are using in your circuit, while providing datasheet. You can always look up for the components and their datasheet on https://www.mouser.in/

Below are the datasheets of the contactor and precharge relay used. Do read how contactors and this precharge relay works so it could help you with designing the circuit.

- 07_AIR_Contactor.pdf
- Datasheet Precharge Relay - Mini K HV.pdf

You have to design this LV circuit on Eagle (just the schematic, no brd), with proper labeling. You will be required to submit a zip containing the schematic file and a detailed report explaining, every part of the circuit and justifying the component you used.

Do contact for any doubts,
Suyash Majhi (JDE)