Electrical design

Line following

Beacons

Touch

Brush motors

Locomotion wheels

Firing wheels

The circuits used in the robot can be broken down into sensor and drive circuits. The circuits which interpret (compare, filter) the sensor signals will be placed near the sensors themselves. Other circuits, such as the H-bridges used, will be placed near the TINAH board. The batteries will be placed as close to the TINAH board as possible, to reduce the moment of inertia. No cable will interface directly with the TINAH board: all cables will go through a permanently mounted circuit board which has leads to battery outputs and TINAH inputs.

The comparators for the reflectance sensors used to follow tape at the front of the robot will be mounted behind the larger-radius wheel, on the right of the robot. This board will contain 4 LM311 comparator chips, and several resistors. It will be approximately 60 by 25 mm, and mounted sideways, parallel to the side of the chassis. Removing and replacing the circuit will be as easy as pulling it out—it will be held in place loosely and constrained by two bolts during the competition itself.

The touch sensors require no circuit to interpret their signal. They will be connected via header pins on the reflectance sensor interpreter board to the wire-to-board header mounted on the same board that goes to the ribbon cable.

The internal reflectance sensor (used to determine whether or not the robot has a ball to fire) and trailing tape follower will be individually routed to the TINAH input board.

The IR sensors will be individually routed to the TINAH board/battery via shielded cables. The two 1 kHz wires will be twisted together before joining the sensor ribbon cable and moving back towards the TINAH board. The 10 kHz cable will be routed alongside the trailing tape follower cable.

The two H-bridge circuits will be enclosed in a bent sheet-metal box (approximately 60 by 120 by 40 mm) kept close to the TINAH board. The inputs to the H-bridges will come from the TINAH board/battery board, and the outputs will move to snap-fit connectors, which go to the motors. All of the servos (two wheel-rotation, one loading mechanism) will go directly to the TINAH/battery interface board. The two other geared Barber Coleman motors (collector and firing mechanism) will go directly to the TINAH/battery interface board, as neither requires H-Bridge circuits.

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| Name (quantity, size) (pins) | Function | Input/output values | Comments |
| H-bridge (1, 60\*120)  Input pins: 12V, ground, 2 TINAH PWN  Output pins: 2 battery PWM | Locomotion motor inputs/outputs | Inputs: 12V, ~1.3 A (max) Outputs: 12V ~1.3 A (max) | Enclosed within a metal box, 40 mm tall. Cables to motors are three-strand shielded wire |
| TINAH board/battery interface (1, 15\*150) Input pins: Battery ground, 5V, 9V, 12V, various sensors Output pins: VCC and ground, sensor data (to various TINAH inputs) | Provides a single interface for connecting inputs/outputs requiring both TINAH and battery. | Three rails of outputs/inputs (VCC, ground, signal) and three rails of constants (5V, 9V, 12V) | Mounted close to/over TINAH and battery, near back of robot. Signal rail is not continuous, and has individual wires leading to TINAH inputs |
| Reflectance sensor interpreter (1, 25\*60) Inputs: 4 QRD outputs, 4 touch outputs Outputs: 4 9V/ground (QRD), 4 touch inputs (5V) | Four LM311 comparators, and touch sensor to ribbon cable inputs. | Inputs: Front tape-following sensors (5V, 40mA) touch sensors (5V) Outputs: compared (digital) tape-following signal (5V), touch sensors (5V) | A single ribbon cable comes from this board and is routed to the board/battery interface. It includes touch sensor and compared tape sensor outputs. |
| IR sensor filter (3, 75\*25) | Amplifies and filters 1 kHz and 10kHz IR inputs. | Inputs: IR light, 9V, ground Outputs: 0-5 volts | Stored in bent sheet-metal boxes, mounted 6 inches apart, centred above the brush. Outputs are sent via. |