

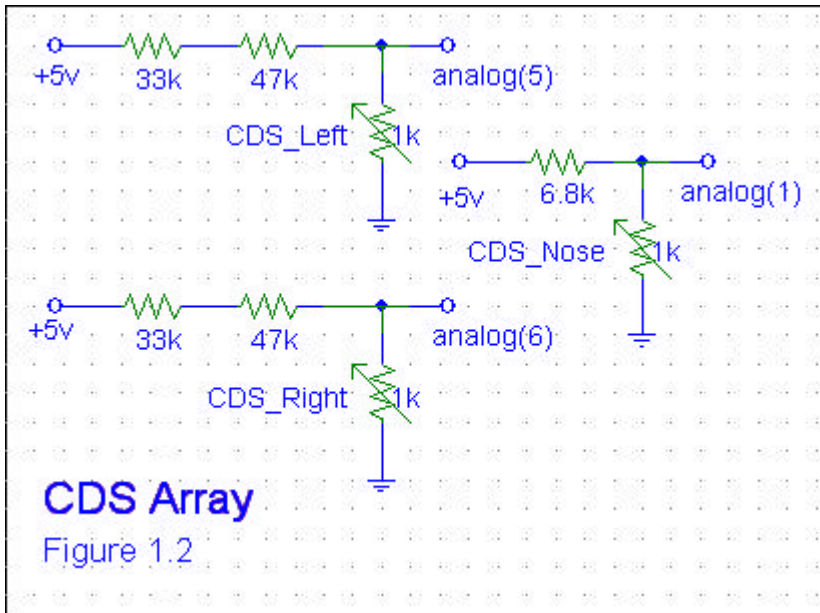
## **Infra-Red Subsystem**

The infra-red detection subsystem consists of IR emitters and detectors. The system measures the amount of IR light present in its path and determines if an object is present. The emitters are modulated at 40kHz in hardware, they produce a wavelength of 940nm. The detectors are tuned to 'see' that wavelength to attempt to prevent noise from other light. They have also been modified to produce an analog signal (in their original form a digital signal was produced). Trans Am has three forward looking IR detectors and three forward spraying emitters. The emitters are shielded with black tubes to focus a controlled beam of light in the desired direction. The forward most IR emitter projects a beam from the center nose of the car. A high mounted detector looks forward for direct path collisions. The other two emitter/ detector combinations are mounted in front of the front wheels. They are vectored outward away from the car. This configuration provides vision for both obstacle avoidance and wall following.

## **Tracking Subsystem**

The tracking subsystem consists of two major elements: the cadmium-sulfide (CDS) cells and the ground illumination system. The entire array is mounted under the front section of the vehicle. It is contained in a shielded box constructed as part of the body and sealed.

The CDS cells react with light and function as variable resistors. They are biased with resistors in a voltage divider configuration. They provide an analog signal with the signal magnitude directly correlating to the amount of light present on the sensor. The



cells are shielded a step further. They are recessed in black tubing so the only light that could reach them would have to be reflected off of the floor directly below.

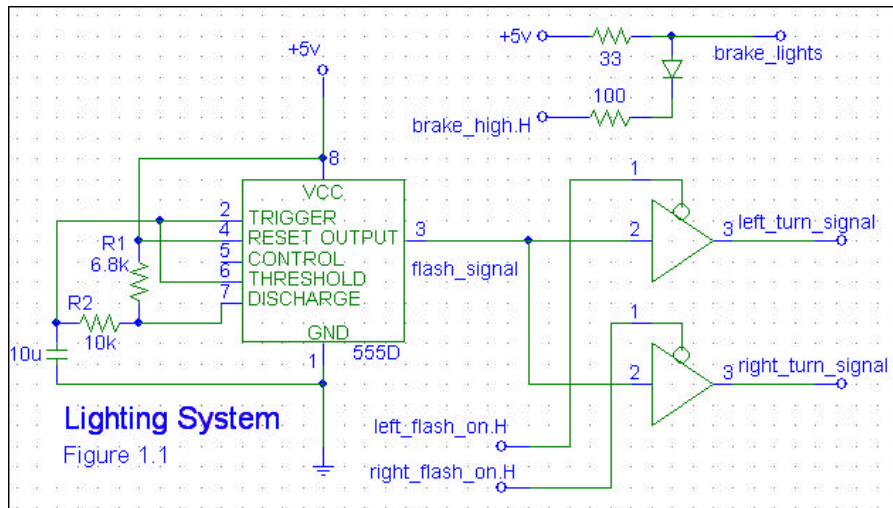
The ground illumination system consists of five green light emitting diodes. They provide a constant light source underneath the shielding and are angled to reflect into the protective tubing that contains the CDS cells.

### Collision Detectors

Bumpers are present on all four of Trans Ams sides. They are all connected through on analog port on the board. Each consists on momentary switches wired in parallel. The bumpers are mounted to the switches themselves, and work well for moderate speed collisions. From each bumper assembly an input to the differentiating resistive network is formed. The differentiating network is set of resistors of unique values in a voltage divider configuration. This network is part of the MTJPRO11 board, it is well documented in the literature for the board.

## Lighting System

Trans Ams turn signals and brake lights are controlled from within the lighting system. A separate board was built using one of the output expansion ports of the MTJPRO11, in conjunction with a latch. The signals in the latch control tri-state buffers



which in turn either allow the lights to be on off. The flashing circuit is an RC network built from the 555 integrated

circuit. The brake circuit is a voltage divider using a diode to control output based in signal from the microprocessor.