

Automatic Railway Gate Controller with High Speed Alerting System

The main aim of this project is to operate and control the unmanned railway gate in the proper manner in order to avoid the accidents in the unmanned railway crossing. In a country like ours where there are many unmanned railway crossings, accidents are increasing day by day. These train accidents are due to the absence of human power in the railway. In order to overcome the accidents due to the above problem we have planned to design the project.

Automatic Railway Gate Control System with High Speed Alerting System is an innovative circuit which automatically controls the operation of railway gates detecting the arrival and departure of trains at the gate. It has detectors at the far away distance on the railway track which allows us to know the arrival and departure of the train. These detectors are given to microcontroller which activates the motors which open/close the railway gate correspondingly.

Another feature of this circuit is that it has an intelligent alerting system which detects the speed of the train that is arriving. If the speed is found to be higher than the normal speed, then the microcontroller automatically activates the alarm present at the gate. This alerts the passengers at the railway crossing on the road about this. Also This circuit has the feature for Identification of train from other intruders i.e, animals etc .This can be implemented in manned level crossings also, as manual errors can be eliminated by automation.

Circuit Diagram of Automatic Railway Gate Controller:

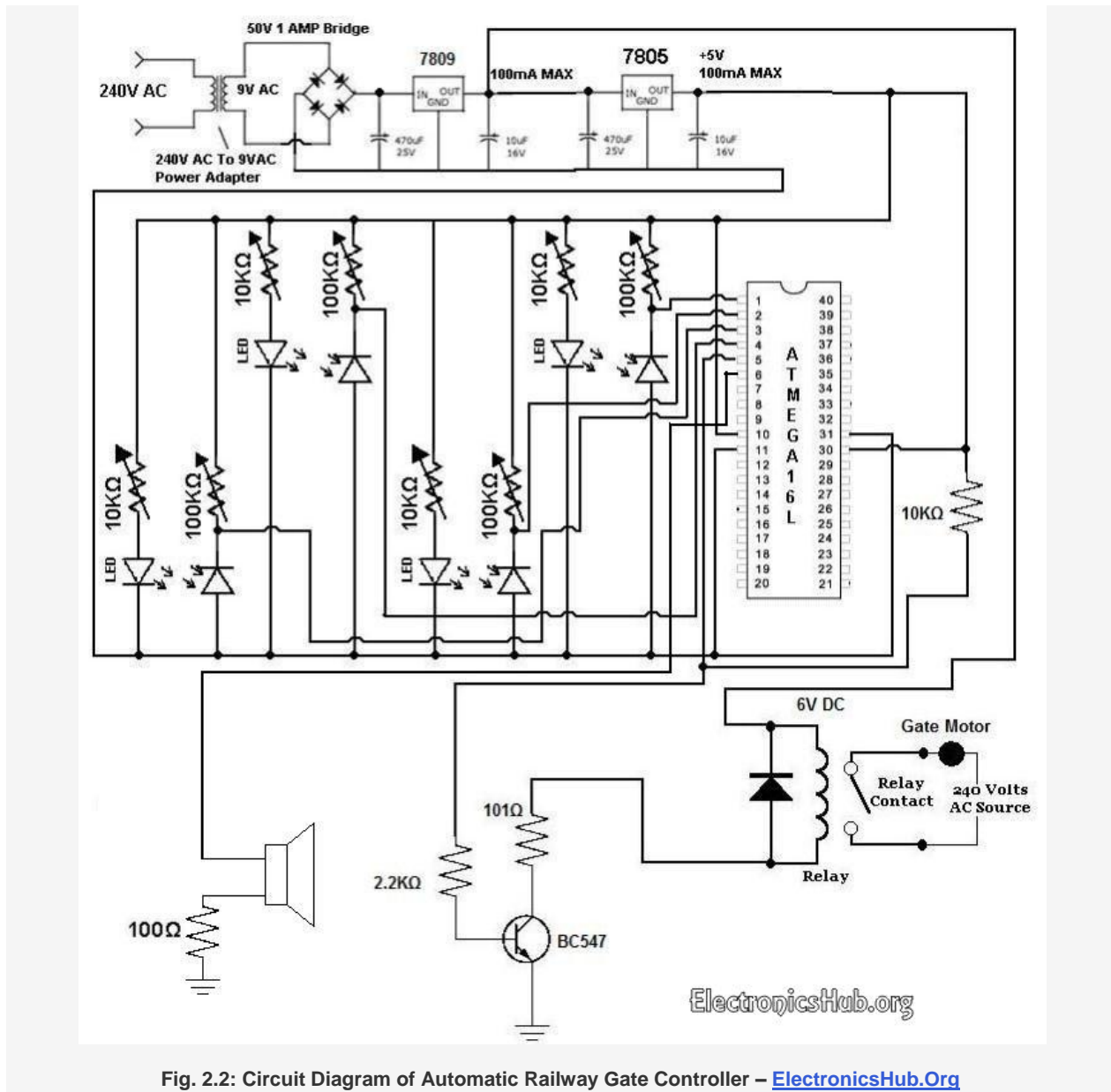


Fig. 2.2: Circuit Diagram of Automatic Railway Gate Controller – ElectronicsHub.Org

Circuit Operation:

The operation of the circuit can be clearly explained as follows. Basically the circuit consists of four IR LED-Photodiode pairs arranged on either side of the gate such that IR LED and photodiodes are on either side of the track as shown in the figure below.

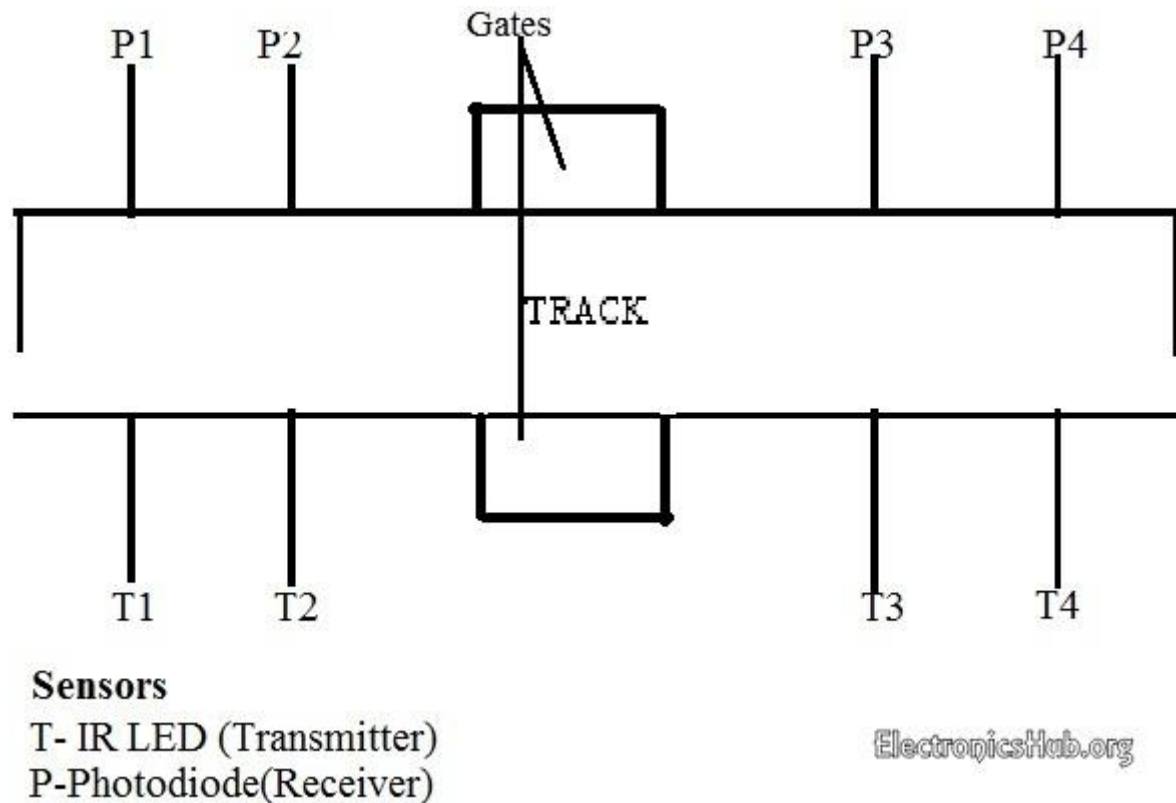


Figure 2.3: Sensor Arrangement – ElectronicsHub.Org

Initially transmitter is continuously transmitting the IR light which is made to fall on the receiver. When the train arrives it cuts the light falling on receiver. Let us assume the train is arriving from left to right, now when the train cuts the 1st sensor pair a counter is activated and when it crosses 2nd sensor pair the counter is stopped. This counter value gives the time period which is used to calculate the velocity of the train.

The sensor2 output is sent to microcontroller which makes the relay activate which causes the gate to be closed. Now when the last carriage of the train cuts the sensor4 microcontroller de-activates the relay and gates are opened.

How does the sensor know the last carriage?

Here as previously mentioned the counter value is used to calculate the velocity of the train, which means that every wheel of the carriage cuts the sensor pair within small fraction of time based on its velocity. After the last carriage is passed there is no obstacle to the sensor pair within that fraction of time hence it knows that the train has left.

One more feature of this circuit is detecting a train accurately i.e, there may be a chance that some obstacle (for e.g some animal) may cut the sensor then in such a case the counter is made to run for certain period of time (this time period is set considering the possible lowest speed of train) if the obstacle does not cut the 2nd sensor before this predefined time then this obstacle is not considered as train and gates remain opened.

One more advantage of calculating the velocity of train is, if the speed of the train crosses a limit i.e, if it is traveling at an over speed then the passengers are alerted using a by activating a buzzer.

The system basically comprises two IR LED – Photodiode pairs, which are installed on the railway track at about 1 meter apart, with the transmitter and the photodiode of each pair on the opposite sides of the track. The installation is as shown in the block diagram. The system displays the time taken by the train in crossing this distance from one pair to the other with a resolution of 0.01 second from which the speed of the vehicle can be calculated as follows:

$$\text{Speed (kmph)} = \text{Distance/Time}$$

As distance between the sensors is known and constant, the time is counted by the microcontroller and from this information, we can calculate the speed.

This circuit has been designed considering the maximum permissible speed for trains as per the traffic rule.

The microcontroller is used to process the inputs that are provided by the sensors and generate the desired outputs appropriately.

Source: <http://www.electronicshub.org/automatic-railway-gate-controller/>