

AUTOMATIC CAR WASH SYSTEM WITH PLC

A Project Report submitted in partial achievement of the
requirements for the Degree of Bachelor of Science (B.Sc.)
Hons. -In
Electrical and Electronics Engineering

Submitted By
MASUD RANA (152-33-2664)
MOHSIN MIA (152-33-2669)

Supervised by
DR. M. SHAMSUL ALAM
Professor and Dean
Department of Electrical and Electronics Engineering
Faculty of Engineering
Daffodil International University



**DEPARTMENT OF ELECTRICAL & ELECTRONIC
ENGINEERING
FACULTY OF ENGINEERING
DAFFODIL INTERNATIONAL UNIVERSITY, MAIN CAMPUS**

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CERTIFICATION

This is to certify that the Project entitled “AUTOMATIC CAR WASH SYSTEM WITH PLC “is finished through the following students beneath my direct supervision and this work has been carried out by means of them in the laboratories of the Department of Electrical and Electronics Engineering below the Faculty of Engineering of Daffodil International University in partial success of the necessities for the degree of Bachelor of Science in Electrical and Electronics Engineering. The presentation of the work was held on

Signature of the Candidate

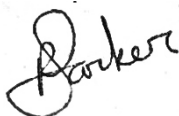


Masud Rana
&



Mohsin Mia

Countersigned



DR. M. SHAMSUL ALAM

Professor and Dean

Department of Electrical and Electronics Engineering

Faculty of Engineering

Daffodil International University

DECLARATION

The Project entitled “AUTOMATIC CAR WASH SYSTEM WITH PLC “ is submitted via two Name: Masud Rana, ID:152-33-2664 and Mohsin Mia ,ID:152-33-2669 session two summer 2015 has been commonplace as first-class two independent success two of the two requirements for the degree of Bachelor two of science in Electrical and Electronics Engineering.

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To Parents and teachers

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ABSTRACT

In the late sixties of the ultimate century, the American company general electric developed the programmable logic controllers (PLC) as an alternative to the complicated relay manage system. With the growing velocity of life, the demand to function duties at a greater pace is being laid out too. In the current world, technology has linked each town, city and united states of America with the different through skill of transportation. This has in the end led to a big amplify in the wide variety of vehicles. To easy these cars there is a want of a proper washing system. The most frequent problem regularly encountered while cleansing these motors is time consumption. Time is a commodity that desires to be managed effectively and correctly in order maximize productivity. Therefore, this mission is developed to minimize the time to clean vehicles. In this automatic car-washing project, we use a conveyor belt on which customer cease the car. When we press a change conveyor belt, begin moving. Sensors are placed on conveyor belt at exceptional places for vehicle detection. When the first sensor senses the car, it stops the conveyor belt and begins a valve simultaneously through water on auto in a similar fashion at specific degrees when a car is detected it will use brushes, soap, and dryer to clean the car. . This is accomplished through imposing a small mannequin of Automatic Car Wash as an application. Fast and Easy PLC Control the object of a PLC simulator is to 'fake out' the enter into a PLC so that the programmer can check and debug the software before set up into its operating environment. Here a number of techniques work in a sequential fashion, in this stage PLCs are used to maintain this sequence. We use PLC for reliable and smooth control journey and use servo driver for extra clean velocity manipulate of servomotor with conveyor.

ABBREVIATION & SYMBOLS

Symbol/Abbreviation	Term
I	Current
V	Voltage
i.e.	That is
I/O	Input and output
LED	Light Emitting Diode
NC	Normally Close
PW	Pulse Width
No	Number
AC	Alternating current
DC	Direct current
A/D	Analog to digital
PLC	Programmable Logic controller
ETC	Etcetera
GND	Ground
NO	Normally Open
RF	Radio Frequency
IP	Internet protocol
PES	Photo Electric sensor
uA	Micro Ampere
GUI	Graphical User Interface
ACW	Automatic Car Wash
HMI	Human Interfacing

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1 INTRODUCTION

1.1 Car wash Antiquity

With the modern convenience of computerized automobile washes, it may be tough to bear in mind that the enterprise was once now not usually so high-tech. Though, different business auto washes got here earlier than it.

1.1.1 History of washing car

The begin of the records of auto washing dated again into 1914. People used manpower to push or cross the automobiles thru stages of the process. Eventually, manual vehicle wash operations peaked at 32 drive-through facilities in the United States. Prior to this time, the evolution of vehicle washing used to be simply .the use of automated pulley structures and manual brushing.

For as lengthy as there have been cars, their owners have desired to preserve them clean, shiny, and looking great. A deep easy from a vehicle wash is the key to making any car seem great.

Car Washes in the Early Days

Of course, the unique car wash for Fredericksburg residents was once a hand wash, whether they did it themselves or paid any person else to do it. This type of car wash could not quite accomplish the equal stage of deep easy as modern day car washes, but it was once a start. Simple automation came in the structure of automobile wash attendants bodily pushing vehicles down the line, as one character soaped, some other rinsed, and another dried — no longer the wash and wax we're used to today!

The Introduction of Automation

While it was not a automobile wash in Fredericksburg that saw the first real automated setup, it used to be a huge step ahead for the industry. That automobile wash, placed in Hollywood, got here about in 1940. Customers arriving for a wash and wax had their motors

hooked up to a winch gadget that pulled the motors through. This kind of auto wash existed in many amenities across the United States.

It was taken one step similarly in 1946 with a conveyor belt system entire with overhead water sprinkler and mechanical blower for drying, opened for the first time in Detroit.

The deep easy process was once computerized even similarly in the 1950s, with a hands-free automated vehicle wash invention. The notion spread across America into the 1960s, with new aspects like recirculating water systems, several tire washing methods, and wraparound brushes. In the 1970s, points like the automated wheel cleaner got here on board.

The New Car Culture of this year

The recession that hit in the 1970s slowed progress, but the Nineteen Eighties were an era of a new automobile culture. Auto detailing and different careful remedy of cars were vital to many. Car washes in Fredericksburg and beyond have been booming with an upward shove in vehicle ownership.

With a greater pastime and possession in cars, car wash technology flourished. The polycarbonate car wash door used to be introduced in the 1990s; a lighter yet nonetheless durable alternative to heavy insulated doors that may want to soak up water over time.

As time marched on, operators added more one-stop save elements that allowed for auto detailing and additional remedies to show up at the identical time and location that they presented primary automobile washing. Customers were capable to surely personalize their experience based on what they desired and needed, something that still holds actual today. More and extra drivers have switched away from doing the work of washing their vehicles at home, realizing the cost and time savings of heading to the car wash instead.

Modern Car Washes in the society

Car washes are ubiquitous these days, positioned all round the globe.

The International Carwash Association notes global annual vehicle wash sales revenues exceed \$24 billion, showing that this is a thriving industry!

Automation is the norm, and today's buyers have greater preference than ever. At car washes in Fredericksburg, drivers can choose full-service packages, basic, and categorical packages, attended vehicle washes, or self-serve options. At each price point, and at every degree of care, there is a auto wash service that meets these needs.

Drivers can pay with everything from credit score playing cards and money to PayPal and other web- or mobile-based options at some auto washes.

Car wash carrier vendors are focusing on environmental elements such as making sure water reclamation as section of their processes, assembly standards and rules inside their neighborhood areas.

Vehicles are an investment for many people, and, as such, drivers desire to take care of their cars. Car wash provider providers are acknowledging this via making everyday washing affordable, understanding that a good, ordinary deep easy goes a long way in keeping the life of a vehicle..

1.2 Objective and goal of this Project

- Try to minimize Time, Place and Manpower.
- With PLC is very reliable from another control system its realize
- This process must be improved and new step for Artificial intelligence.

1.3 Background of this Project

The current world is moving towards artificial intelligence. People are eager to work very fast and accurate, day-by-day. With this, people are interested in technology that enables people to complete their work.



Figure 1-1 Automatic car wash

People are not able to work for a long time, but due to the requirement of automation technology it is possible to work. The thing of perfect timing and where people are not able to do it, there is also Automation Technology that has the ability of people at hand. Automatic car wash is a system consisting of a few steps where the entire car is automatically cleared. Before this would require a lot of manpower in this system, but due to Automatic Car Wash, it is possible to manage a very small amount of manpower. Through this project it is possible to complete every step at a very short time and accurately. There is also a very small amount of space available in this project. The whole system of this project is very loyal, where it was very difficult to do this work with manpower. This complete work can be done through less time, less space, accurate process, reliable process, less labor, through automation technology (PLC).

1.4 Type of Automation Process system



Figure 1-2 Industrial Automation

Information technology comes in two principal flavors: automation and consumer interfaces. Technologies such as facts visualization, conversation equipment and digital media are examples of person interfaces. Automation equipment typically fall into one of the following categories:

1.4.1 Process Instrumentation system

The automation of business company procedures through way of a central controller that invokes technique steps in response to things to do and data.

1.4.2 Composition process

A method automation approach in which strategies react independently to activities like dancers reacting to cues from music. Choreography many times makes use of a publish/subscribe mannequin for activities whereby an match is published once and all subscribing methods are notified.

1.4.3 Flowing process

Workflow is a usual time length for the semi-automation of techniques that embody both human and automatic steps. In practice, most business enterprise approaches contain human tasks and are no longer full automated. Workflow engines may additionally also use technique orchestration, choreography or both. Humans commonly have interaction with the workflow using interfaces that visualize a undertaking with applicable information..

1.4.4 Commercial Instructions

Rules of automation that are used to direct the glide of processes, validate information or make decisions. Tools such as a business organisation rule administration platform may moreover allow enterprise users to configure rules directly. This approves changes to be made on the fly without the need for heavyweight development and exchange management processes.

1.4.5 Incident Processing

Technologies that observe streams of facts for actionable events. Such activities can be used to set off techniques or notifications.

1.4.6 Mechanism Automation process

Automation that performs bodily work such as manufacturing a product.

1.4.7 Engineering device details

An kind of computing machine mechanization that has best factors such as sensory perception. The time duration robotics also implies machines that are adaptable and bendy enough to cope with a differ of duties.

1.4.8 Choice Processes system

Code that makes industrial corporation applicable alternatives such as the preference to execute a monetary transaction. The time period algorithm implies a stage of sophistication that outcomes from a rigorous diagram process. However, the time period is moreover usually used as a buzzword in techniques that lack concrete which means.

1.4.9 Non-natural Intellect

Artificial Genius is a category of software software that learns. It is widely used for decision automation and robotics.

1.5 Advantages and disadvantages of automation System

1.5.1 Advantages of Automation

Improved working environment

With the use of automation it is feasible to enhance the working conditions and security within your manufacturing process or plant. Automation can reduce fitness and protection risks, cast off guide dealing with and decrease the danger of repetitive stress injury.

Increased competitiveness, income.

Automation allows to you to grow to be more aggressive in your market. This is due to the fact as your production procedure is more automated, human error is reduced, product high-quality end up extra consistent, and value per section goes down due to expanded production speeds and the reduction in sources required to produce the goods.

No labour crisis for washing

Finding labour for mundane, repetitive duties is becoming greater and more difficult, and is possibly to come to be more difficult in the UK after Brexit. two Unemployment in the UK is currently at the lowest it's ever been for the reason that July 1975, so many factories are struggling to locate manufacturing facility workers, particularly for heavy guide work. Automation can remove the want for group of workers to function these kinds of tasks.

Increase manufacturing capacity

Automation increases your production ability as machines can be set to work 24/7 unmanned. Automated machines do no longer have breaks, unwell depart or holidays, and consequently even if they are only walking at some stage in ordinary shift hours, this on my own can often lead to a manufacturing increase of 140%+. Automated machinery can also commonly run faster and produce extra precisely made merchandise with fewer defects.

Compliance consistency

Automated manufacturing is inherently extra constant and accurate in manufacturing quality. In order to meet market demands these days, product pleasant has to be higher and extra steady than ever before, frequently the only way to attain this is with automation. Automated inspection systems can be mounted at the quit of a manual or computerized manufacturing procedure using sensors and imaginative and prescient structures to robotically test products for defects and compliance with specification. two This allows inaccurate merchandise to be rejected, doing away with defects and luxurious product recalls.

Increased manufacturing unit productivity or OEE

With all the benefits of automation in the points above your method will become more streamlined and efficient with lower going for walks expenses and quicker production speeds and higher nice production. This dramatically improves your factory productivity. For some actual lifestyles examples study our testimonials page.

1.5.2 Disadvantages of Automation

Capital expenditure

Whilst automation can show distinctly positive and carry you a high quality ROI, it may also require a pretty high capital cost. That's why, earlier than making a decision we propose thinking about both the investment wished and additionally the ROI you expect to achieve. When calculating the ROI it is essential to encompass accelerated throughput value, reduced labour charges and the discount in defects/recalls along with the capital expenditure before deciding whether or not or no longer there is a commercial enterprise case for investment.

Use Granta's venture builder to locate out how a lot your bespoke automation answer would fee you in just a few minutes.

Gets rid of jobs

It is proper that with the introduction of automation there are some jobs that may grow to be redundant, but this does no longer always have to be a poor implication of automation. Instead of group of workers performing mind-numbing, monotonous or disagreeable tasks, they can be skilled to transfer to working in different areas of your business. Many agencies have discovered that after installation of automation they have viewed income rise, for that reason growing greater jobs in exclusive components of their business.

Bespoke automation becomes redundant

As with any type of machinery, if you exchange your production manner or product you are manufacturing so that a precise laptop is no longer section of the procedure then the desktop turns into redundant. two Therefore it is very essential to future proof any automation you install into your production process. A knowledgeable automation agency will format your automation machine to allow it to be easily tailored to swimsuit changes in your product format or manufacturing process. For example; by way of the use of wellknown bendy automation such as robots, these can be easily used somewhere else in a manufacturing procedure even if the present system will become redundant

1.6 Components used in this project

1.6.1 Programmable Logic Controller (PLC)

PLCs are nice over regular laptop as they were built for harsh industrial environment and have the facility for significant input/output (I/O) arrangements. These connect the PLC to sensors and actuators. PLCs study limit switches, analog method variables (such as temperature and pressure), and the positions of complicated positioning systems. Some use computing device vision. On the actuator side, PLCs operate electric powered motors, pneumatic or hydraulic cylinders, magnetic relays, solenoids, or analog outputs. The input/output arrangements may also be built into a simple PLC, or the PLC may additionally have external I/O modules attached to a laptop network that plugs into the PLC.

1.6.1.1 How a PLC operates in system

The operation of the PLC gadget is simple and straightforward. The Process or CPU completes three processes: (1) scans, or reads, from the enter gadgets (2) executes or “solves” the program logic, and (3) updates, or writes, to the output gadgets.

For the PLC to be useful, it must first have a Program or Logic for the CPU to execute. A gadget engineer or PLC programmer will first create the application good judgment in a programming device (these days it is generally software program running on a personal computer). This good judgment can be written in Ladder Logic, Instruction List, Sequential Function Charts, or any of the IEC languages.

The programmer will then download the program to the PLC. This is usually accomplished via briefly connecting the programmer to the PLC. Once the application is hooked up or downloaded to the CPU – it is usually no longer fundamental for the PC to remain linked

Once the software is in the CPU – the PLC is then set to “run”, and the PLC executes the application program repeatedly. In addition to executing the program, the CPU in many instances reads the status of the input devices, and sends records to the output devices. The Input device senses the popularity of the actual world inputs (a switch, a level, etc.), translates them to values that can be used through the CPU, and writes those values to the Input table. The application program is executed, and writes values to the Output table. The Output gadget then converts the output price to a actual world alternate (motor turns on, valve opens, etc.)

This procedure of studying inputs, executing logic, and writing outputs is referred to as the PLC Scan or Sweep

The CPU constantly Reads Inputs, Solves Logic, and Writes to the outputs (there are different tasks the CPU does – which will be mentioned later). It is essential to understand the scan because it may also dictate how a programmer structures common sense

The manipulate application or application application is saved in memory. As the PLC executes logic, it may additionally read and shop values to memory. The values may additionally additionally be used and refernced by the application program.

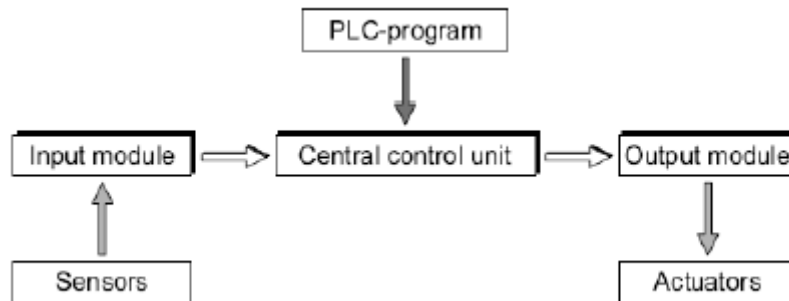


Figure 1-3 how to Operates PLC

1.6.1.2 Advantages of PLC system:

- Easy to trade good judgment i.e. flexibility
- Reliable due to absence of moving parts
- Low power consumption
- Easy upkeep due to modular assembly
- Facilities in fault finding and diagnostic
- Capable of handling of very complex good judgment operations
- Good documentation facilities
- Easy to couple with the technique computers
- Analog signal dealing with and shut loop manage programming
- Counter, timer and comparator can be programmed
- Ease operator interface due to colourographic and advisory machine introduction.

1.6.1.3 Other Auxiliary devices connected To a PLC:

1.6.1.3.1 Input devices:



Figure 1-4 Input device which connected to PLC

Condition Sensors
 Encoders
 Pressure Switches
 Level Switches
 Temperature Switches
 Vacuum Switches
 Float Switches
 Switches and Pushbuttons
 Sensing Devices
 Limit Switches
 Photoelectric Sensors and proximity sensors

1.6.1.3.2 Output Devices for PLC



Figure 1-5 Output device which connected with PLC

Valves
 Motor Starters
 Solenoids
 Actuators
 Horns and Alarms
 Stack lights
 Control Relays
 Counter/Totalizers
 Pumps
 Printers
 Fans

1.6.1.4 Basic requirements for PLC

In order to create or change a program, the following items are needed:

- PLC
- Programming Device
- Programming Software

- Connector Cable

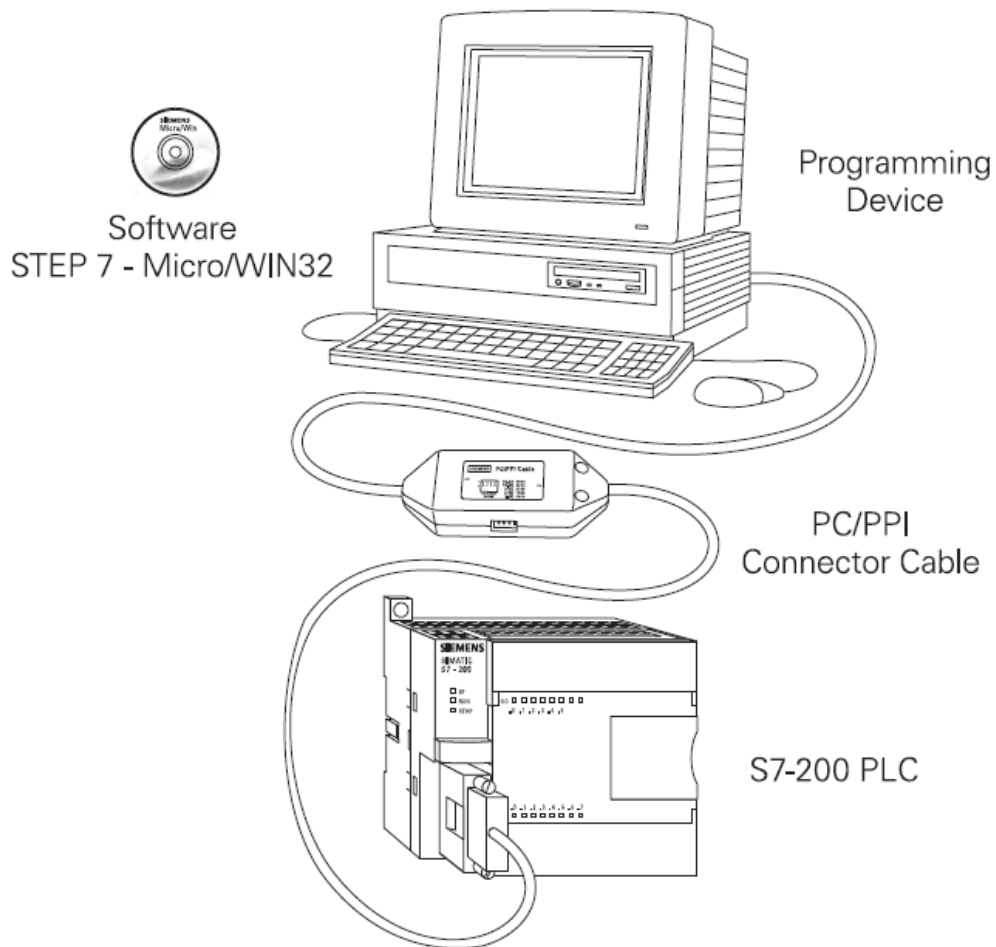


Figure 1-6 Basic requirement for use PLC system

1.6.1.5 PLCs as compared to the other control Systems:

Compare with Relay Control System

By connecting the input and output contacts in collection and/or parallel, any desired logic functions may additionally be produced. Combinations of quite a number good judgment factors may additionally be used to create fairly complicated manage plans. For a easy task, the number of manipulate relays required should be so severa that it can result in a large manipulate panel. A traditional relay machine might also consist of several hundred or thousand switching contacts, which offers the design engineer with a considerable task. It is additionally extremely tough to change the manage feature of a panel once it has been wired up, and is in all likelihood to contain a whole re-wiring of the system. Together with

the other disadvantages of cost, speed and reliability, the above drawbacks for relay control system have led to the replacement of relay control structures via modern choices based on electronics and microprocessors. Relay continues to be used drastically as output devices (actuators) on other kinds of manipulate system, being best for the conversion of small control signals to higher-current/higher-voltage driving signals.

Compare with Digital Logic Control Systems

Digital ICs, which deal solely with binary signals, manner this information through a range of good judgment 'gates'. Logic gates operate at a great deal higher speeds and consume considerably less strength than an equivalent relay circuit. Although digital ICs have the advantage of small size, it cannot switch higher power signal. Relay is used to convert small control indicators to greater energy using signals.

Compare with Electronic Continuous Control System

The operational amplifier (op-amp) handy for analog computing operations, which involve the overall performance of mathematical operations such as integration, differentiation, etc., were quickly adopted into the subject of non-stop manipulate (Closed-loop comments systems) and provided a plenty simplified answer to complicated manipulate features evaluate with existing discrete electronic systems. Analog manage is now closely primarily based on linear built-in circuits, and stays the quickest structure of manipulate available. However, the 'fine tuning' of comments systems in the course of format and commissioning remains a hard task. This, coupled with the fixed nature of digital circuit construction, results in a manipulate medium that cannot effortlessly have its feature changed - the complete electronic device can also have to be replaced if this proves necessary.

Compare with Computer Control System

Today, powerful lower priced micro- and mini- computer systems are available, and are regularly used in both sequence and continuous manipulate systems. Microprocessor-based manage panels are small sufficient to detect at (or near) the point of last control, simplifying connection requirements. In massive processes it is now frequent for various microcontrollers to be used rather of a single massive mainframe manage computer, with ensuing advantages in performance, fee and reliability. Each micro can provide most efficient local control, as nicely as being in a position to ship or receive manipulate data through different microcontrollers or a host supervisory laptop (mini or micro). This is termed disbursed control and permits for greater sophistication of manage than was with a centralized method using a single giant computer, in view that the manipulate characteristic is

divided between numerous devoted processors

1.6.2 Human Machine Interface (HMI)

An acronym for Human Machine Interface. An HMI is a software program utility that provides records to an operator or consumer about the state of a process, and to accept and put in force the operators manipulate instructions. Typically facts is displayed in a photograph structure (Graphical User Interface or GUI)

1.6.2.1 HMI Block Diagram

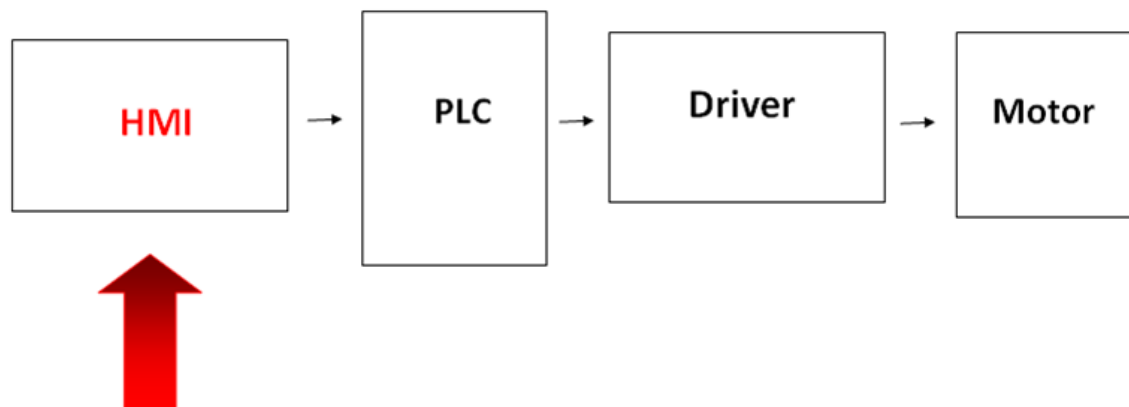


Figure 1-7 Block diagram of HMI system

1.6.2.2 Basic Types of HMI system



Figure 1-8 HMI

There are three indispensable sorts of HMIs: the pushbutton replacer, the records handler, and the overseer. Before the HMI came into existence, a manager would per chance consist of heaps of pushbuttons and LEDs performing specific operations. The pushbutton replacer HMI has streamlined manufacturing processes, centralizing all the aspects of every button into one location. The statistics handler is perfect for purposes requiring regular remarks from the system, or printouts of the manufacturing reports. With the data handler, you ought to make sure the HMI show is massive enough for such matters as graphs, visual representations and manufacturing summaries. The records handler consists of such elements as recipes, data trending, records logging and alarm handling/logging. Finally, every time an software includes SCADA or MES, an overseer HMI is extraordinarily beneficial. The overseer HMI will most likely prefer to run Windows, and have a variety of Ethernet ports.

1.6.2.3 Physical Properties of a HMI



Figure 1-9 HMI Screen

The authentic bodily properties of an HMI fluctuate from model to mannequin and amongst manufacturers. It is vital that one makes the fabulous selection. An HMI that is placed in a water plant would possibly have pretty a wide variety water seals around its perimeter, as opposed to an HMI that is located in a pharmaceutical warehouse. The authentic dimension of an HMI is also a key bodily property that will vary, because no longer all functions require a large, high-resolution monitor. Some features may additionally additionally totally require a small, black and white contact show display screen monitor. When it comes to deciding on an HMI, the physical houses are fantastically integral due to the fact one ought to take into consideration the working environment, and what protection measures the HMI needs to guard itself. Also, a unique size may additionally moreover be wanted due to space limitations. Lastly, bodily houses encompass the processor and memory of the HMI. It is necessary to make certain that the processor and memory skills are adequate ample to manage a system.

1.6.2.4 *How does an HMI Working?*

First replicate on consideration on the specific components that are necessary to make a manufacturing control desktop operate. The manufacturing line consists of all the gear that performs the work required in the production of the product. Next, replicate on consideration on the more than a few input/output sensors that display screen temperature, speed, pressure, weight and feed rate. Third, figure out on the programmable commonsense controller (PLC) that will obtain the records from the input/output sensors, and converts the data into logical combos.

1.6.2.5 *Advantages of an HMI system*

The largest advantage of an HMI is the user-friendliness of the graphical interface. The graphical interface consists of coloration coding that permits for basic identification (for example: purple for trouble). Pictures and icons enable for quickly recognition, easing the problems of illiteracy. HMI can limit the price of product manufacturing, and doubtlessly make bigger earnings margins and decrease manufacturing costs. HMI units are now fairly progressive and succesful of larger potential and extra interactive, intricate aspects than ever before. Some technological blessings the HMI affords are: changing hardware to software, disposing of the want for mouse and keyboard, and allowing kinesthetic computer/human interpla.

1.6.2.6 *Advantage of an HMI over a PLC alone*

The gain to the use of an HMI over the use of simply a PLC is the fact that there are no disadvantages! Using without a doubt a PLC will no longer grant any real-time feedback, can't set off alarms nor modify the system except reprogramming the PLC. The key gain to an HMI is it functionality; an HMI can be used for easy duties such as a espresso brewing controller, or a ultra-modern control unit of a nuclear plant. With new HMI designs emerging each and every day, we are now seeing HMIs that offer remote access, allowing for access of the terminal whilst away. Another reap of an HMI is that the character can in my opinion format the person interface.

1.6.3 **Stepper motor Details**

Stepper motors are type of DC motors that are in many instances used. Stepper motors supply big benefit over traditional DC motors as they may additionally additionally be used for unique positioning in a big range of applications alongside with robotics, automation, printers, copy machines rollers and disk drivers. Stepper motors furnish open-loop, relative feature control. Open loop capacity that, when you command the motor to take forty two steps, it affords no direct plausible of discovering out that it truely did so. The manipulate is relative, meaning that there is no way to decide the shaft position directly. You can only command the motor to rotate a high-quality quantity clockwise or counter-

clockwise from its modern-day position. These "commands" consist of energizing the more than a few motor coils in a special sequence of patterns. Each pattern motives the motor to skip one step. Smooth action would possibly also be sold from supplying the patterns in the applicable order.

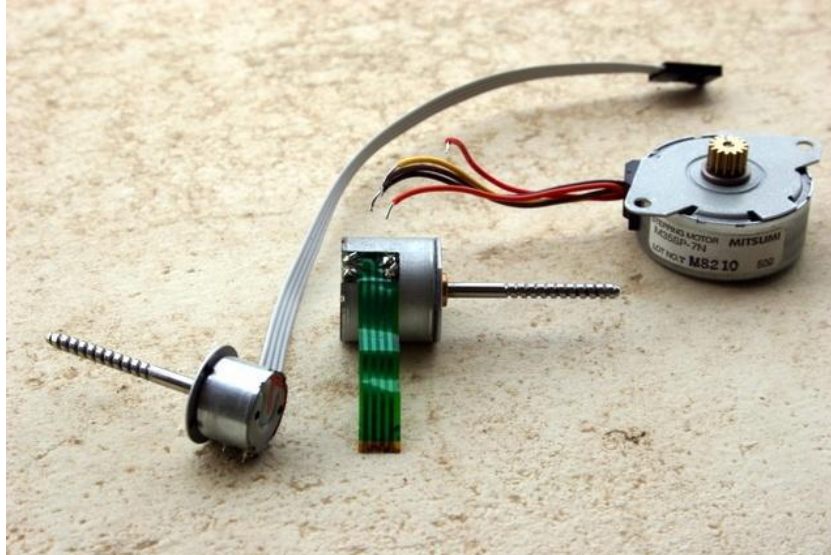


Figure 1-10 Steeper motor view

1.6.3.1 Stepper motor features details:

Stepper motors provides a number of valuable features such as:

- Excellent rotational accuracy.
- Large torque.
- Small size.
- Work well over a wide range of speeds.
- Can be used for motion or position control.

1.6.3.2 Stepper motor various types:

Stepper motors are available in two types:

1) Bipolar motors, with two coils. These have 4 wires on them. They are problematic to control due to the fact they require changing the route of the modern float thru the coils in the perfect sequence.

2) Unipolar motors (used in project). These have six or eight (or occasionally five) wires, and can be managed from a microprocessor. A Unipolar stepper motor has four constant coils arranged round a magnetized rotor, as shown on figure. Typically, the coils are arranged in two centre tapped pairs, on opposing sides of the motor. Driving cutting-edge via any coil will motive the rotor magnet to be attracted to it, and by using sequencing the force cutting-edge although every coil in turn, the motor can be made to rotate continuously. Higher torque can be accomplished if two coils are energized at a time, and by means of alternating between one and two coil power states, half of stepping mode can be realized.

Stepper motors fluctuate in the quantity of rotation delivered per step. Many have indispensable discount equipment trains so that they have even higher angular resolution. Because the motors are openloop, if you do control to mechanically crush the motor and

turn the shaft to a new position, the motor will not try to repair itself to the historical position.

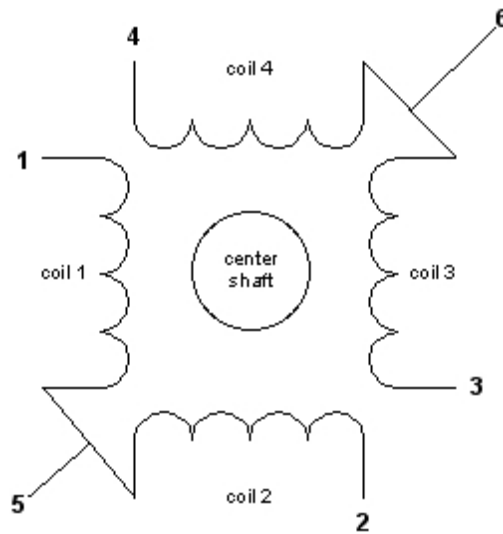


Figure 1-11 Stepper motor coil structure view

1.6.3.3 Details of Stepper motor operation process

To illustrate this, let's consider the unipolar motor. Say that it is Required to rotate the permanent magnet rotor 4 steps in a clockwise direction.

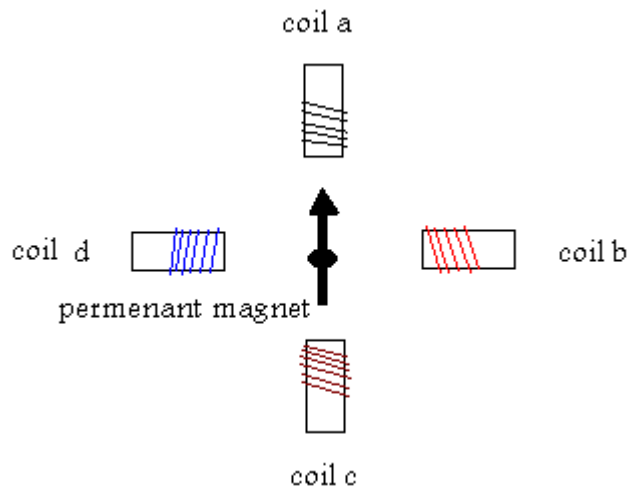


Figure 1-12 Stepper motor internal

At first look, it looks that the easiest way to do this is by way of energizing coil a so that the permanent magnet rotor is attracted to it. Then energizing coil b and cutting the modern from coil a. the energizing coil c and slicing the contemporary from coil b and so on. By this sequence the rotor will rotate in a clockwise direction, to reverse the rotation just follow voltage to coils in a reverse sequence. The method noted above is easy however doesn't manage to pay for the maximum possible torque. Maximum torque is accomplished via energizing two coils at a time so that the rotor is usually between the two coils. Energizing sequences

Step	Coil a	Coil b	Coil b	Coil c
1	1	0	0	0
2	0	1	0	0
3	0	0	1	0
4	0	0	0	1

Step	Coil a	Coil b	Coil b	Coil c
1	1	1	0	0
2	0	1	1	0
3	0	0	1	1
4	1	0	0	1

Table 1.4.5.1 and table 1.4.5.2

Both techniques are known as full-stepping approach because the rotor steps from coil to coil or the midpoint of two coils to the other midpoint. This is in contrast to half-stepping where it is feasible to pass the rotor from one coil to the midpoint subsequent to that coil. This operation mode is proven in table.3. The major downside of this mode is that the torque is no longer constant; when the rotor steps to the midpoint between two coils it experienced double the torque when it is attracted via a single coil. In the first case the cutting-edge strolling through two coils presents the necessary strength for the rotor maintaining torque.

Step	Coil a	Coil b	Coil b	Coil c
1	1	0	0	0
2	1	1	0	0
3	0	1	0	0
4	0	1	1	0
5	0	0	1	0
6	0	0	1	1
7	0	0	0	1
9	1	0	0	1

Table 1.4.5.3

1.6.4 Specification of DC Motor

A DC motor is any of a type of electrical machines that converts direct modern electrical energy into mechanical power. The most frequent kinds be counted on the forces produced via capability of magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic; to periodically change the direction of modern-day go with the go with the flow in segment of the motor. Most types produce rotary motion; a linear motor without delay produces force and action in a straight line.



Figure 1-13DC motor

DC motors have been the first kind appreciably used, due to the truth that they ought to be powered from existing direct-current lights energy distribution systems. A DC motor's tempo can be controlled over a wide range, the use of each a variable furnish voltage or through altering the strength of present day in its discipline windings. Small DC motors are used in tools, toys, and appliances. The normal motor can function on direct present day however is a light-weight motor used for portable strength equipment and appliances. Larger DC motors are used in propulsion of electric powered vehicles, elevator and hoists, or in drives for metallic rolling mills. The introduction of energy electronics has made alternative of DC motors with AC motors viable in many functions.

1.6.4.1 Working of A DC Motor

A motor is an electrical desktop which converts electrical strength into mechanical energy. The precept of working of a DC motor is that "whenever mechanical force". The route of this force is given by means of Fleming's left hand rule and it is magnitude is given by using $F = BIL$. Where,

B= magnetic flux density I = cutting-edge
L = size of the conductor inside the magnetic field.

Fleming's left hand rule: If we stretch the first finger, 2nd finger and thumb of our left hand to be perpendicular to each other AND direction of magnetic discipline is represented by means of the first finger, direction of the present day is represented by second finger then the thumb represents the route of the force experienced via the current carrying conductor.

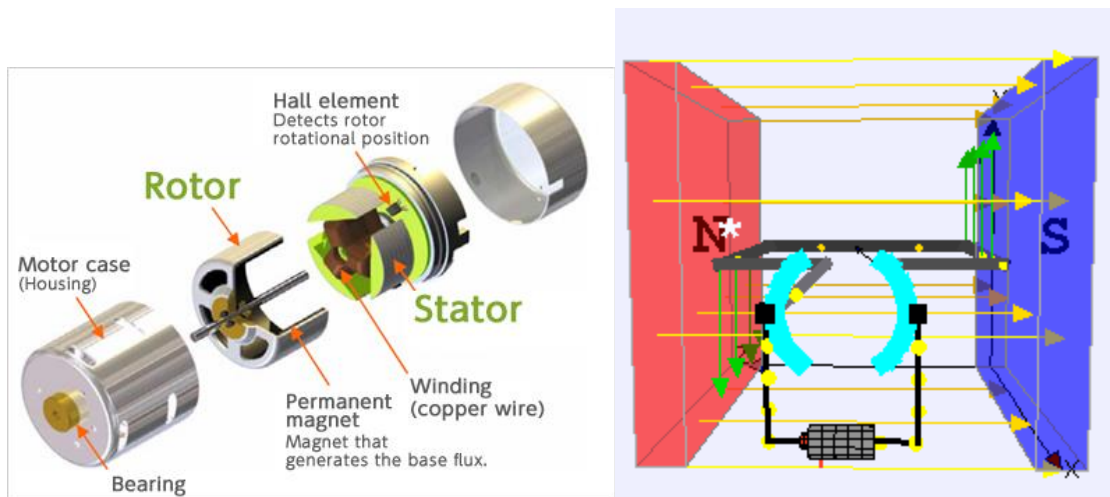


Figure 1-14DC motor internal structure

Above animation helps in understanding the working principle of a DC motor. When linked to a DC supply, current sets up in the winding. Magnetic discipline may also be furnished by discipline winding (electromagnetism) or by using permanent magnets. In this case, modern carrying armature conductors journey force due to the magnetic field, in accordance to the precept referred to above.

1.6.5 Pump motor Details

DC powered pumps use direct present day from motor, battery, or photo voltaic power to cross fluid in a range of ways. Motorized pumps typically function on 6, 12, 24, or 32 volts of DC power. Solar-powered DC pumps use photovoltaic (PV) panels with solar cells that produce direct modern when exposed to sunlight.



Figure 1-1512v DC Water pump

The working precept of a water pump relies upon on the kind of motor – Electric, Centrifugal, Diesel Driven, etc. ... With the opening of action in the pump aspects such as an impeller or piston diaphragm, air is pushed out of the way. A partial low stress is created, which can be crammed up by water.



Figure 1-16 working process of DC Pump motor

WATER PUMP Basic Functions. Water pumps are simple devices. They pressure coolant through the engine block, hoses and radiator to dispose of the warmness the engine produces. It is most oftentimes driven off the crankshaft pulley or in some instances the pump is gear-driven off the crankshaft.

1.6.6 Details of Conveying System

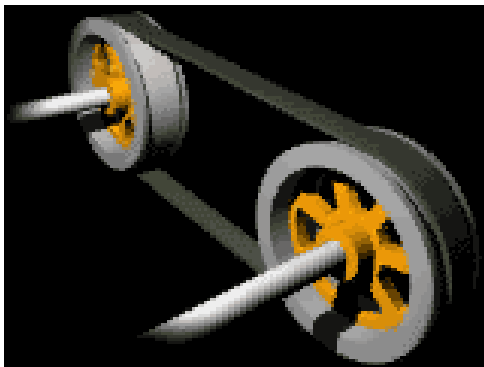
A conveyor laptop is a common piece of mechanical coping with equipment that strikes substances from one vicinity to another. Conveyors are normally useful in functions involving the transportation of heavy or cumbersome materials. Conveyor systems enable rapid and environment friendly transportation for a broad variety of materials, which make them very famous in the cloth dealing with and packaging industries. They additionally have popular customer applications, as they are frequently located in supermarkets and airports, constituting the remaining leg of item/ bag shipping to customers. Many varieties of conveying structures are reachable and are used in accordance to the a range of desires of awesome industries. There are chain conveyors (floor and overhead) as well. Chain conveyors consist of enclosed tracks, I-Beam, towline, electricity & free, and hand pushed trolleys.



Figure 1-17 conveyor system

1.6.7 Details of Conveyor belt Mechanism

the conveyor belt—that rotates about them. One or each of the pulleys are powered, moving the belt and the material on the belt forward. The powered pulley is referred to as



the drive pulley whilst the unpowered pulley is referred to as the idler pulley. There are two principal industrial training of belt conveyors; Those in everyday cloth managing such as these moving packing containers along inside a manufacturing facility and bulk material dealing with such as those used to transport massive volumes of sources and agricultural materials, such as grain, salt, coal, ore, sand, overburden and extra.

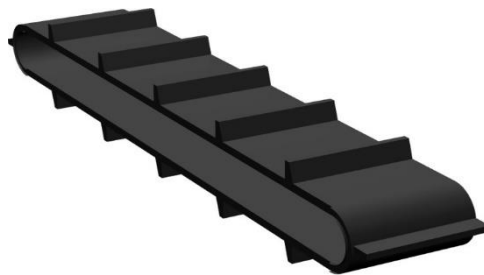


Figure 1-18 Conveyor belt

1.6.8 PE sensor Details

A photoelectric sensor, or picture eye, is an equipment used to discover out the distance, absence, or presence of an object with the resource of the use of a moderate transmitter, frequently infrared, and a photoelectric receiver. They are normally used in industrial manufacturing. There are three superb advisable types: adverse (through beam), retro-reflective, and proximity-sensing (diffused).

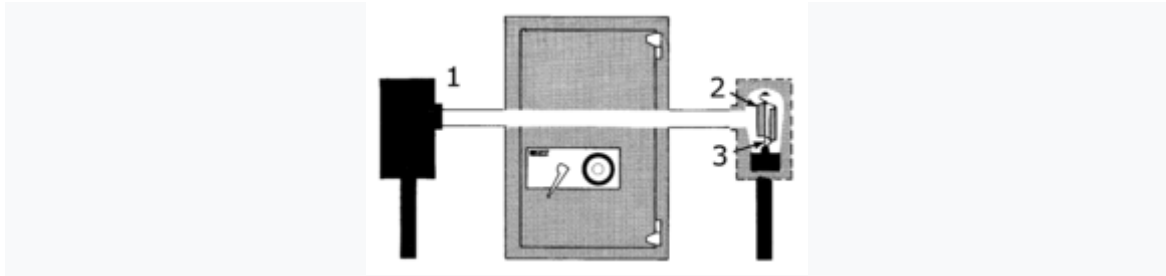


Figure 1-19 photoelectric sensor

Industrial sensors are the eyes and ears of the new manufacturing unit floor, and they come in all sizes, shapes, and technologies. The most standard applied sciences are inductive, capacitive, photoelectric, magnetic, and ultrasonic. Each science has exceptional strengths and weaknesses, so the requirements of the software itself will determine what technological know-how need to be used. This article is targeted on photoelectric sensors and defines what they are, their benefits and some most important modes of operation. Photoelectric sensors are quite simply current in everyday life. They assist safely manipulate the opening and closing of storage doors, flip on sink faucets with the wave of a hand, manage elevators, open the doorways at the grocery store, recognise the triumphing auto at racing events, and so tons more.

A photoelectric sensor is a desktop that detects a alternate in mild intensity. Typically, this skill both non-detection or detection of the sensor's emitted slight source. The kind of light and approach with the aid of way of which the target is detected varies depending on the sensor.

Photoelectric sensors are made up of a mild source (LED), a receiver (phototransistor), a signal converter, and an amplifier. The phototransistor analyzes incoming light, verifies that it is from the LED, and as it must be triggers an output.

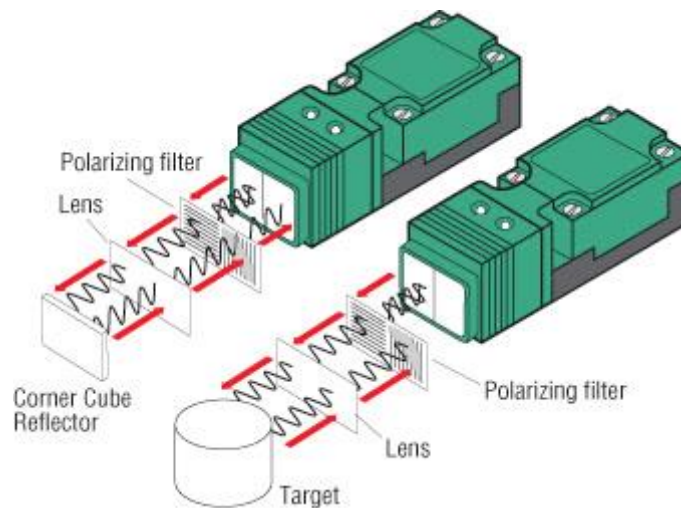


Figure 1-20 photoelectric sensor sensing process

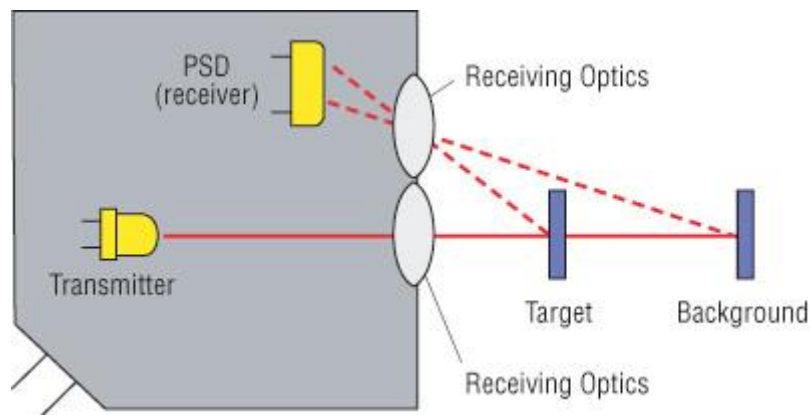


Figure 1-21 photoelectric sensor sensing process

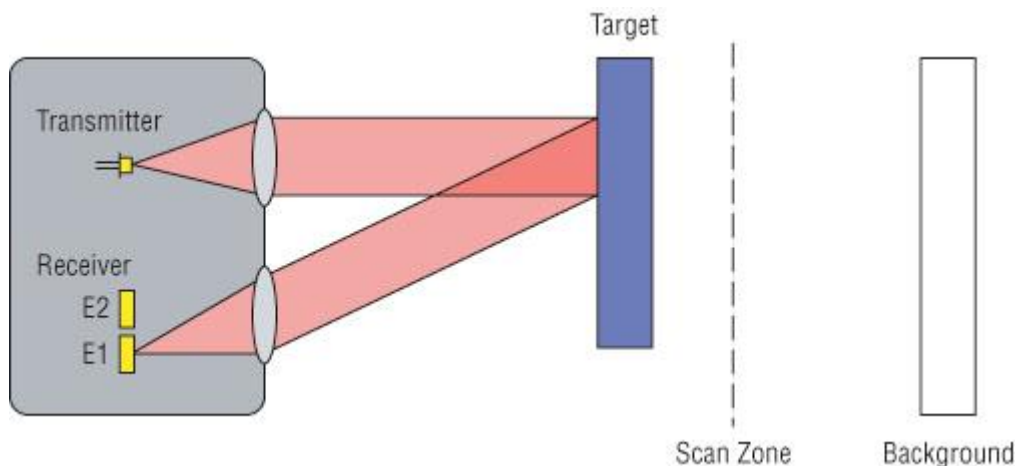


Figure 1-22 photoelectric sensor sensing process

PE sensors offer many blessings when in contrast to other technologies. Sensing stages for PE sensors a long way surpass the inductive, capacitive, magnetic, and ultrasonic technologies. Their small dimension versus sensing range and a unique variety of housings makes them a ideal match for almost any application. Finally, with persistent advances in technology, photoelectric sensors are price aggressive with different sensing

technologies.

1.6.8.1 *Sensing Modes of PE sensor*

Photoelectric sensors grant three essential strategies of goal detection: diffused, retro-reflective and thru-beam, with variations of each.

1.6.8.2 *Diffused Mode of PE Sensor*

In diffused mode sensing, now and again referred to as proximity mode, the transmitter and receiver are in the equal housing. Light from the transmitter strikes the target, which shows light at arbitrary angles. Some of the mirrored mild returns to the receiver, and the target is detected. Because a good deal of the transmitted power is misplaced due to the pursuits attitude and capability to replicate light, delicate mode effects in shorter sensing stages than is potential with retro-reflective and thru-beam modes.

The gain is that a secondary device, such as a reflector or a separate receiver, is now now not required. Factors affecting subtle mode sensing fluctuate encompass the target's color, size, and cease due to the fact these at as soon as have an effect on its reflectivity and therefore its capability to replicate slight again to the sensor's receiver. The desk under illustrates the impact of the purpose on the sensing range for subtle mode sensing.

1.6.9 **Details of Relay**

we would perchance no longer realize it, however you're continually on-guard, staring at out for threats, prepared to act at a moment's notice. Millions of years of evolution have primed your intelligence to store your skin when the slightest chance threatens your existence. If you are the usage of a electrical energy tool, for example, and a tiny timber chip flies in the direction of your eye, one of your eyelashes will ship a sign to your talent that make your eyelids clamp shut in a flash—fast ample to defend your eyesight. What's taking location here is that a tiny stimulus is scary a a lot better and greater really helpful response. You can hit upon the equal trick at work in all sorts of machines and electrical appliances, the vicinity sensors are outfitted to trade matters on or off in a fraction of a second the use of clever magnetic switches known as relays. Let's take a closer appear at how they work!

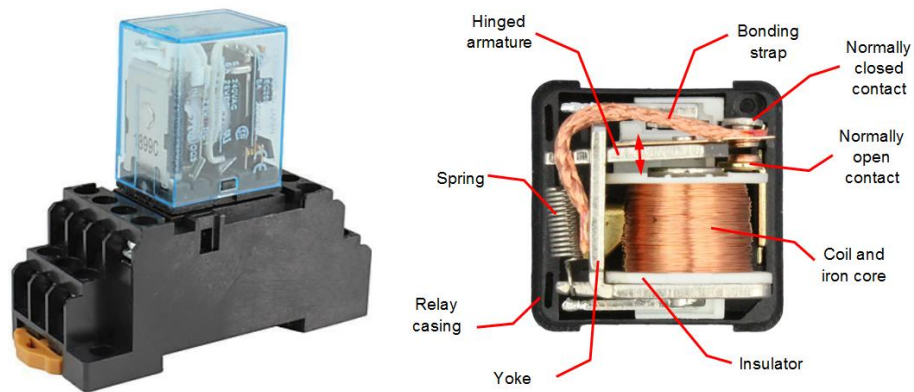


Figure 1-23 electromagnetic relay

1.6.9.1 How relays work in Circuit

When strength flows thru the first circuit, it prompts the electromagnet (brown), generating a magnetic area (blue) that attracts a contact (red) and activates the 2d circuit . When the power is switched off, a spring pulls the contact returned up to its original position, switching the 2nd circuit off once more.

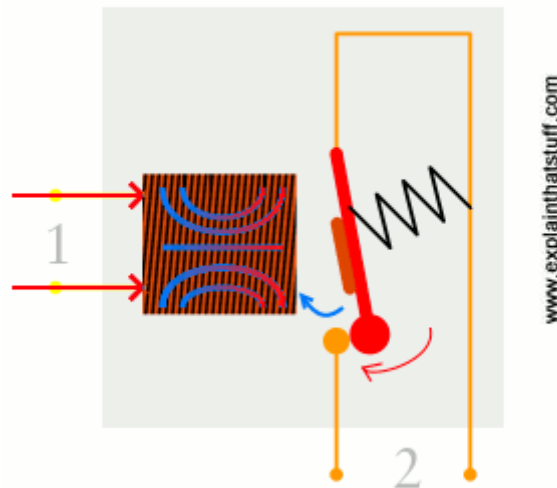


Figure 1-24 Relay operation

This is an occasion of a "normally open" (NO) relay: the contacts in the second circuit are not associated via way of default, and swap on solely when a cutting-edge flows through the magnet. Other relays are "normally closed" (NC; the contacts are connected so a contemporary flows through them with the aid of potential of default) and swap off solely when the magnet is activated, pulling or pushing the contacts apart. Normally open relays are the most common.

Here's another animation exhibiting how a relay hyperlinks two circuits together. It's truly the equal element drawn in a barely fantastic way. On the left side, there is an enter circuit powered via a change or a sensor of some kind. When this circuit is activated, it feeds present day to an electromagnet that pulls a steel swap closed and prompts the second, output circuit (on the proper side). The especially small modern in the enter circuit for that purpose prompts the large modern in the output circuit:

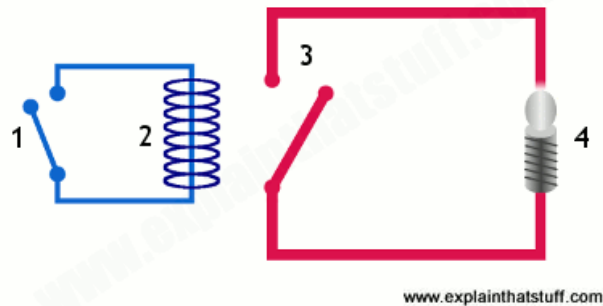


Figure 1-25 Relay operation

1. The enter circuit (blue loop) is switched off and no modern flows through it until some thing (either a sensor or a switch closing) turns it on. The output circuit (red loop) is also switched off.
2. When a small cutting-edge flows in the input circuit, it prompts the electromagnet (shown right here as a darkish blue coil), which produces a magnetic discipline all round it.
3. The energized electromagnet pulls the metallic bar in the output circuit toward it, closing the change and allowing a lots higher contemporary to drift thru the output circuit.
4. The output circuit operates a high-current appliance such as a lamp or an electric motor.

1.6.10 What is CB

A circuit breaker is a switching device that interrupts the bizarre or fault current. It is a mechanical machine that disturbs the waft of high magnitude (fault) contemporary and in additions performs the feature of a switch. The circuit breaker is broadly speaking designed for closing or opening of an electrical circuit, as a consequence protects the electrical machine from damage.



Figure 1-26 Circuit breaker

1.6.10.1 Working principle of relay

. Circuit breaker in fact consists of fixed and moving contacts. These contacts are touching every different and carrying the cutting-edge below ordinary conditions when the circuit is closed. When the circuit breaker is closed, the modern-day carrying contacts, referred to as the electrodes, engaged every different under the pressure of a spring.

During the regular operating condition, the palms of the circuit breaker can be opened or closed for a switching and upkeep of the system. To open the circuit breaker, only a strain is required to be utilized to a trigger.

circuit-breakerWhenever a fault takes place on any part of the system, the time out coil of the breaker gets energized and the shifting contacts are getting apart from every other by means of

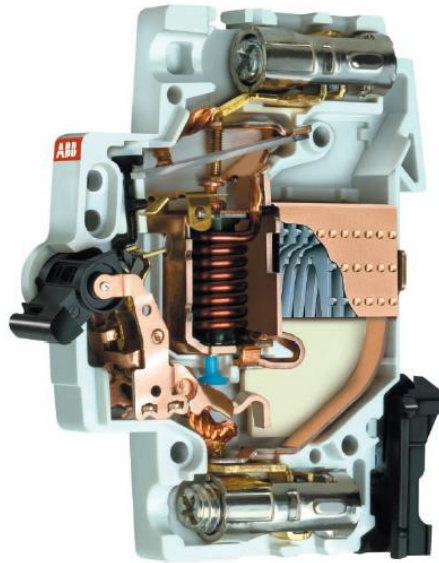


Figure 1-27 A Circuit breaker Internal

The circuit breaker contacts have to lift the load current barring excessive heating, and need to additionally face up to the warmth of the arc produced when interrupting (opening) the circuit. Contacts are made of copper or copper alloys, silver alloys and different quite conductive materials. Service life of the contacts is restricted with the aid of the erosion of contact material due to arcing whilst interrupting the current. Miniature and molded-case circuit breakers are generally discarded when the contacts have worn, but energy circuit breakers and high-voltage circuit breakers have replaceable contacts.

When a high present day or voltage is interrupted, an arc is generated. The size of the arc is usually proportional to the voltage whilst the depth (or heat) is proportional to the current. This arc ought to be contained, cooled and extinguished in a controlled way, so that the gap between the contacts can again face up to the voltage in the circuit. Different circuit breakers use vacuum, air, insulating gas, or oil as the medium the arc varieties in. Different strategies are used to extinguish the arc including:

1.6.10.2 Short-circuit

A quick circuit fault is an accidental phase-to-phase or phase-to-ground connection in an electrical gadget that is triggered by using insulation breakdown, gear malfunction, or human error. Oftentimes, the quick circuit fault causes an extremely excessive level of present day to flow; and (1) electrical equipment need to be capable of withstanding the excessive mechanical and thermal stresses related with the quick circuit current, and (2) interrupting units should be capable of shortly and safely interrupting the short circuit current. Inadequate brief circuit withstand or interrupting capability can lead to catastrophic failure of equipment, posing a risk to facility operations (i.e., electrical outage, infrastructure damage, or fire) and personnel (i.e., electric shock, burns, physical trauma, or death).

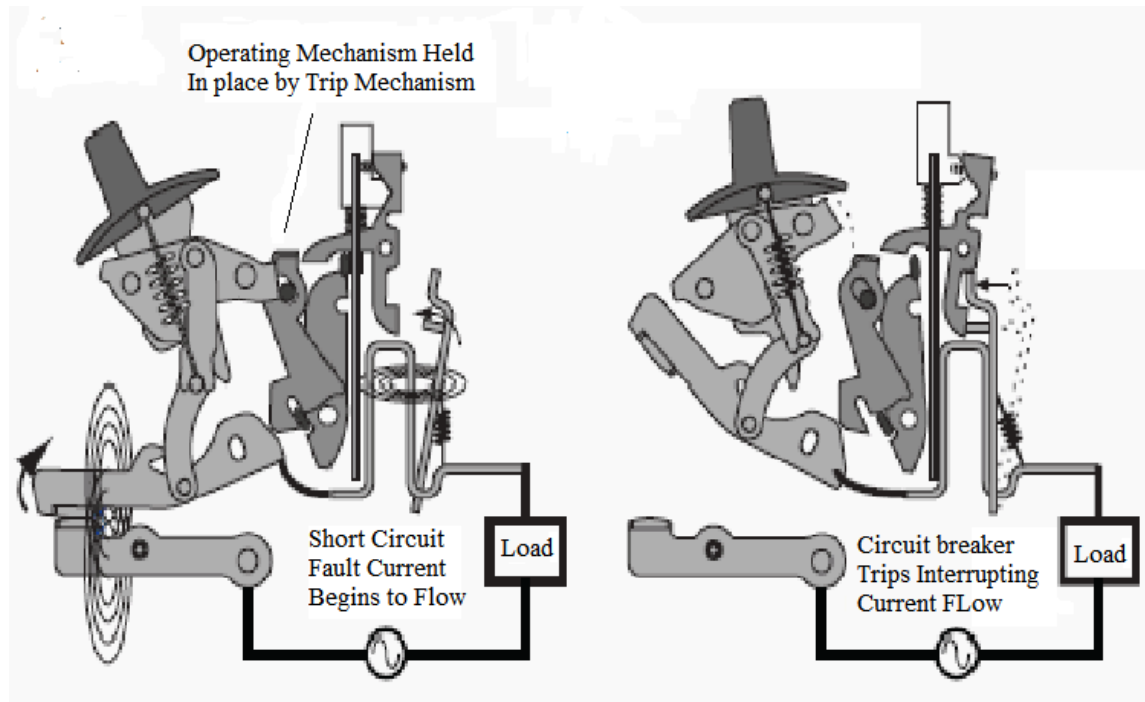


Figure 1-28 Circuit breaker Mechanism

The maximum short-circuit current that a breaker can interrupt is determined with the aid of testing. Application of a breaker in a circuit with a prospective short-circuit current greater than the breaker's interrupting capability ranking may result in failure of the breaker to safely interrupt a fault. In a worst-case situation the breaker might also efficaciously interrupt the fault, solely to explode when reset.

Typical domestic panel circuit breakers are rated to interrupt 10 kA (10000 A) short-circuit current.

Miniature circuit breakers used to guard control circuits or small appliances may also not have sufficient interrupting capability to use at a panel board; these circuit breakers are referred to as "supplemental circuit protectors" to distinguish them from distribution-type circuit breakers

1.7 Car wash flow diagram

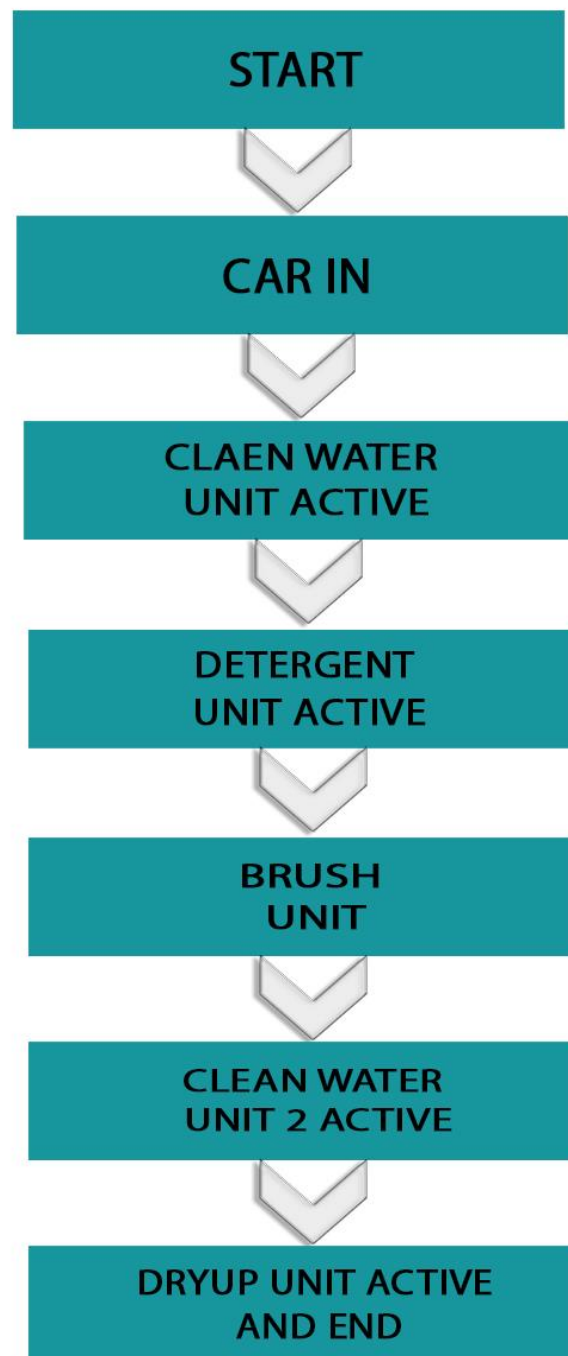


Figure 1-29 car wash flow process

1.8 Block diagram details of this project

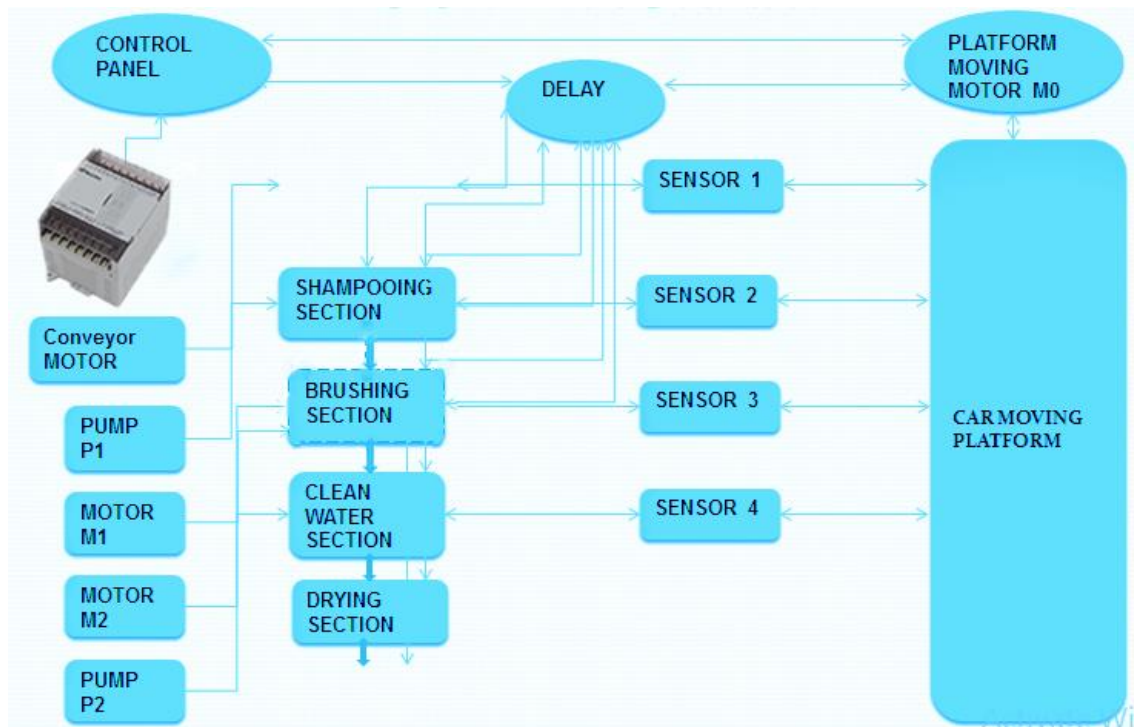


Figure 1-30 Car wash block diagram

1.9 Types of automatic car wash System

- There are unique kinds of computerized automobile wash machine round the world.
- Self-serve vehicle wash
- In-bay automatics
- Exterior conveyor vehicle wash
- Express exterior automobile wash
- Full –service auto wash
- Flex-serve auto wash
- Hand washes
- Driveway Washing

1.10 Advantage of automatic car wash

1.10.1 Environmental benefits of automatic car wash are:

- Lower water consumption
- Less waste
- Recycled water

- More environmentally friendly products

1.10.1.1 Lower Water Consumption in this Washing system

Automatic auto washes are very environment friendly when it comes to water usage. Having repeated the identical project thousands of times, computerized auto washes use an efficient amount of water to get the job done.

When you wash your vehicle at domestic you will use an significant of water, even if you are attempting to be careful. It is estimated that the common auto automobile.

1.10.1.2 Less Waste for washing

Looking at the previous point about water consumption, domestic washes use a extensively large amount of water than auto automobile washes. So, where does the water and cleaning soap go when you wash your car at domestic in the pressure way?

Excess water from a home automobile wash receives absorbed into the ground and flushed down the sewers. So do all the cleansing merchandise you have used. This is now not excellent for the environment. This run off can pollute the nearby water provide and poison the soil.

1.10.1.3 Recycled Water after wash

Conversely, computerized auto washes recycle and reuse their wastewater. But don't worry! They are no longer simply washing your auto with anyone else's soiled water. All recycled water is cleaned and handled before re-use.

1.10.1.4 Friendly Products

Automatic car washes have get entry to to, and consequently use, more environmentally protected cleaning products. This is higher for your vehicle and the environment.

Not solely are the products safer at an auto car wash, however they are additionally amassed after use so they don't seep into the ground and pollute the environment.

1.10.2 Personal Benefits of an Auto Car Wash system

There are a number of private advantages to be loved thru the use of an automated vehicle wash as well. Some examples are:

- Saving time and Money
- A more thorough, gentler clean
- Less put on and tear

1.10.2.1 *Saving Time and Money*

This can be a big for a lot of people. For most of us, there are no longer sufficient hours in the day to accomplish what we hope to get done. Saving time on any assignment can be a extensive bonus.

Most people assume that using an computerized auto wash will be more highly-priced than washing it yourself at home. Once you figure in all the expenses of cleansing products, equipment, water, and time spent, it is honestly no more highly-priced to use an auto service.

Since time is money, you are saving both!

1.10.2.2 *Small Companies and Businesses*

If you are a small enterprise owner, with business enterprise vehicles, computerized car washes are an notable option. Affordability and effectivity make this the smartest choice for organization cars. Making a exact impression is very important, and retaining your vehicle looking magnificent is handy with an auto vehicle wash.

1.10.2.3 *Automatic Car Wash Brampton and Mississauga*

If you are searching for dependable and low cost automated car wash in the Brampton and Mississauga area, In N Out Car Wash and Detailing Centre is a notable choice!

Come take a look at it out today!

2 TECHNOLOGY AND COMPONENT

2.1 Technology use in this project

In this mission we use some of the contemporary equipment and technology tools that is being used for experimental purposes. Here in this chapter we will talk about all these equipment and equipment's

2.1.1 PLC use in this project

Automatic auto wash used in the modern-day world's manage system's most cutting-edge technology, PLC has accomplished our job in this project. Here is the work of PLC Understanding car's location, automatic sections will be introduced accordingly. After understanding Garry's presence, the sensor tells PLC, alongside with PLC logic Understanding the 24-volt output will relay the relay and begin the next section. In this way the complete assignment will manage this PLC alone. WECON PLC has been used in this project, whose configuration is given below,



Figure 2-1 WECON PLC

The LX3V-4TC analog block amplifies the signal from four thermocouple sensors (Type K or J) and converts the facts into 16 bit reading's saved in the predominant unit. Both Centigrade (°C) and Fahrenheit(°F) can be read. Reading decision is 0.4°C/0.72°F of Type K and 0.3°C/0.54°F of Type J. The LX3V-4TC can be linked to the WECON LX3V

sequence Programmable Logic Controllers (PLC). All information transfers and parameter settings are adjusted by means of software control of the LX3V-4TC; by way of use of the TO/FROM utilized directions in the PLC. LX3V-4TC consume 5V voltage from LX3V most important unit or lively extension unit, 90mA present day of electricity supply. Thermocouples with the following specs can be used: Type K, Type J.

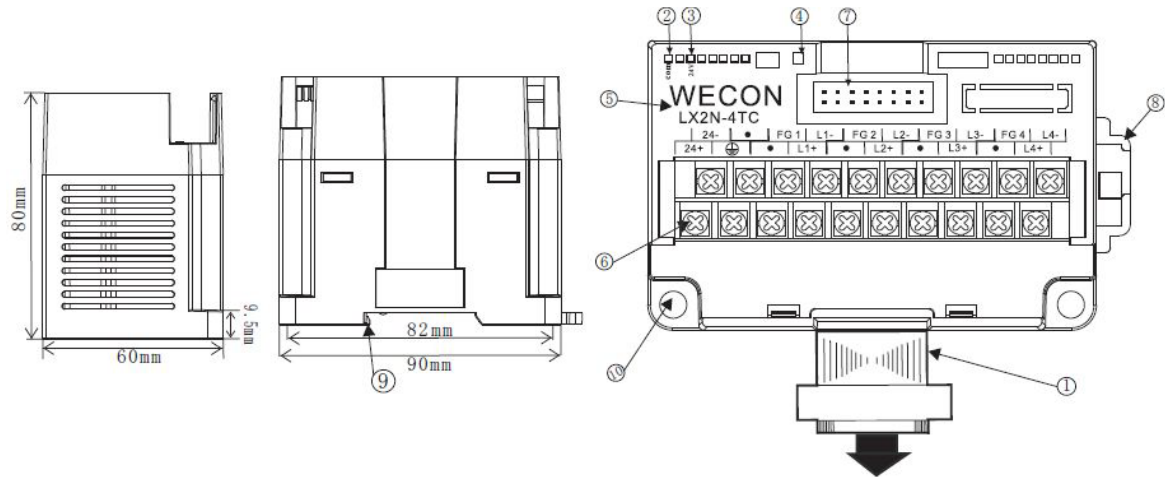


Figure 2-2 WECON PLC internal structure

- | | |
|--|---------------------------------|
| ① Extension cable and connector | ⑥ Analog signal output terminal |
| ② Com LED: Light when communicating | ⑦ Extension module interface |
| ③ Power LED: Light when connect to 24V | ⑧ DIN rail mounting slot |
| ④ State LED: Light when normal condition | ⑨ DIN rail hook |
| ⑤ Module name | ⑩ Mounting holes ($\phi 4.5$) |

2.1.1.1 Install environment

Item	Description
Environment specification	Same as those for the main unit
Dielectric withstand voltage	500V AC, 1min (between all terminals and ground)

2.1.1.2 Power supply specification

Item	Description
Analog circuit	24V DC \pm 10%, 50mA
Digital circuits	5V DC, 90mA (internal power supply from the main unit)

2.1.1.3 Performance specification

2.1.1.3.1 Analog output

Item	Centigrade ($^{\circ}$ C)		Fahrenheit ($^{\circ}$ F)	
	Both $^{\circ}$ C and $^{\circ}$ F are available by reading the appropriate buffer memory(BFM).			
Input signal	Thermocouple: Type K or J (either can be used for each channel), 4 channels,			
Rated temperature range	Type K	-100 $^{\circ}$ C to +1200 $^{\circ}$ C	Type K	-148 $^{\circ}$ F to +2192 $^{\circ}$ F
	Type J	-100 $^{\circ}$ C to +600 $^{\circ}$ C	Type J	-148 $^{\circ}$ F to +1112 $^{\circ}$ F
Digital output	Type K	-1000 to 12000	Type K	-1480 to 21920
	Type J	-1000 to 6000	Type J	-1480 to 11120
	12-bit conversion, save as complement of 2 in 16 bits			
Resolution	Type K	0.4 $^{\circ}$ C	Type K	0.72 $^{\circ}$ F
	Type J	0.3 $^{\circ}$ C	Type J	0.54 $^{\circ}$ F
Overall accuracy	\pm (0.5% full scale +1 $^{\circ}$ C) Freezing point of pure water 0 $^{\circ}$ C / 32 $^{\circ}$ F			
Conversion speed	(240ms \pm 2%) \times 4 channels (unused channels are not converted)			

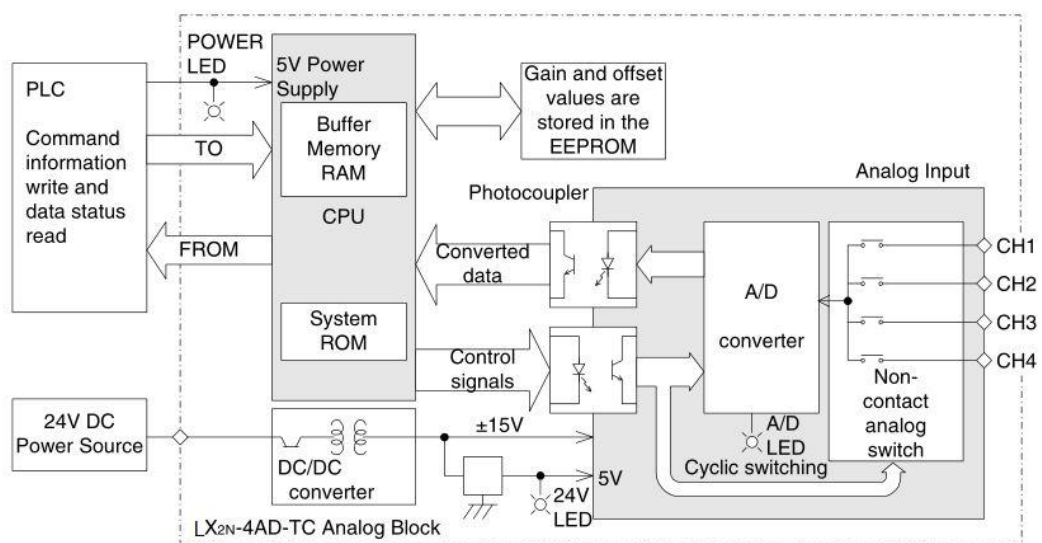


Figure 2-3 System Block diagram of WECON PLC

2.1.2 HMI use in this project

HMI capacity Human Interface, which is in a position to apprehend the language of the person directly. Because every person is no longer conscious of the language of the PLC. In this case, if one has to recognize his language What the PLC wants to say. In addition, that is just feasible by a PLC Expert. In that sense, this HMI machine is going to convey our manipulate machine to the very basic point of view. We have used WECON HMI on this project. The work of which is the whole plant on screen, on-off, the present day nation of the plant, whether there is con faults, now what is going on in the plant, etc. From the show and the show shown Control the plant. WECON used in this project, whose configuration is two given beneath,



Figure 2-4 WECON HMI

2.1.2.1 Centralized monitoring system

Remote view and reveal function : Could take a look at and reveal the machine a long way heaps.

Classification of rights management: Beautiful interface, component, provide higher feel: Exquisite person interface appearance, abundant Materials, make your undertaking gorgeous.

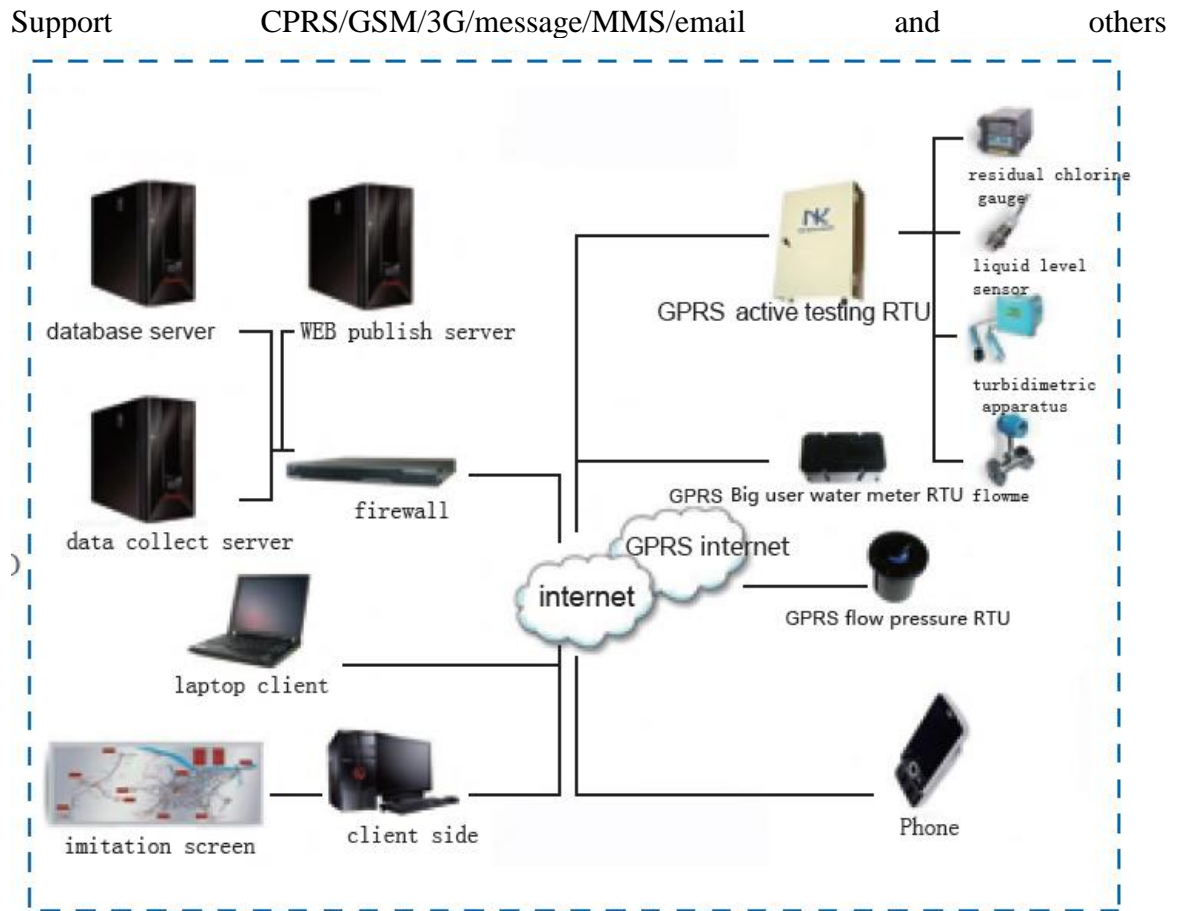


Figure 2-5 Connection of HMI

communication mode: Very high real-time: Adopt new technology, improve the real-time, Security control

2.1.3 Conveyor Motor details

communication mode: Very high real-time: Adopt new technology, improve the real-time, Security manage 11 screen protection level, factor the operation safe.

Our challenge has been made of contemporary technology motor, which can run pretty smoothly. This motor is succesful of carrying the speed as per our requirement

Our assignment has been used

40W single segment motor

Model 90YT40GV22X/90GK10H



Figure 2-6 40W single phase motor 90YT40GV22X

A gear motor can be both an AC (alternating current) or a DC (direct current) electric motor. Most tools motors have an output of between about 1,200 to 3,600 revolutions per minute (RPMs). These kinds of motors also have two high-quality tempo specifications: ordinary speed and the stall- velocity torque specifications.

Gear motors are specifically used to restrict tempo in a sequence of gears, which in flip creates extra torque. This is executed with the aid of capacity of an built-in collection of gears or a equipment discipline being linked to the foremost motor rotor and shaft with the aid of a 2nd discount shaft. The 2nd shaft is then related to the sequence of gears or gearbox to create what is diagnosed as a sequence of discount gears. Generally speaking, the longer the teach of bargain gears, the reduce the output of the end, or final, tools will be. 30 An super instance of this precept would be an electric time clock (the type that makes use of hour, minute and 2nd hands). The synchronous AC motor that is used to electrical energy the time clock will commonly spin the rotor at round 1500 revolutions per minute. However, a collection of reduction gears is used to slow the movement of the arms on the clock. For example, whilst the rotor spins at about 1500 revolutions per minute, the reduction gears permit the ultimate secondhand tools to spin at only one revolution per minute. This is what approves the secondhand to make one complete revolution per minute on the face of the clock.

2.1.4 Motor speed controller

Our task has been used in contemporary science motor controllers, which allow the motor to operate like our advantage. And the motor This motor controller is working except

protection. Our challenge has been used



Figure 2-7 Motor speed controller

2.1.5 DC Motor use in this project

For the clean water section, we have used 12 volt pumping motors. Which is used in 3 devices separately. For the movement of conveyors belt we have used a tools motor. Gear motors are principally used to decrease speed in a sequence of Gears, which in flip creates more torque. It moreover has an enable pin for turning on/off the motor and a course pin for altering the direction. Using the I298 motor driver circuit. It additionally offers the appropriate cutting-edge (maximum 2A), which is required to generate the awesome torque with the aid of capacity of the motor. Our assignment has been used



Figure 2-8 DC motor

2.1.6 Brush Structure make

Using Cupler with a extraordinary brush, we have made a brush section by means of combining it with the motor.

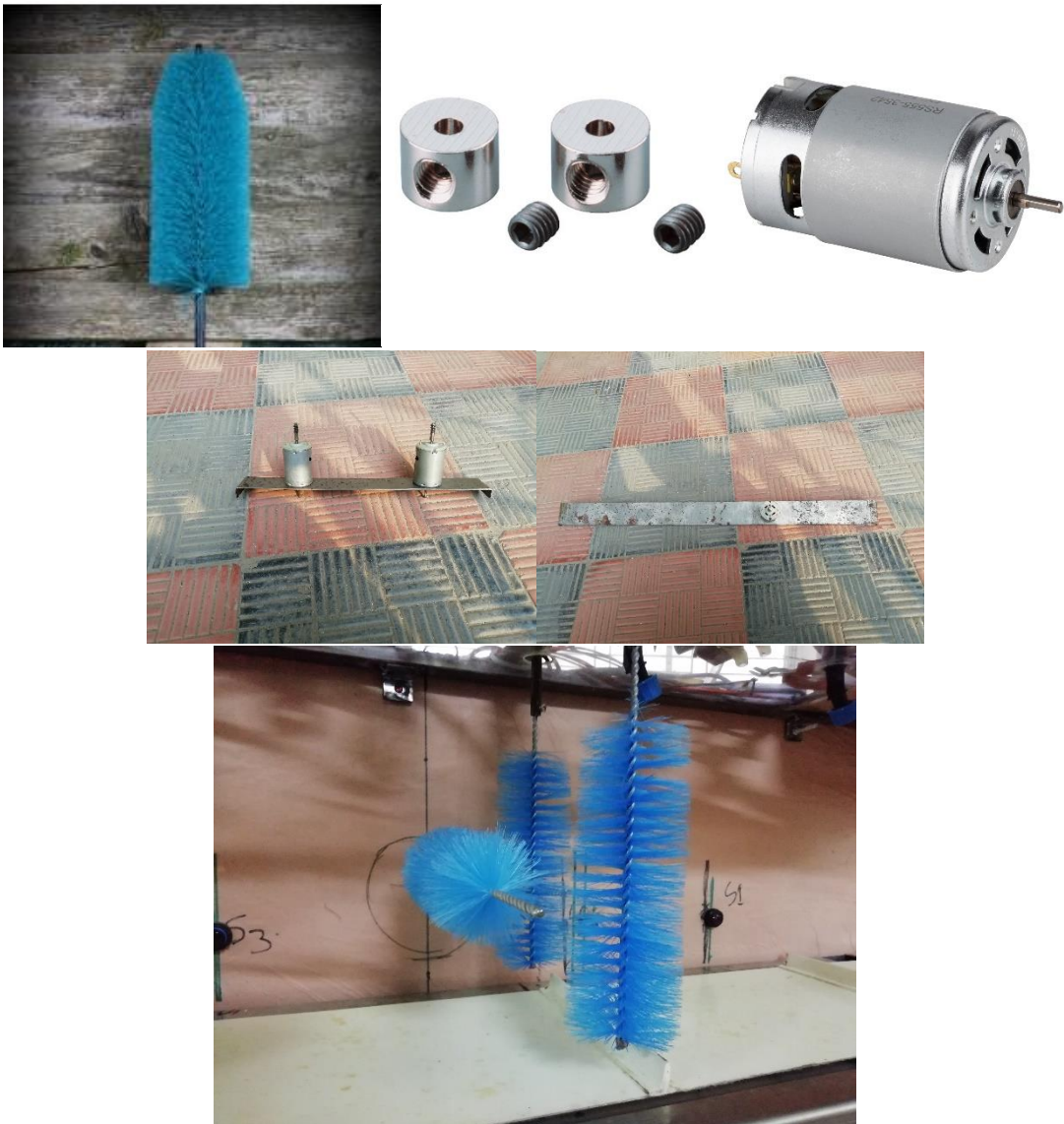


Figure 2-9 brush Section

2.1.7 Pump motor details

For the clean water area we have used 12 volt pumping motors. Which is used in three units separately. Our undertaking has been used



Figure 2-10 DC 12V Pump motor

2.1.8 24v SMPS

Our project uses 24 volt SMPS for PLC input command, HMI power supply, PE sensor power supply. Here is the circuit Protected work is done.



Figure 2-11 24V SMPS

2.1.9 12v SMPS

12 volts SMPS has been used for unit power supply in our project. Here is the circuit Protects and does the work. Our project has been used



Figure 2-12 12V SMPS

2.1.10 PE sensor use

Our challenge has been used in cutting-edge technology Photo Electric Sensor which is 30cm. Able to discover object. The function of the sensor is knowledgeable to the PLC, and for that reason PLC prompts quite a number sections accordingly.

In this gadget for work a completion is finished by Photo Electric sensor. Ultrasonic sensors emit a sound pulse that displays off of objects coming into the Wave field. The mirrored sound, or “echo” is then acquired by the sensor. Detection of the sound generates an output signal for use thru an actuator, controller, or computer. The output sign can be analog or digital. Our venture has been used



Figure 2-13 Photo electrical sensor

2.1.11 DryUP fan

A fan is used as per our requirement, which will help the car to dry after the wash. Our project has been used



Figure 2-14 Dry up fan

2.1.12 Relay using

According to the PLC command, the work of relocation work is done with the help of a number sections. A 12 volt DC relay is used to manage the LED. A 12 volt relay as an alternative of a 5 volt relay has been used to grant isolation to the microcontroller from the LED, which can damage the controller with the aid of capability of drawing large current. That is, according to Car's position, the PLC relay tells that any place have to be commenced.

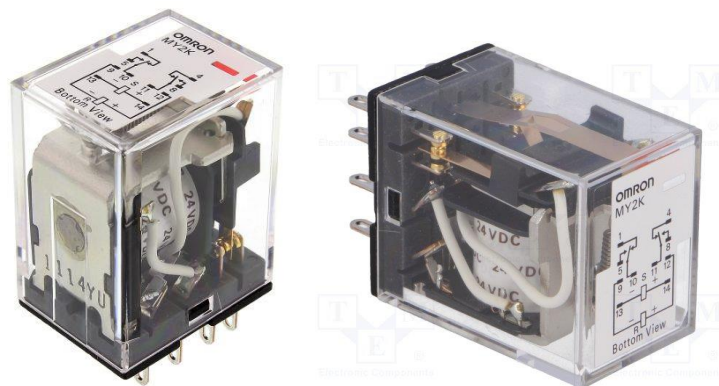


Figure 2-15 relay

2.1.13 Circuit breaker using

Circuit Breaker has been used to preserve the assignment protected from an unavoidable chance from AC Supply. This will also work as a switch to our project's primary supply. Our assignment has been used



Figure 2-16 circuit breaker

2.1.14 On/Off switch

Our project's safety rises in the use of advanced excellent switch. We have used this project in the push button of the world famous schneider business enterprise Switch.



Figure 2-17 on / off switch

2.1.15 Emergency SW

Our project's safety rises in the use of advanced quality switch. In this project we've used the world-famous schneider company's Emergency Switch.



Figure 2-18 emergency switch

2.1.16 AC Indicator lamp

That will show if we have an AC supply of our project.



Figure 2-19 indicator

2.1.17 Wire Connector

We have used the Wire Connector for short circuits and correct connection.



Figure 2-20 connector

2.1.18 Wiring channel

We used it to keep Connecting wire secure and to make control pannel more beautiful. It is PVC plastic.



Figure 2-21 pvc channel

2.1.19 Hose Pipe

We have tried to make cable laying more attractive through this. It is PVC plastic.



Figure 2-22 hose pipe

2.1.20 Cable

We used the different cable types. Different types of cable for AC Sopply, DC supply, Sensor Output, PLC, HMI Connection

Has been used.



Figure 2-23 *electrical wire*

2.1.21 PVC tape

Through this, cable laying has been made easier and has been made attractive.



Figure 2-24 *electrical tape*

2.1.22 Structure

Our project has a lot of iron angle frames on it. Which is cut into many Gul-angle frames and cut into 1 structure has been done .

Below are the different angle size sizes

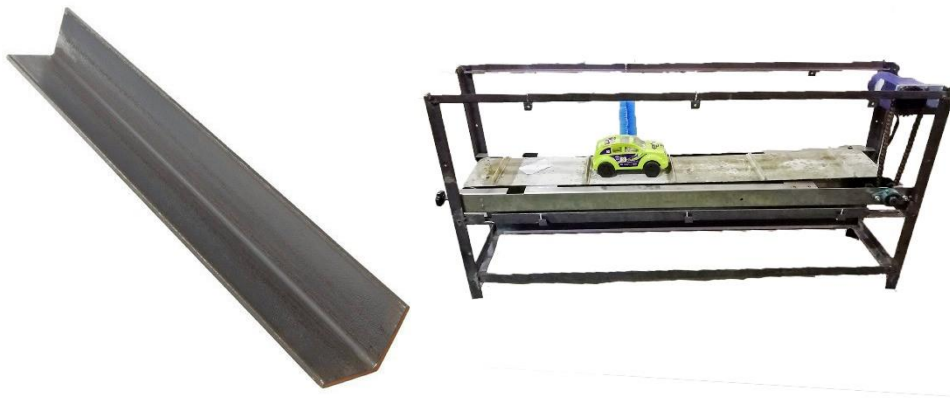


Figure 2-25 iron angle

2.1.23 Flat bar

It has been done by motors for different sections.

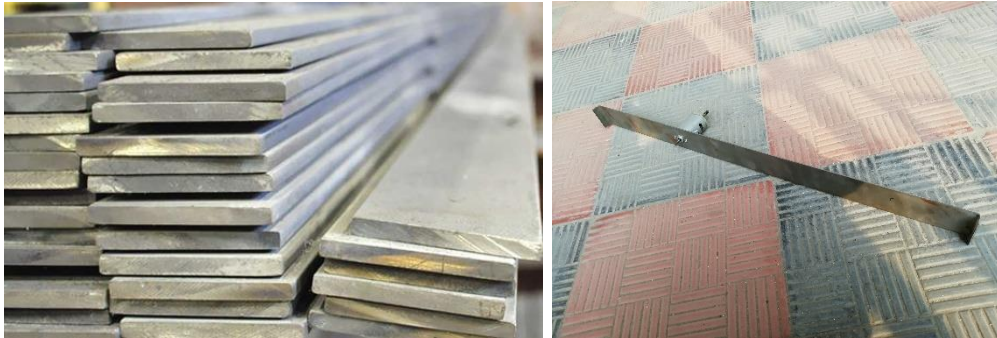


Figure 2-26 flat bar

2.1.24 Acrylic sheet

It has been made with angle frames to make our project attractive through a variety of Acrylic Sheets.

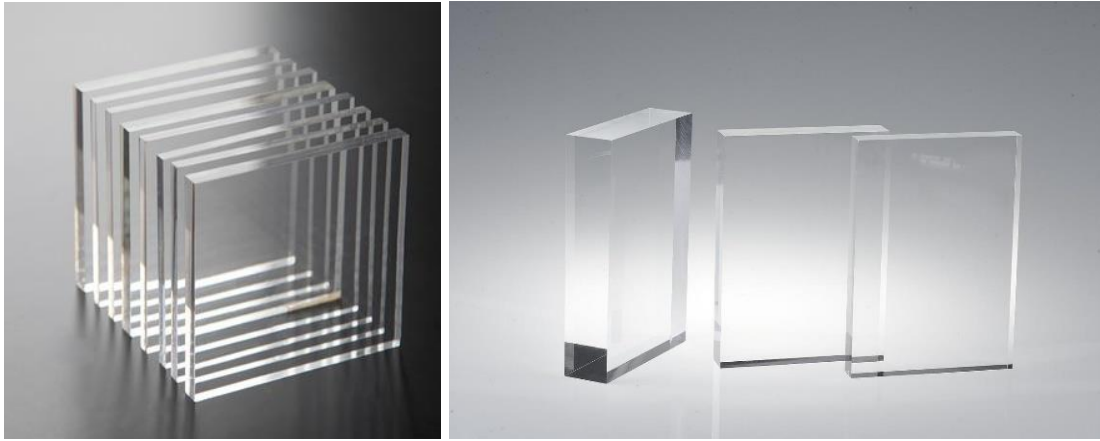


Figure 2-27 Acrylic sheet

2.1.25 Conveyor System

It is made with SS Steel Material, with belt. The belt is made of plastic.

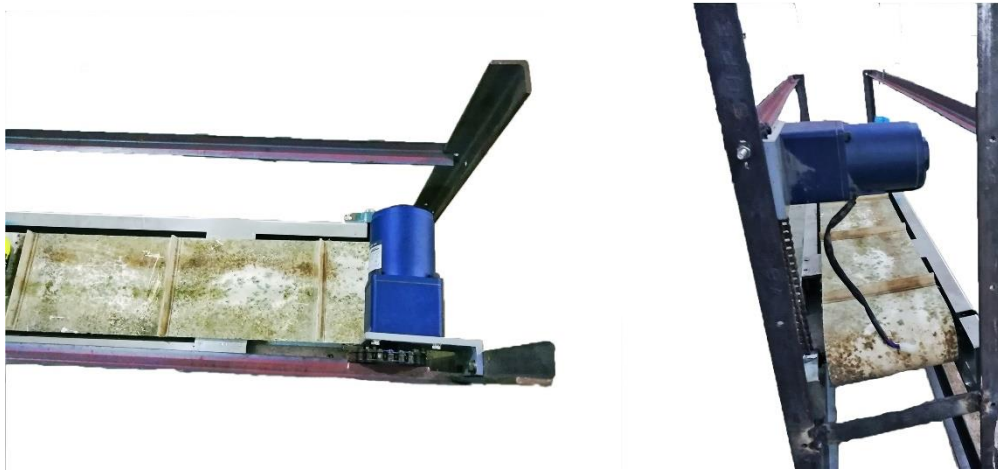


Figure 2-28 conveyor system

2.1.26 Conveyor belt details

The belt is made of plastic. Conveyor belt is connected in the iron shape with pulleys to move vehicle from begin factor to specific ranges for necessary operation. This belt is connected with equipment motor. For manipulate of conveyor movement, it begin transferring when one stage complete its operation and stops when arrives at sensor of every stage to done the quintessential operation.

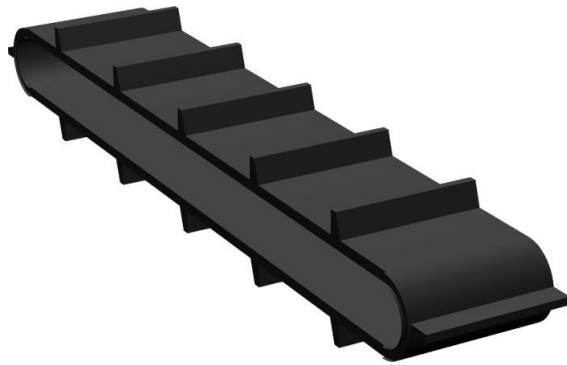


Figure 2-29 conveyor belt

2.1.27 Others Component we use in this project

2.1.27.1 Pumping pipe



Figure 2-30 pumping pipe

2.1.27.2 Masking tape



Figure 2-31 masking tape

2.1.27.3 Nut with bolt



Figure 2-32 nut bolt

2.1.27.4 Screw



Figure 2-33 screw

2.1.27.5 Cable tie



Figure 2-34 cable tie

2.1.28 Control panel



Figure 2-35 Control panel

2.2 Software Uses

2.2.1 Software Overview

2.2.1.1 WECON PLC Editor details



Figure 2-36 WECON PLC software editor

PLC is a digital pc used for automation of typically industrial electromechanical processes; PLCs are used in many machines, in many industries.

It reads exterior enter alerts such as: the state of buttons, sensors , switches and pulse waves , and then makes use of a microprocessor to operate logic, sequence, timing, counting and arithmetic operations, ensuing in the corresponding output sign notably primarily based on the enter sign fame or internally stored fee and pre-written program.

WECON PLC editor makes use of ladder and directions list as programming language.

2.2.1.2 Ladder diagram Programming

Ladder common sense is extensively used to software PLCs, where sequential control of a method or manufacturing operation is required. Ladder good judgment is beneficial for simple however quintessential control structures or for transforming historic hardwired relay circuits. As programmable exact judgment controllers grew to be greater sophisticated it has also been used in very complicated automation systems. It is a graphic language evolution came in relay ladder unique relay manipulate system primarily based completely on the units used in the design, such as buttons X, intermediate relay M, time relay T,

counter C, and so on same residences contact time of electrical device. The ladder as the two

Shows in figure.

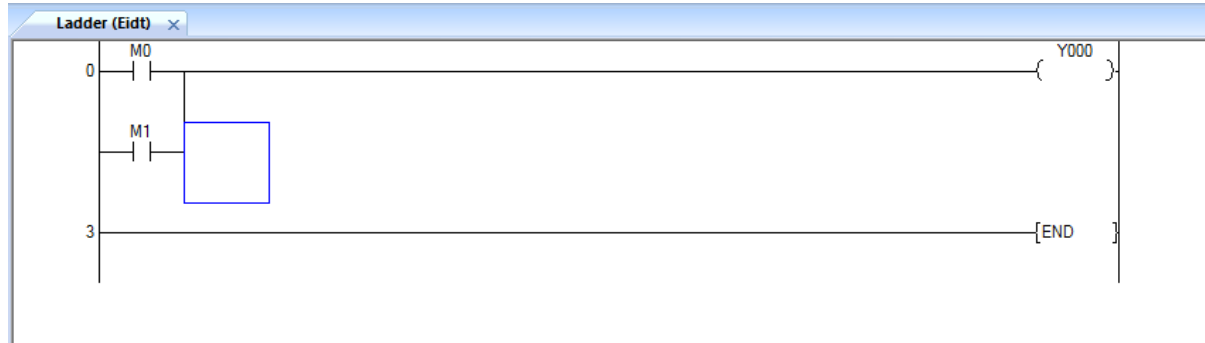


Figure 2-37 Ladder diagram

2.2.1.3 PLC Program Instructions list details

Instruction List (IL) is designed for programmable common sense controllers (PLCs). It is a low diploma language and resembles assembly. All the guidelines and operands are inputted for PLC programming. The IL as the Figure indicates below.

Step	Instruction	Operand
0	LD	M0
1	OR	M1
2	OUT	Y000
3	END	
4		

Figure 2-38 Instruction list

2.2.1.4 Programing switch process

According to their very very own programming practice, customers can swap ladder and training list in order to enhance programming efficiency. There is switch characteristic as Figure indicates.

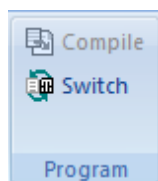


Figure 2-39 Program switch

2.2.1.5 Basic operation

WECON PLC Editor software provides full and powerful functions.

2.2.1.6 Start and exit from software

WECON PLC Editor is a programming device for designing, debugging, and keeping applications on Windows, please start the software program through click on icon on laptop or pick [Start]->[WECON PLC Editor].

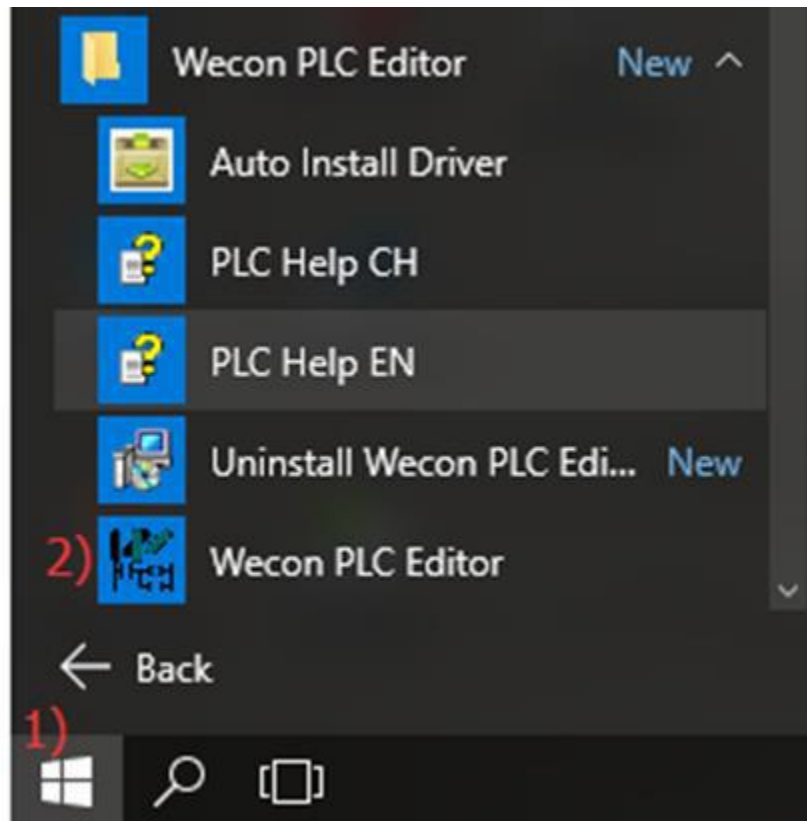


Figure 2-40 WECON PLC Editor

Click [WECON logo] -> [Close] to exit software, if program is no longer saved, software program will ask saving, as Figure 2-2 and Figure 2-3 show.

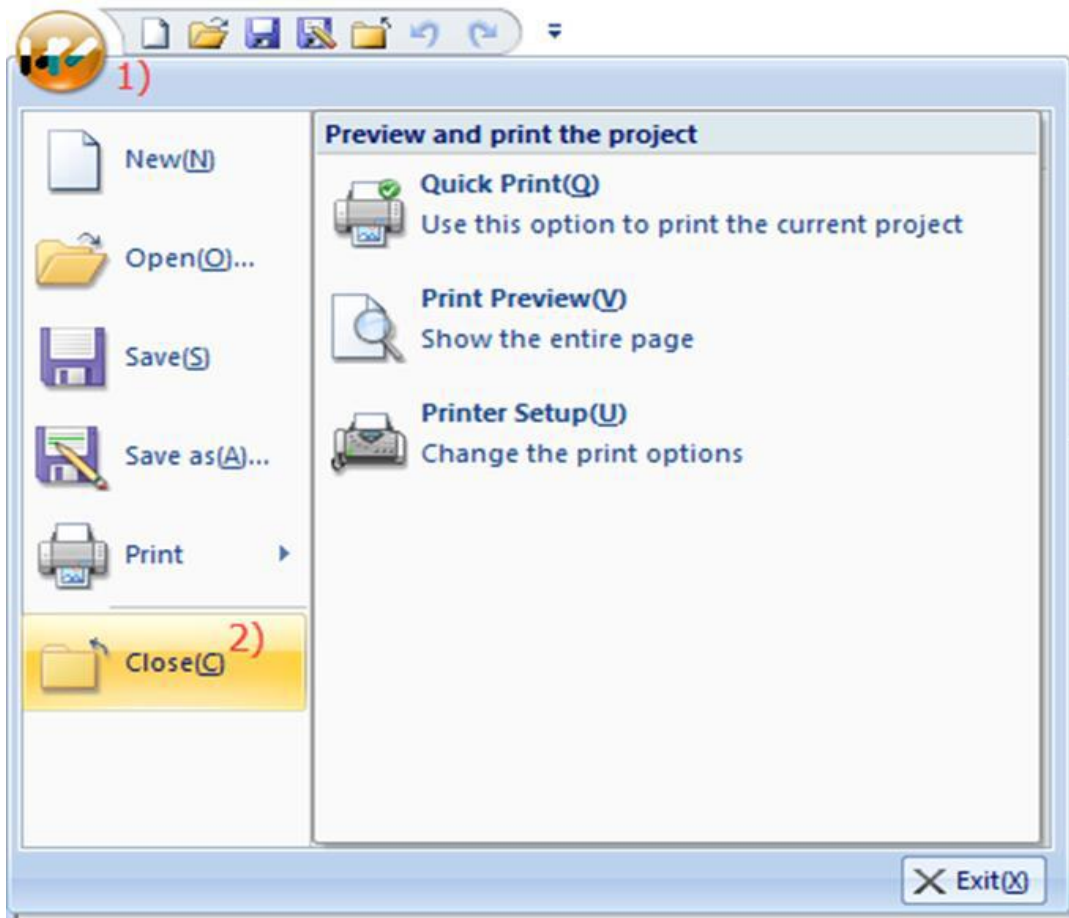


Figure 2-41 WECON PLC Editor

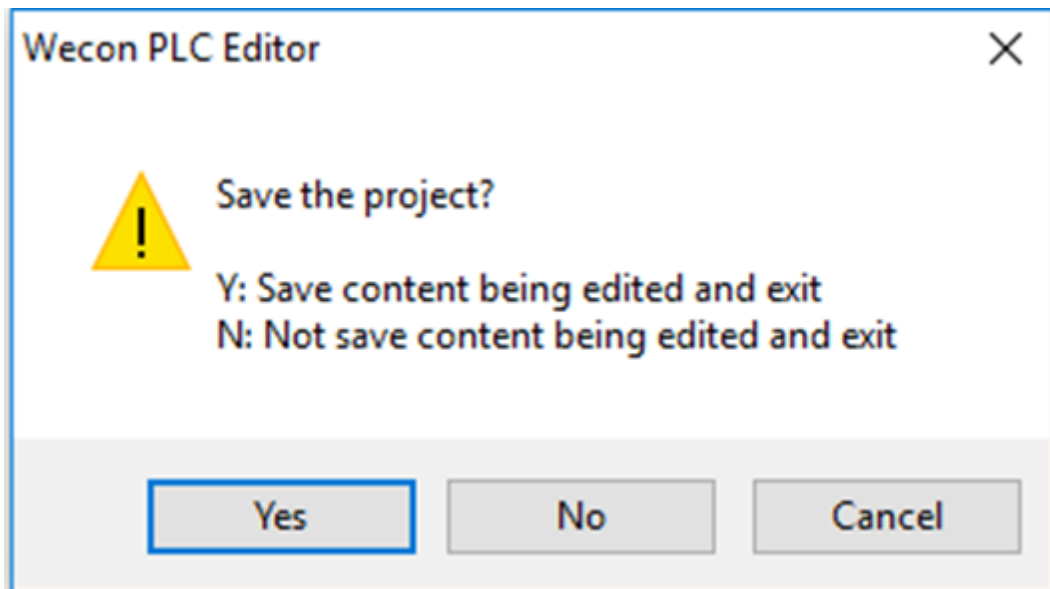


Figure 2-42 WECON PLC Editor

2.2.1.7 PLC Integral structure Introduction process

The Figure indicates WECON PLC Editor Screen, the upper vicinity of main display screen is [Menu Toolbar]; the [Project Manager] on the left of screen; the programming vicinity is on the middle of screen. The low part lists different tools.

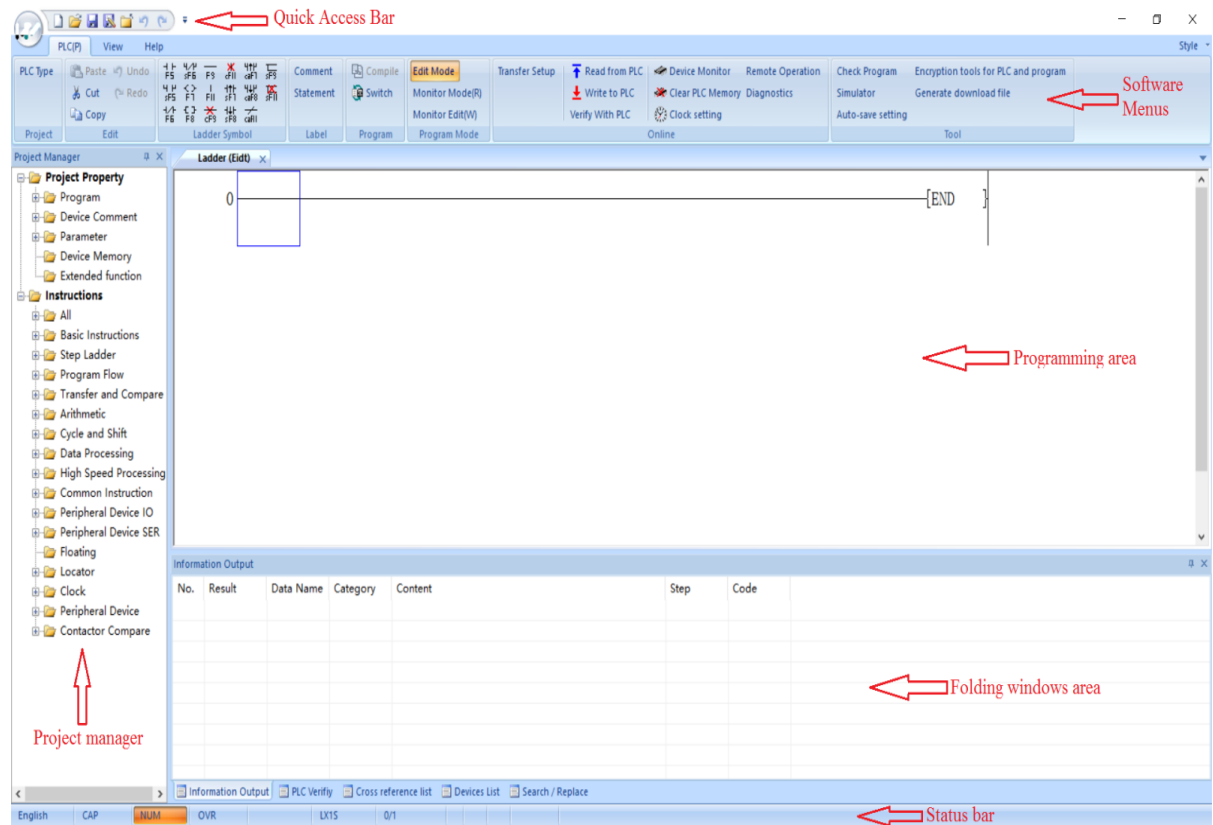


Figure 2-43 Integral structure

Users can adjust the [Project Manager] and other equipment position through themselves.

2.2.1.8 Project Toolbar details

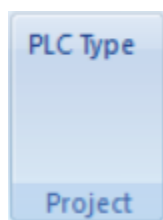


Figure 2-44 Toolbar

User can trade the PLC kind for software by way of click [PLC Type] in [Project] toolbar.

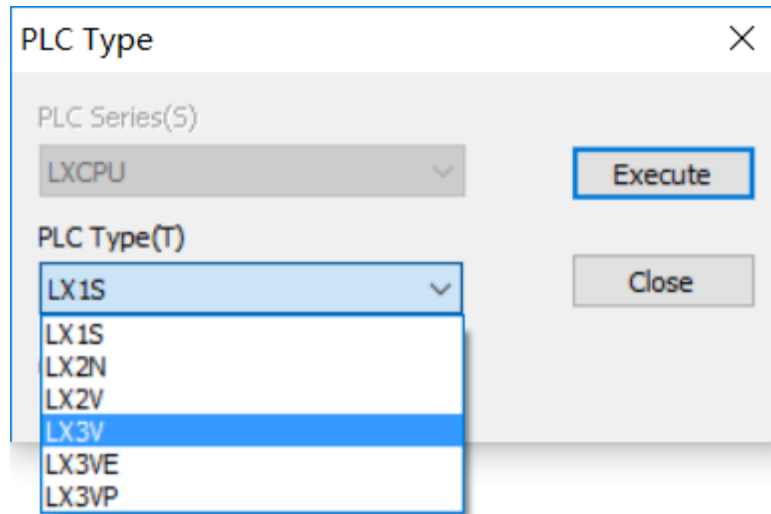


Figure 2-45 PLC type

The Table shows detailed description of the ladder symbol

Symbol	Instruction	Function	Hotkey
	LD, AND	Open contact	F5
	OR	Open branch	SHIFT+F5
	LDI, ANI	Close contact	F6
	ORI	Close branch	SHIFT+F6
	OUT	Output coil	F7
	CJ/CALL	Input application instruction	F8
		Draw horizontal line	F9
		Draw vertical line	F11
		Delete horizontal line	CTRL+F9
		Delete vertical line	CTRL+F11
	LDP, ANP	Rising pulse	SHIFT+F7
	LDF, ANF	Falling pulse	SHIFT+F8
	ORP	Rising pulse open branch	CTRL+ALT+F7
	ORF	Falling pulse close branch	CTRL+ALT+F8

2.2.1.9 Verify program

Checks to your code for errors compiling it.the the program again check

2.2.1.10 Upload to PKC

Compiles your code and uploads it to the configured board. See importing beneath for details.

2.2.2 HMI Program editor Software

2.2.2.1 LeviStudio



Figure 2-46 WECON HMI



Figure 2-47 WECON HMI Monitor

WECON HMI software-LEVISTUDIO 2017**2.2.2.2 HMI Control Devices****2.2.2.2.1 Bland PLC supported in software:**

s7-200/300/400/1200 plc

Schneider twido Series

OMRON PLC

Delta PLC

Fatek PLC

Panasonic PLC

ABB PLC

Advantec Adams Module

Mitsubishi PLC

KOYO PLC

Keyence PLC

Taian PLC

Vigor

Emerson

2.2.2.2.2 Open free Protocol details:

Modbus RTU Slave/Master

Modbus ASCII Slave/Master

Modbus TCP/IP

BACNET

2.2.2.2.3 Other Protocol use:

CAN Bus: SAE J1939

Profibus

Profinet

2.2.2.3 Software Functional process:

Data Recorder(SD Card Supported)

Industrial Picture Libraries

Industrial Vector Picture Libraries

WEB Server

USB Disk Supported

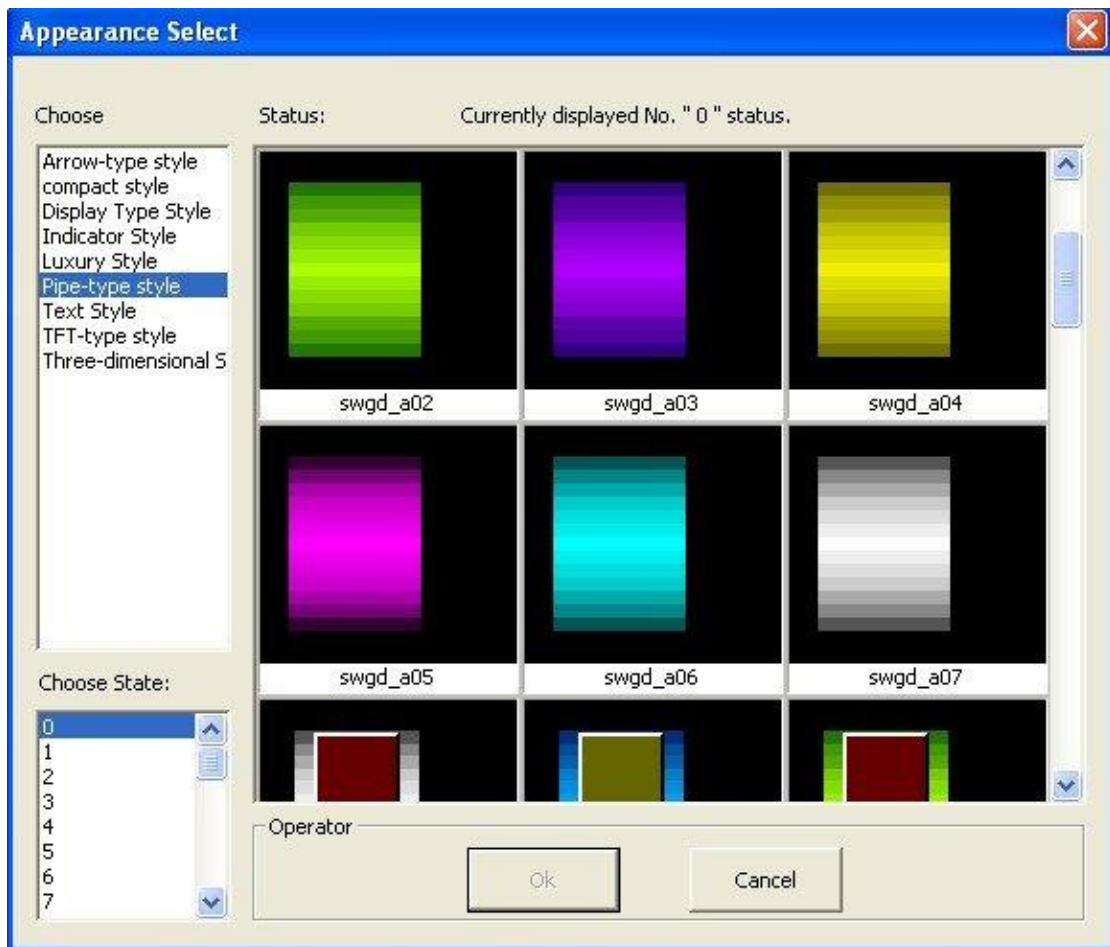


Figure 2-48 Software Functions

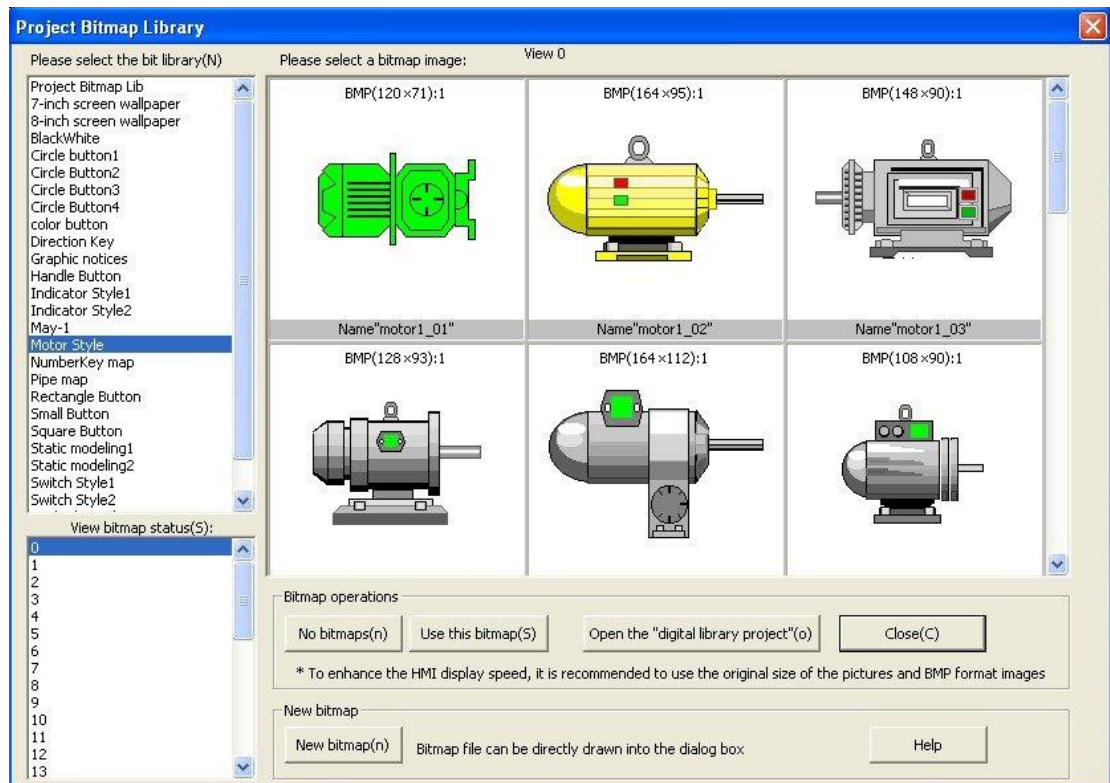


Figure 2-49 Software Functions

2.3 Limitation of car wash system

- Primary investment is excessive
- More amount of water is required
- System installation is complex

2.4 Consumption power in this project

The following are the approximate consumption in system:

- Power required conveyer movement 60 W
- Drying unit 8.16 Watts
- Maximum electricity forty two Watts
- Cars wash water required half Liter approx.
- Shampoo cycle time 10 sec approx.
- Wash cycle time 10 sec approx.
- Drying cycle time 10 sec approx.

3 FUNCTIONAL OPERATION

3.1 Project Functional model

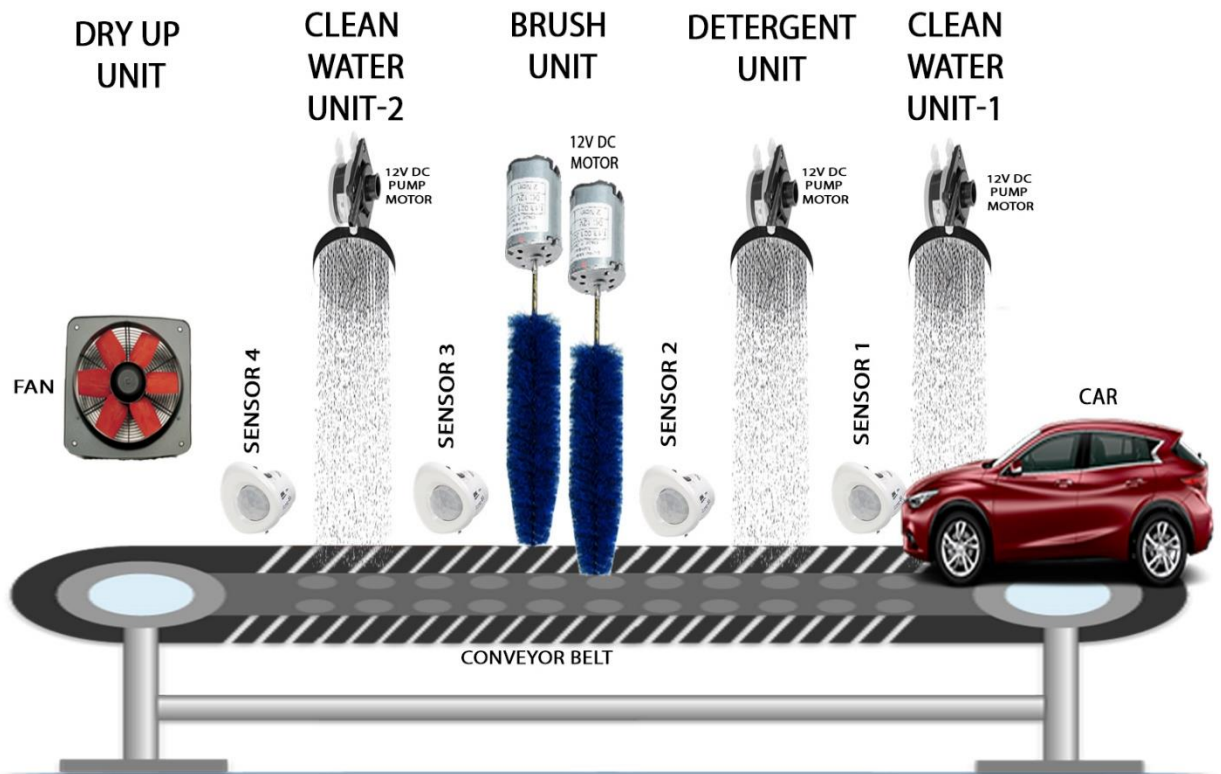


Figure 3-1 System context diagram

3.2 Functional operation of several section



Figure 3-2 System Functional diagram

3.1.1 Clean water Section-1:



Figure 3-3 Clean water nozzle

When the auto arrives at the venture in then conveyor belt motor activated the conveyor belt to go to 1st stage for the showering the easy water upon the automobile for 5 seconds.

3.1.2 Detergent water section:

When the automobile arrives at the first sensor, the conveyor motor stopped. Now this sensor will prompt the shampooing motor sprinkles of shampooing water will shower on the car for 5 second, after shampooing the vehicle the shampooing motor stopped and set off the conveyor belt motor to proceed the subsequent stage.

3.1.3 Brushing section:

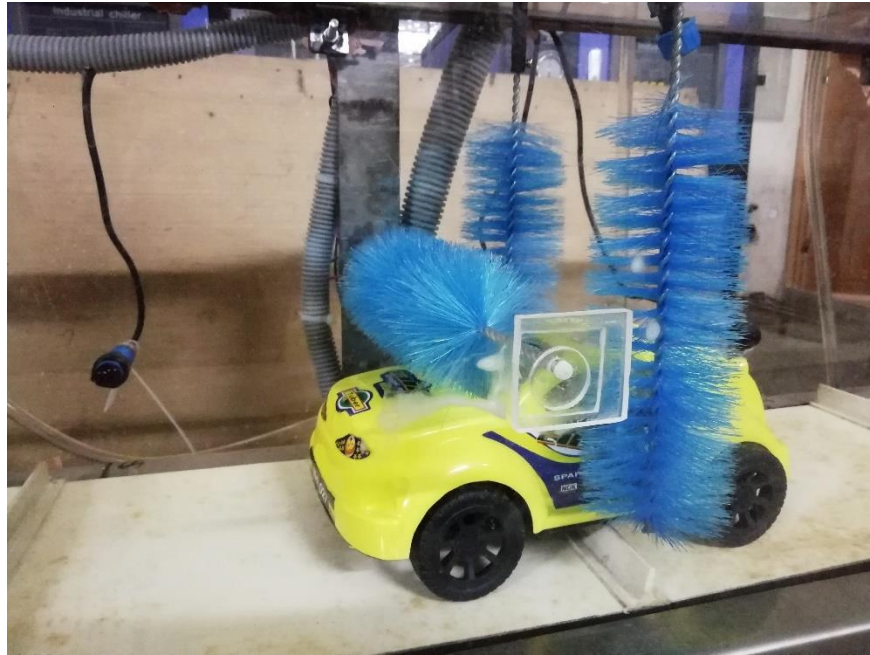


Figure 3-4 Brushing section

After the completion of shampooing the automobile for 5 seconds, the conveyor belt begin shifting again when auto arrives at the 1/3 sensor the conveyor belt motor will stopped, the PLC will spark off the brushing.

3.1.4 Clean water Section-2:

Brushing is completed after five seconds then again conveyor belt motor activated the conveyor belt to go to fourth stage for the showering the smooth water upon the automobile for seven seconds.

3.1.5 Drying section:



Figure 3-5 Dry up section

This is the fifth stage and remaining stage of the gadget in this stage after cleansing water for seven seconds stopped the conveyor belt strikes once more via conveyor motor. The automobile comes at fifth sensor drying stage activated through drying motor. After completion of drying of a automobile now it stopped after seven seconds and conveyor will prompt auto strikes at exit factor.

3.2 Project Circuit Diagram

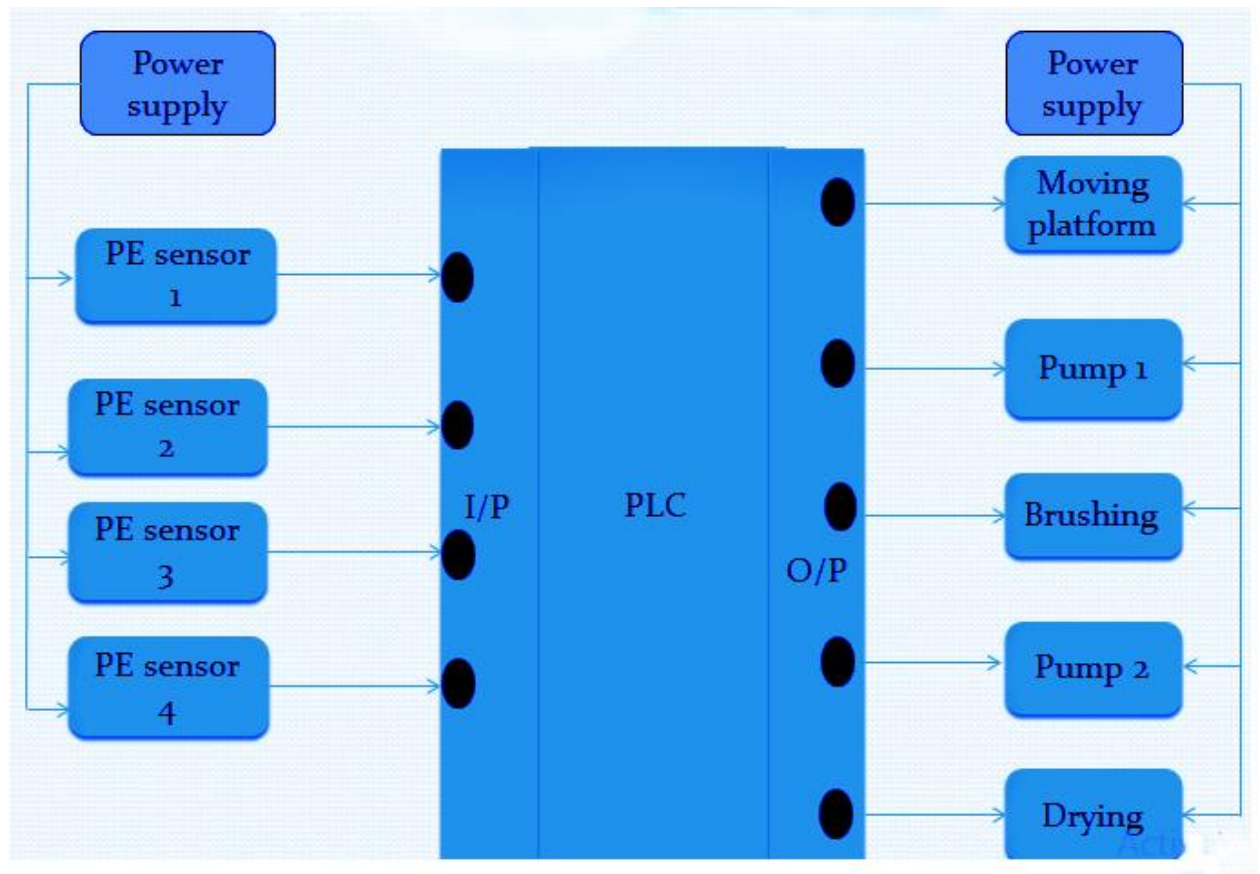


Figure 3-6 system Circuit Diagram

3.2.1 1st Section

When the energy supply is pressed, when the begin change is pressed, the conveyor motor starts off evolved and hopefully the start part starts with the auto and after the prolong is delayed, the first unit starts off evolved with the command of the plc
With the help of relay Then the conveyor motor endured and the automobile reached the next unit.

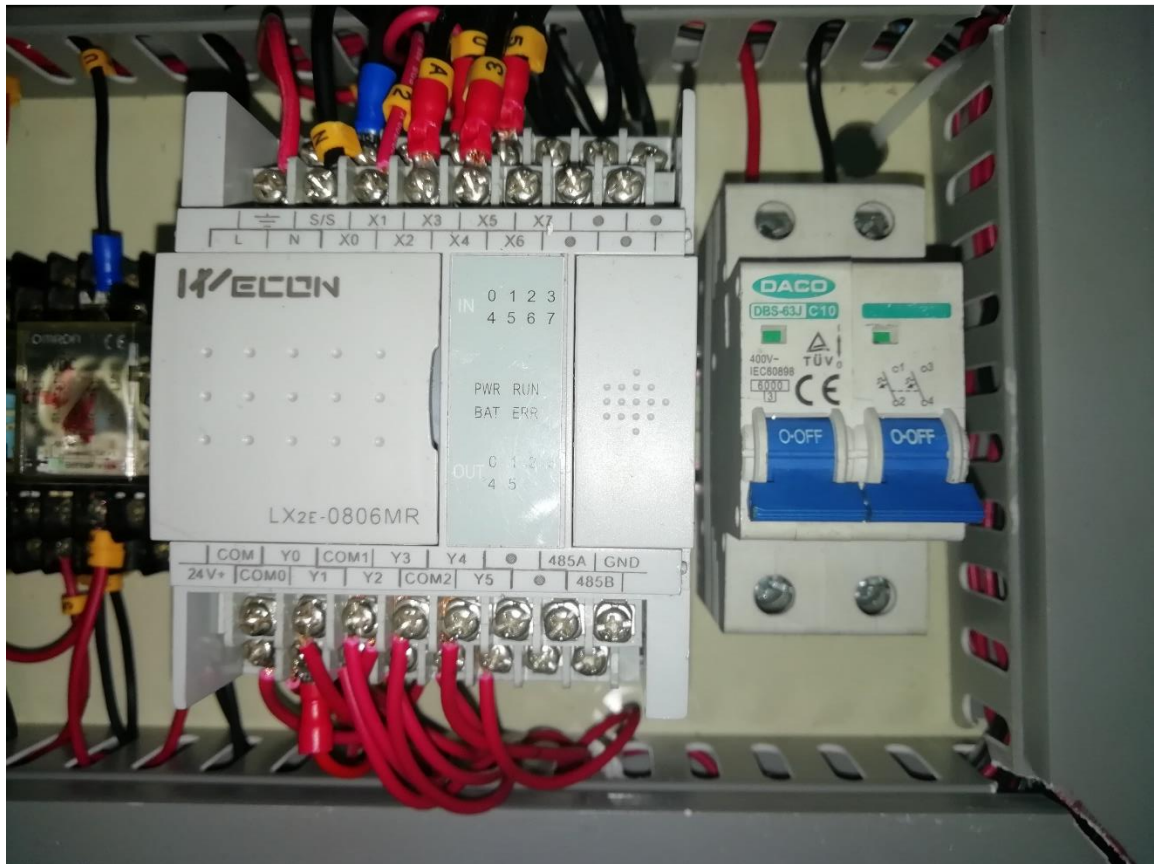


Figure 3-7 PLC Connection

3.2.2 2nd Section

When the 1st sensor tells the plc that the car is in the second unit, then the 2d unit is activated with the aid of the PLC relay. And with the equal closure of the previous unit, the conveyor continues and the auto reaches the subsequent unit.

3.2.3 3rd Section

When the 2nd sensor says to the plc that the auto is in the 3rd unit, then the third unit is powered by way of the PLC relay. And with the same closure of the previous unit, the conveyor continues and the automobile reaches the subsequent unit.

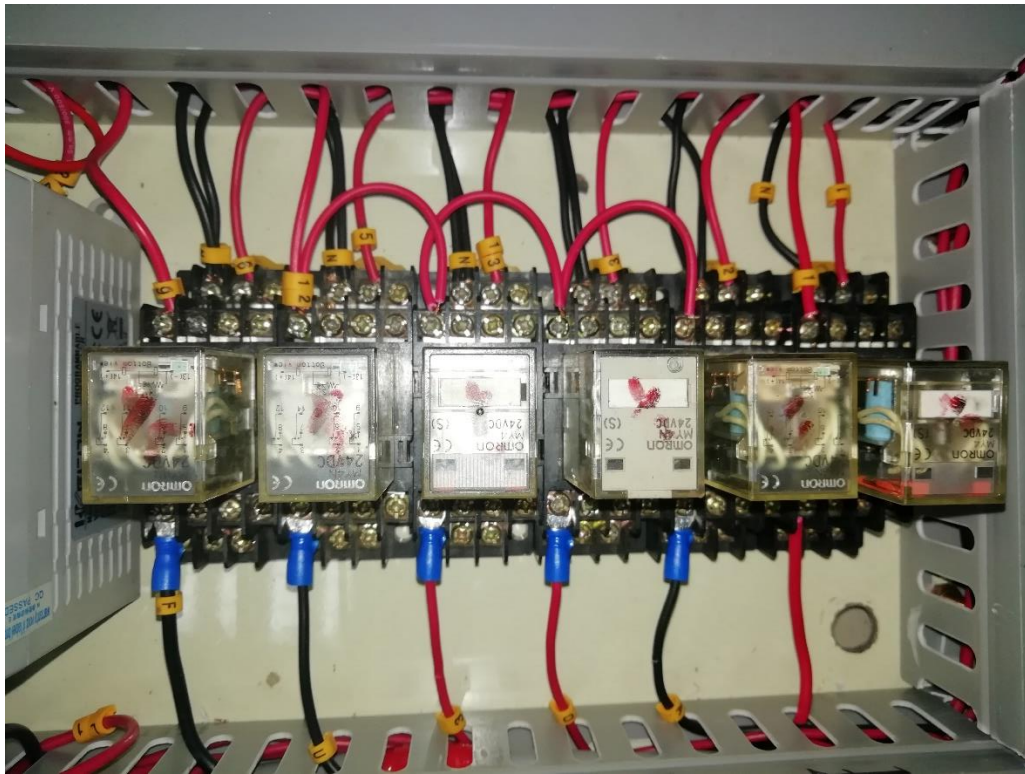


Figure 3-8 Relay connection

3.2.4 4th Section

When the third sensor tells the plc that the automobile is in the 4th unit, then the 4th unit is activated through the PLC Relay. And with the identical closure of the previous unit, the conveyor continues and the vehicle reaches the next unit.

3.2.5 5th Section

When the 4th sensor says to the plc that the automobile is in the fifth unit, then the fifth Revolution begins with the PLC Relay. And with the equal unit closes the previous unit, however now this sensor closes the conveyor and with one timer it is over. When the timer's timing is over, the conveyor can turn it on and off with the 5th part.

4 BEHAVIORAL DESCRIPTION

4.1 DESCRIPTION of this Project

Consists of the following modules, which have an impact on the behavior of the machine (ACW):

Base Conveyer belt

Conveyer Rollers Glass body Water bath are made with metal frame.

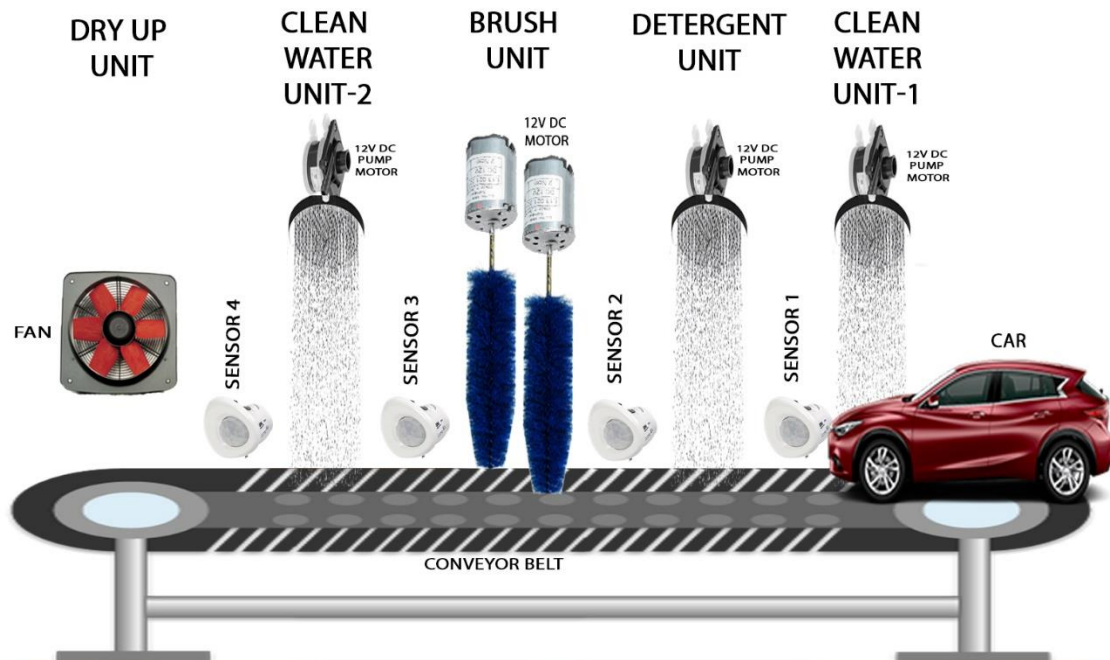


Figure 4-1 Automatic car wash

4.2 Base Structure

Base consists of three DC motors, one gear motor and servo motor also base is divided in to 5 part which are consists of CWU-1, DU, Brushing, CWU-2 and dryer unit. Dc motor are connected with the brushing meeting while the servo motor is connected with gate.



Figure 4-2 Structure of automatic car wash

4.3 Conveyor belt System

Conveyor belt is linked the rollers and their motion is controlled with the 40w motor which is of 220 volt

The water tub, there is two water bathtub is used which is connected with water. Pump and this pump will suck water from one factor to discharge thru other point, water will sprinkles from the nozzles via over the car

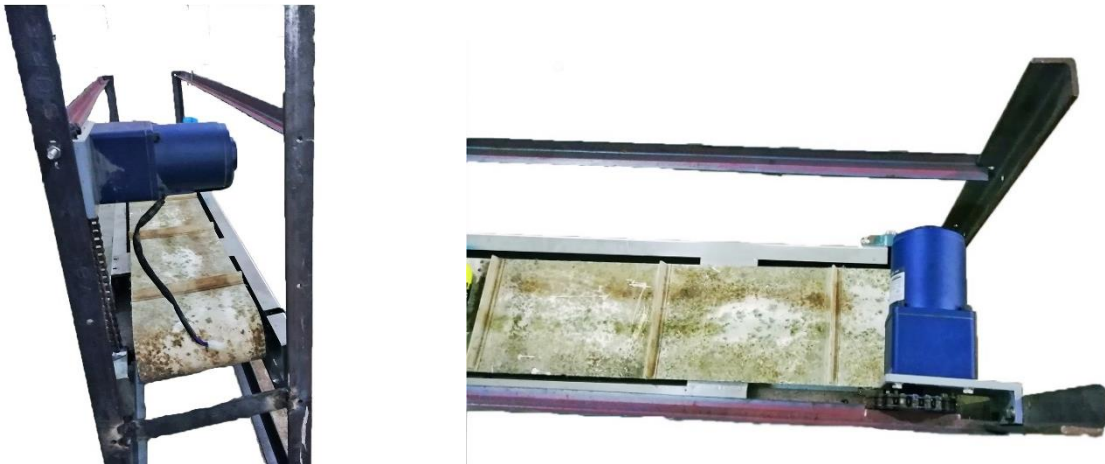


Figure 4-3 Conveyor structure of ACW

4.4 DC Motors:

In our project use 3 DC motor for ACWS. Dc motors are linked with brushes. two These brushes will start move with dc motors when the second sensor is activated.

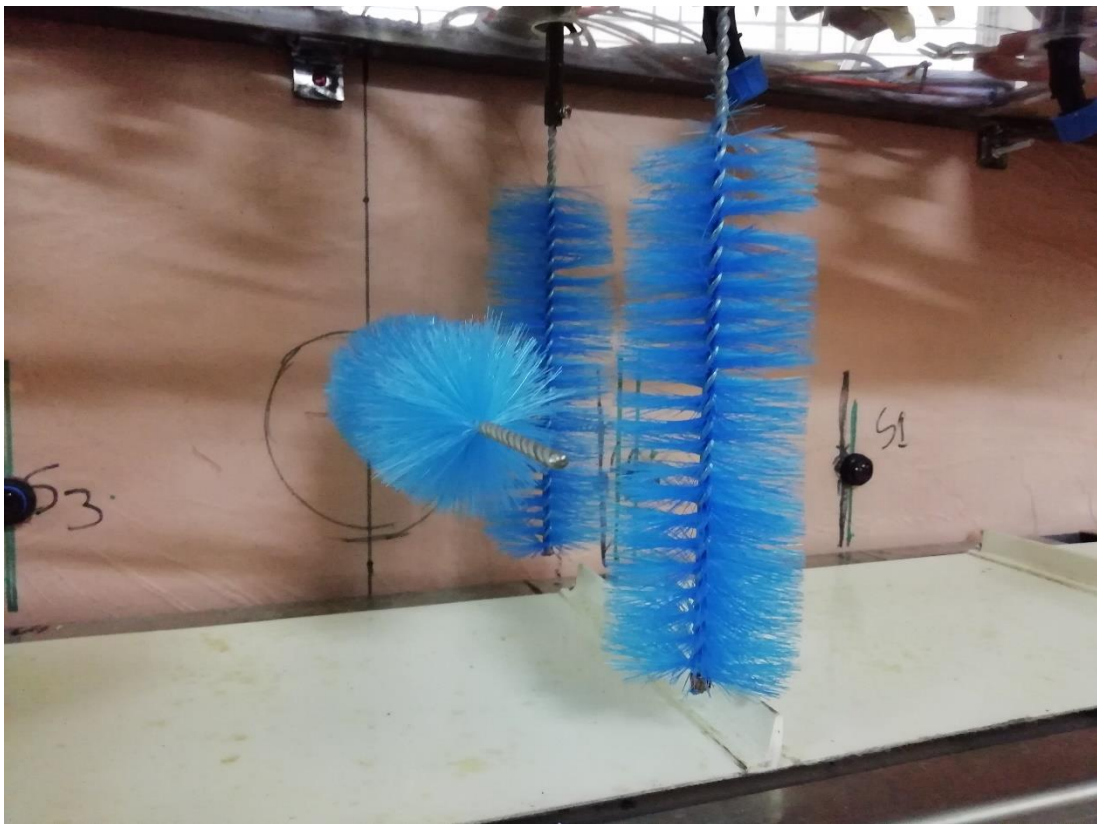


Figure 4-4 Brush section

4.5 Servo motor System:

There is only one servo motor is used in machine this servo motor is connected with the conveyor which will flip on the conveyor system.

4.6 Glass frame for this project:

The total shape of ACW is outfitted with the facility transparent glass and motors are stored retailer from the water.



Figure 4-5 Glass frame

4.7 Control panel

4.7.1 Main control panel



Figure 4-6 Main control panel

This panel has all the electrical connections kept. This panel has been kept on board PLC

- HMI
- Motor controller
- 12V SMPS
- Relay
- Circuit breaker
- Start/stop switch
- Emergency Switch
- Ac Indicator

The purpose of separating the panel is to protect our main project and to enhance the beauty of the project.

4.7.2 Sub control panel

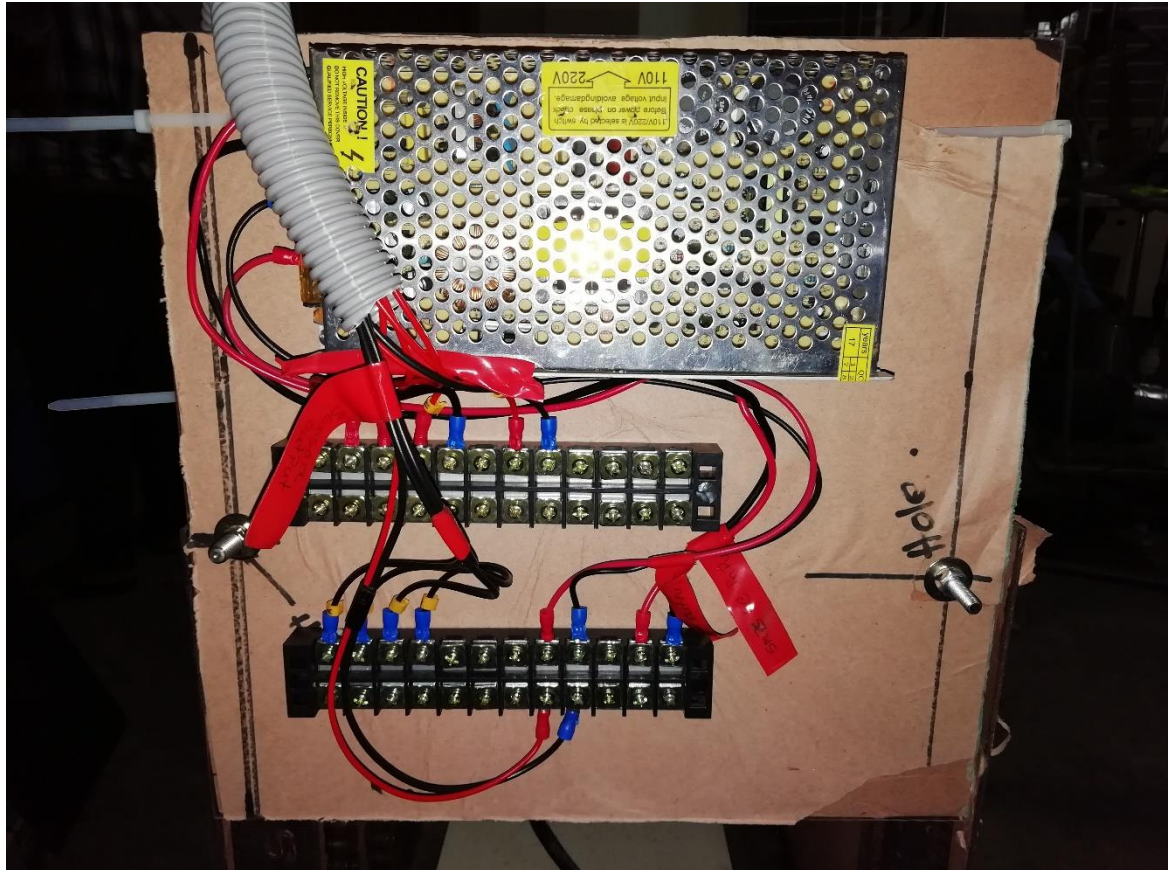


Figure 4-7 Sub Control panel

In this panel, all the connections of the entire project have been added where the separate cable from the main panel will be added.

5 FUTURE ENHANCEMENT

5.1 Work in future

The machine that we have constructed is a working on PLC controller, which have to be compact, quick and accurate. This machine is very dependable and authentic design.



It is solely being developed to make sure that the sketch is feasible, now not impractical and can be carried out on a an awful lot large scale in a more environment friendly way.

- + Interior wash
- + Under chases wash
- + Overcome obstacles
- + Coin & token gadget
- + For each side wash use in future steeper motor
- + Use more dependable sensor
- + Also we can put into effect a counter which will be permitting the variety of Cars washed to be counted.

6 RESULT AND CONCLUSION

6.1 CONCLUSION

After working on the automated car wash undertaking and dryer, we can come to conclusion that such automation device is pretty beneficial, and saving time of operation and also man strength reduced, improving the economy of the system. In the future such type of computerized systems will have more demanded. It has limitless functions and can be used in exceptional environments and scenarios.

- Supermarket & shops
- GAS stations & Railway stations & Air ports
- Hotels & Resorts
- Theaters & universities
- Public places & non-public businesses
- Less Area required for build Shop
- Time requirement is less then traditional Washing process
- Pollution free Weather friendly and more of environmental co-efficient
- Manpower energy no require

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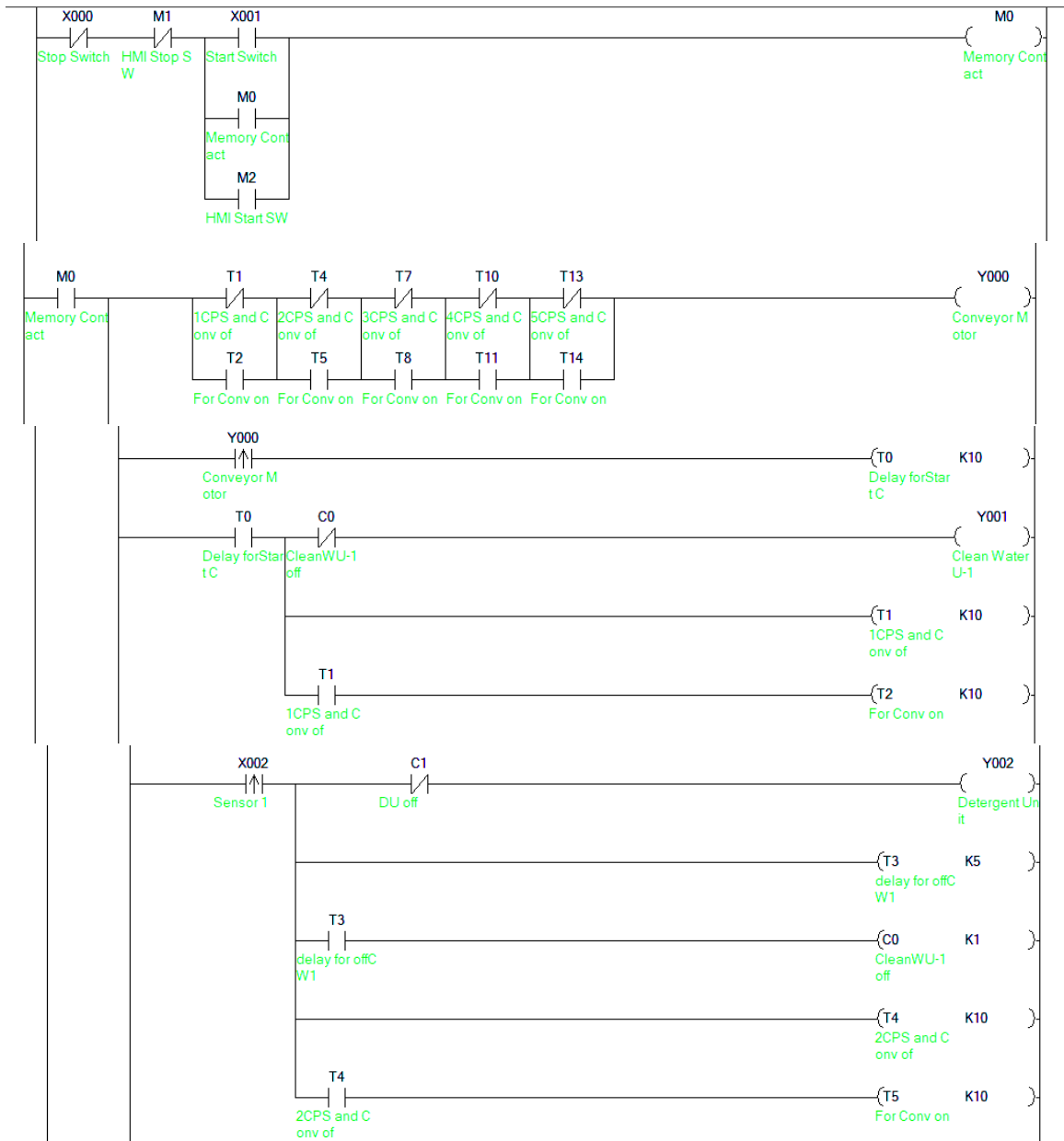
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8 APPENDICES

8.1 Main Ladder program code Appendix A



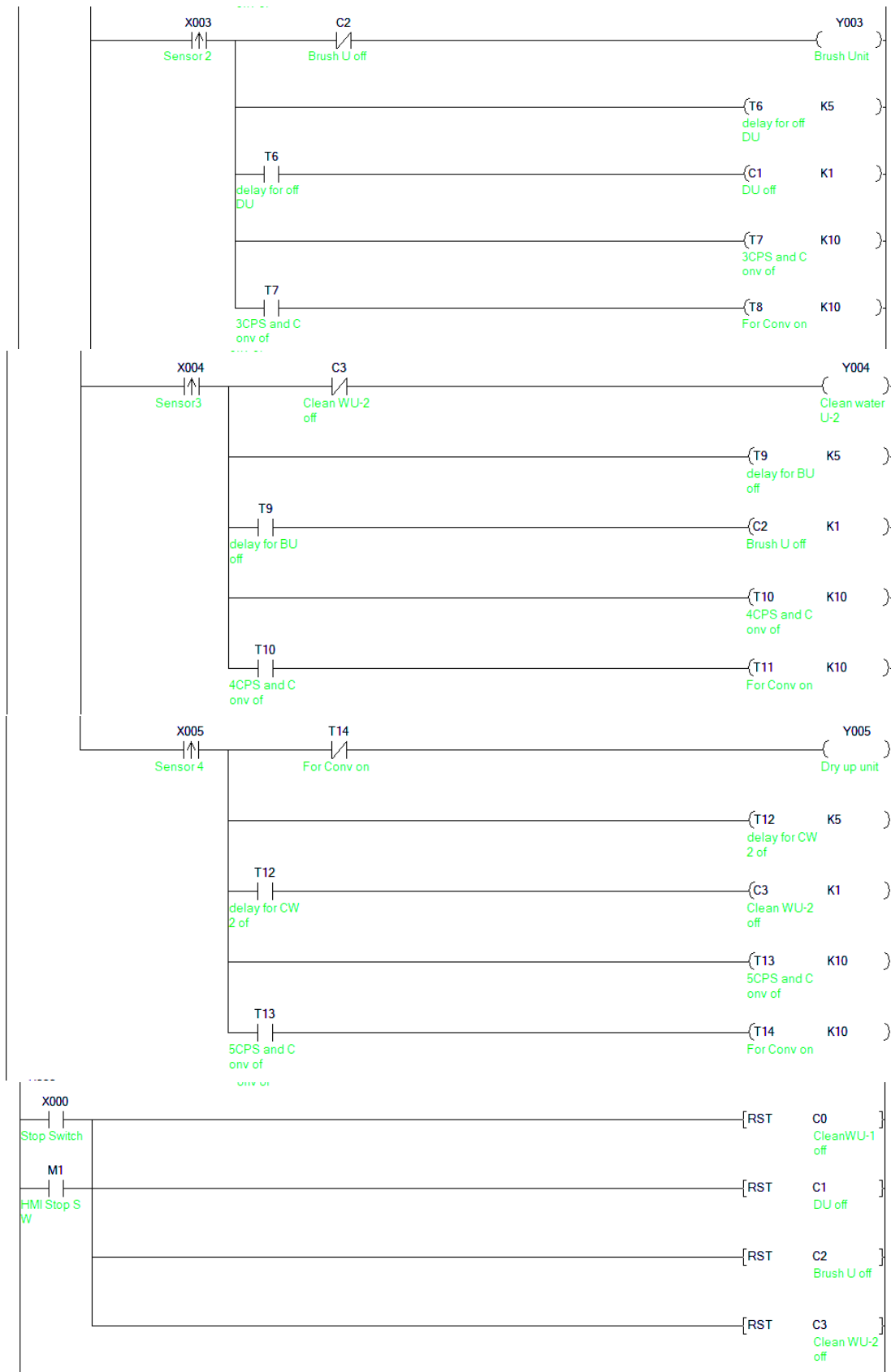

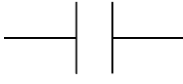
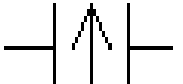
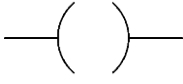


Figure 8-1 Project Ladder diagram

8.1.1 Program keyword and symbol

Ladder input normally Close Contact	
Ladder input normally Open Contact	
Rising Pulse	
Ladder output Coil	

X000, M1	Start Switch
X001, M2	Stop Switch
M	Memory contact
T	Timer
Y	Output relay
C	Counter
RST	Reset Counter

8.2 Diagram of design Appendix B

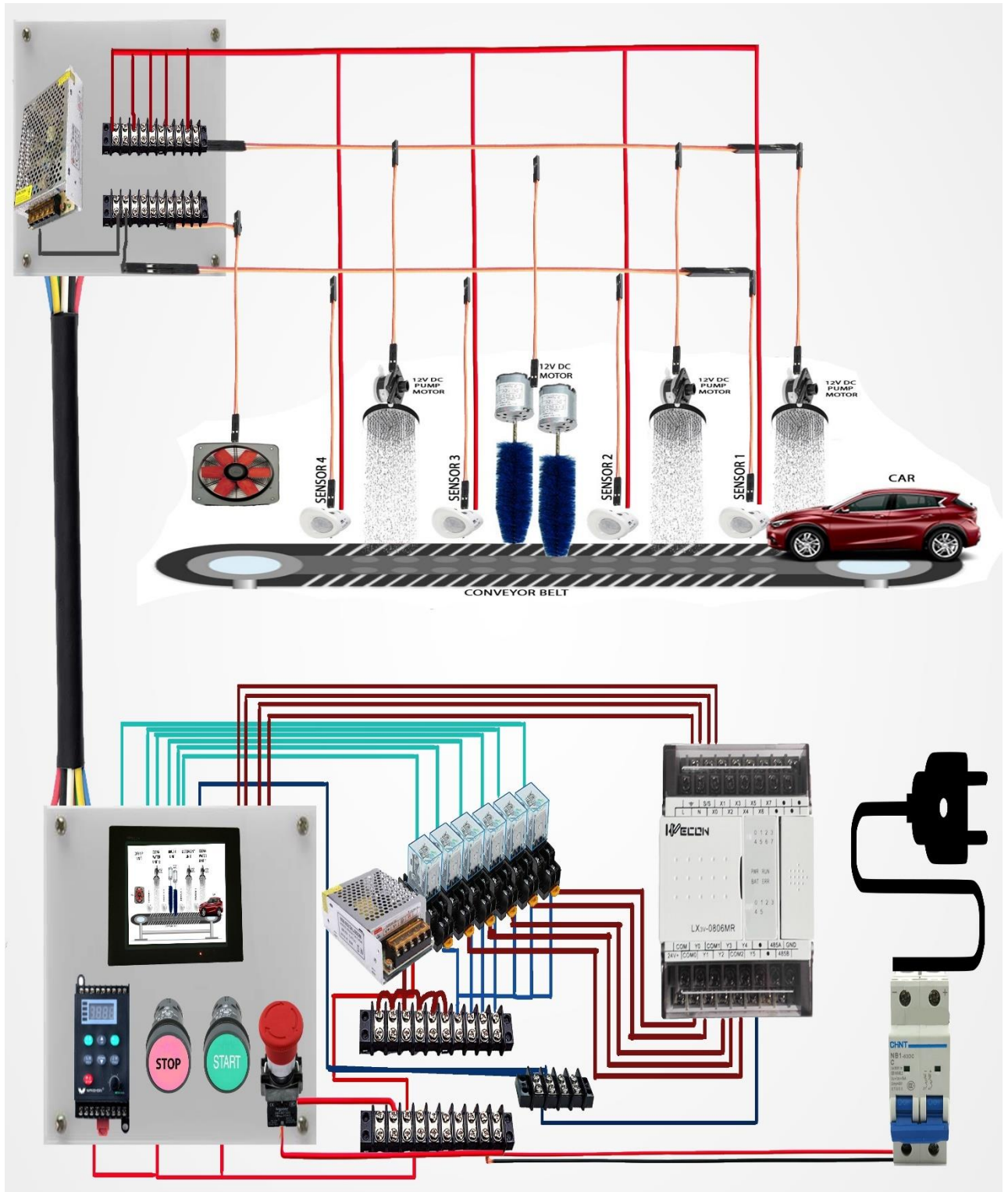


Figure 8-2 Circuit Diagram of our project

8.3

PROJECT COST LIST

No.	Name	Specification	Quantity	Per Cost	Total cost
1.	PLC	8I/O ,WECON ,LX2E – 0806MR	1		15000
2.	HMI	Wecon,LEVI430T	1		10000
3.	Motor	Model: 90YT40GV22X	1	5000	5000
4.	Motor driver		1	3000	3000
5.	DC Motor	12V	3	90	270
6.	Pump motor	12V	3	450	1350
7.	24v SMPS		1	800	800
8.	12v SMPS		1	800	800
9.	PE sensor		4	650	2600
10.	Ac exhaust fan	Ac 220v	1	260	260
11.	Relay	DC24v,	6	220	1320
12.	Circuit breaker	10amps	1	450	450
13.	Wire Conector	PVC	5	50	250
14.	On/Off switch	Scheider	2	600	1200
15.	Emergency SW	Scheider	1	150	150
16.	AC Indicator lamp	Scheider	1	25	25
17.	Wiring channel	PVC	5ft	5	50
18.	Hose Pipe	Plastick	10ft	5	50
19.	Cable tie	PVC	1paket	1	120
20.	Cable				1000
21.	PVC tape		5	20	100
22.	Structure		40.8sft		2000
23.	Flat bar		3sft		200
24.	Conveyor Structure				3000

25.	Acrylic sheet		24.5Sft	300	7350
26.	Pumping pipe		10	25	250
27.	Masking tape		1	20	20
28.	Nut with bolt				100
29.	Screw		3mm	10	30
30.	Brush		4	30	120
31.	Pumping spray		3set	200	600
32.	Pipe Jointer				
	Total cost(tk)				