

# Automatic Storage System Using PLC

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**Abstract-** Automatic racking system is used in the large industry for sorting purpose and for storage of the products. The proposed work describes the design of PLC (Programmable logic controller) based automatic racking system. The system consists of two workstations, one station fills the empty tray and in the other station, these trays are arranged in an order. The system is motorized where DC motors are used to drive the system. Sensors are used to identify the presence of the pallets, and in this system, PLCs are used for the control of the system. The language used to program the PLC is ladder diagram. This principle can be used to fill the tray and shift them to a rack in a synchronized manner and can make ordinary systems automatic and smart. The system replaces the existing manually operated racking system to allow plants to increase productivity, minimize repetitive work, reduce injuries and lower the cost of labors.

**Keywords:** PLC Controller, SENSOR, LIFT, CONVEYER BELT

## I. INTRODUCTION

An Automatic Storage system is defined as a storage system that uses fixed-path storage and retrieval machines running on one or more rails between fixed arrays of storage racks. Automatic storage are used to store and retrieve loads in various settings. The main components of an Automatic Storage are racks, cranes, aisles, I/O-points, and pick positions. Racks are typically metal structures with locations that can accommodate loads (e.g., pallets) that need to be stored. Cranes are the fully automated storage and retrieval machines that can autonomously move, pick up and drop o□ loads. Aisles are formed by the empty spaces between the racks, where the cranes can move. An input/output point (I/O-point) is a location where retrieved loads are dropped o□, and where incoming loads are picked up for storage. Pick positions (if any) are places where people are working to remove individual items from a retrieved load before the load is sent back into the system

### 1. Ladder logic Instructions in DeltaPLC

In Delta PLC Software different instruction are used we are discussing in briefly here, in Allen Bradley PLC Seven types instruction are available, just see below.

Bit logic Instruction (Relay type instruction)

1. Timer/Counter Instruction
2. Compare Instruction
3. Compute/Math's Instruction
4. Move/Logical Instruction
5. Program Control Instruction
6. Scaling Instruction (Analog valve processing)

### 1.1 Bit Logic Instruction

Bit Logic instruction (Relay type instruction) are used to monitor and control the status of bit in the data table, such as input bits or time control word bits. Bit logic instruction has five parts. Just see below.

**XIC:** - Examine If Close

**XIO:** - Examine If Open

**OTE:** - Output Energize

**OTL:** - Output Latch

**OTU:** - Output Unlatch

### 1.2 Basic program in ladder logic in Delta PLC

Here first we make Input and output list.

**Input:-** Start push button NO types  
Stop push button NC type

**Output:-** Motor

When we press the start push button NO type output side motor on, we put parallel input contact but address is output side so when input is discharge because input is momentary types but output motor is on. When we press stop push button NC type output side motor off.

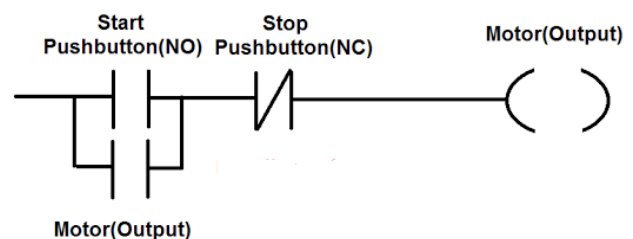


Fig.1 Ladder Programming

## II. PROPOSED WORK

The main objective of this system is to transport, store and retrieve package, which can be achieved using PLC. All the manual operations are replaced by sending signals from the PLC to the respective devices. The work of storing and retrieval of goods from various places is automatically done by a three axis movable rod setup that is controlled by the PLC.

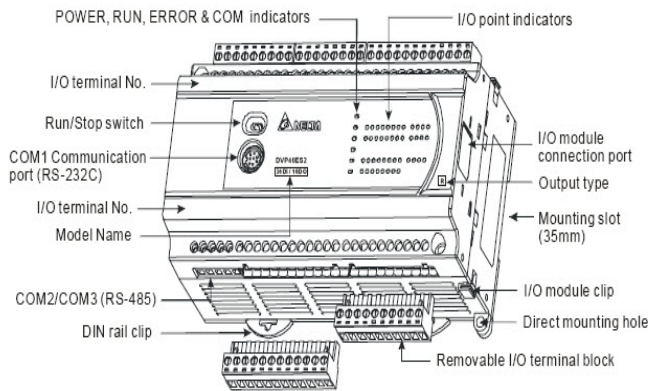


Fig.2 PLC Controller

### General Specification

1. Place of Origin: Taiwan
2. Brand Name: Delta
3. Model Number: DVP-16ES200R
4. Output Power: 1 - 200KW
5. Output Type: Dual
6. Weight: 3KG~300KG
7. Input Voltage: 12V/24V/48V
8. Output Voltage: 0-380V
9. Type: DC/DC Converters
10. Output Frequency: 50Hz/60Hz
11. Output Current: 30A

## III. LITERATURE SURVEY

Automated storage has been widely used worldwide in distribution and production environments since their introduction in the 1950s. For both in production and distribution environments, automatic storage is used for putting products in store and for retrieving those products from storage to P/D station in other word to fulfill an order. There are many factors was depending on automatic storage which is the dimensions of the storage rack, the horizontal and vertical speed of the crane, whether the crane perform single or dual cycles, initial low. **Advanced Technology of Automated Storage and Retrieval System Using PLC Integration** by Ashna Joy, B. Padmanabhan, and A. Abinaya.

UG Student, Assistant Professor. Department of Electrical & Electronics Engineering, Satyabhama University, Chennai, Tamil Nadu, India. [1] The performance of the present embedded system is enhanced by using PLC integration where it coordinates the operation. The performance of the present system is improved by using PLC. **Automatic Control for Storage and Retrieval System Based On PLC** by Assad Musaab Ali Yousif1, Jiang Dening2 Masters student, Dept. of Electronics, Tianjin University of Technology and Education, Tianjin, China1 Ass. Professor, Dept. of Electronics, Tianjin University of Technology and Education, Tianjin, China [2]. This survey paper is based on use of PLCs (Programmable Logic Controllers) and 3-ph motor for the purpose of transport, store and retrieve package (automatic warehouse). A PLC system provides many benefits to control solutions, from reliability and repeatability to programmability.[2]

## IV. BLOCK DIAGRAM

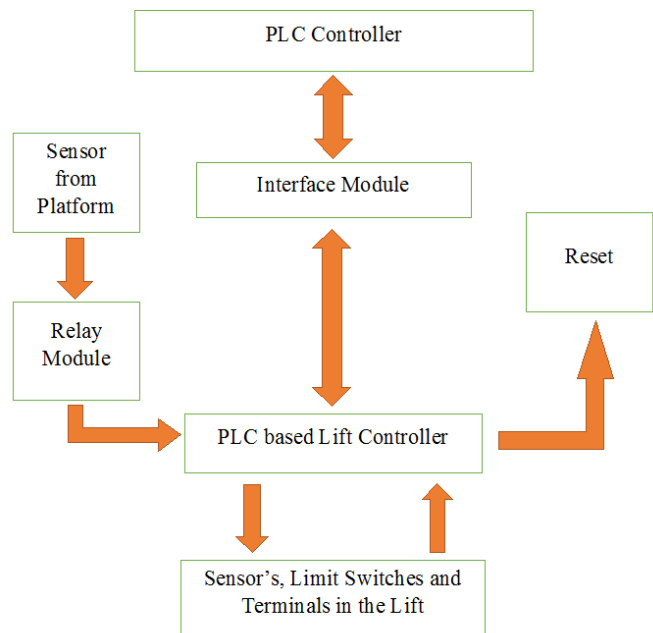


Fig.3 Block Diagram of the proposed system

The basic block diagram is given in fig.3. here PLC is used as controller. The PLC based system controller is interfaced with PLC interface modules, sensors, Lift. The PLC based system controller is nothing but the HMI (Human Machine Interface) screen. Once when the tray enters into the rack number for storing or retrieving the proximity sensors are used for sensing the rows to which it has to perform the operation. The digital inputs are given in PLC through relays. The sensors of proximity sensors are used to sense the presence or absence of objects. The reset option is used to stop the lift at any position and return to its homing position.

**V. PROJECT OPERATION**

The complete project depends upon the DC motor. The motor operation is performed using PLC and relays, Triaxial operation is performed here that is X axis, Y axis and Z axis. Hence, four motor are used to perform the operation Here we have for relays for each motor which works as directions.

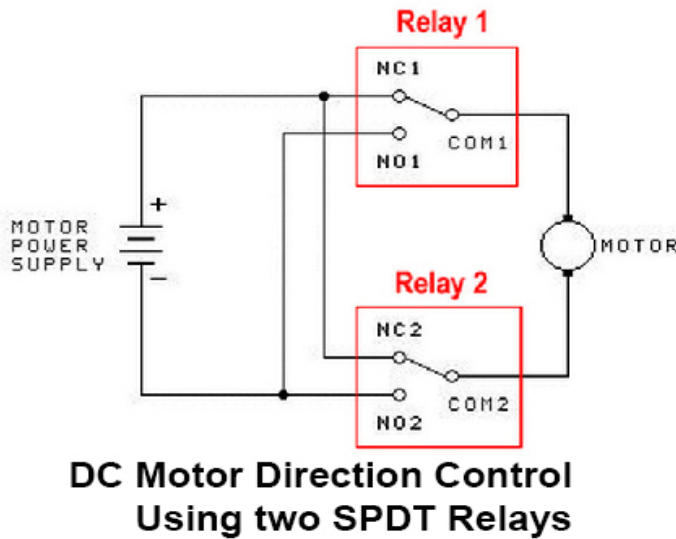


Fig.4. Relay connections for bidirectional motor rotations.

Fig. 4 shows connection diagram and controlling diagram for 12v DC motors in bidirectional movements. Relay is electronic control switch thus for controlling and bidirectional direction movements two relays are used. For T1 period relay 1 gets energized and motor gets rotate in forward direction. Similarly, for T2 period of time relay 2 gets energized and motor rotate in reverse direction.

**VI. FLOW OF PROJECT**

The flow chart is shown in fig.5, where the scenario of incoming object, to its placement into the rack is explained by using this flow diagram.

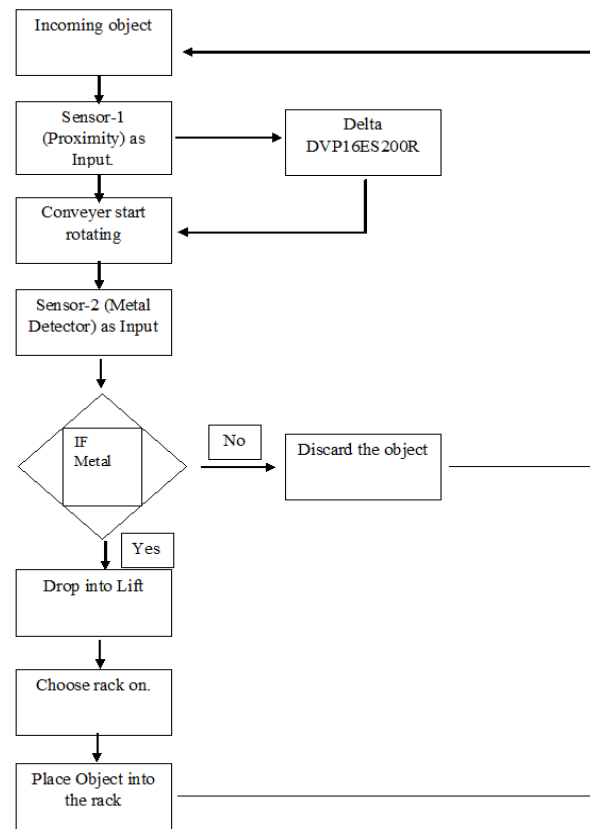


Fig. 5 shows flow and operation of complete project.

**VII. CONCLUSION**

Automatic Storage RS is great circuitry which was develop to improve the storage systems used in industries to handle, store and retrieve materials with precisions, accuracy and speed under defined degree of automation. Automated storage and retrieval system development is divided in layers i.e. fabrication of the mechanical components and their assembly, the electrical circuitry, the electronic circuitry, programming and interfacing.

**REFERENCES**

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[2] AUTOMATIC CONTROL FOR STORAGE & RETRIEVAL SYSTEM BASED ON PLC by Asaad mosad Ali yosifi 2004(Based upon use of PLC & 3phase motor.)[3]

- [3] AN AUTOMATED STORAGE & RETRIEVAL SYSTEM by Aslam, Gardezi & Hayat 2009 (refer to variety of computer-controlled methods for automatically depositing & retrieving loads to & from defined storage location.)[4]