

# Automatic Folding Stair in Bus

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## Abstract

A pivotable fold down step system mounted on a vehicle, such as a fire truck or rescue truck, and synchronises to extend and retract by vehicle door motion. A step system is design to easily archives ingress and egress requirement state within national fire protection agency (NFPA) guidelines. The step remains sealed and contoured to the vehicle profile when in the upright stowed position when the vehicle door is closed. The fold down step is operated by means of pressurised fluid system which is integral to the vehicle. As the vehicle door is opens the step is extended downward, under pressurized control, to allow for rapid and safe egress from the vehicle. As the vehicle door closes, the step is again operated by the pressurized integral fluid system and the step rises and folds into a stowed position within the vehicle body prior to transport of the vehicle [13]. A method for generating electricity from solar power to an air handling unit or an electrical system for a bus/RV, relying on a photovoltaic panel (1) DC disconnects (2,3); charge controller (4); batteries (5); air handling unit or an electrical system (7); electrical wires, and fuses. The photovoltaic panel (s) will generate electrical power that will provide sufficient power to run the air handling unit or an electrical system [15]. In order to board or exit a vehicle, one or a plurality of steps or plates are provided for negotiation of a possible difference of height by a person in a wheelchair entering or getting off between the level of the floor of the vehicle and a platform at a higher or lower level. At least one step or plate is foreseen which is height adjustable, and can be positioned at a position above the floor of the vehicle, below the floor of the vehicle, or at the same level as the floor of the vehicle [9]. To design this project, the existing product in market must be compared and the latest designs that have been created. The motivate for designing a folding stair in bus is to contribute towards the comfortable transportation for old age people, pregnant women and blind people and handicap person with affordable cost. In this system we are also include the solar panel .by using of solar panel generate the electric city and use this electric city for the passenger to charge mobile phone.

**Keywords: Automatic Folding Ladders, Transportation, Solar Panel, Electric City, Mobile Phone**

## I. INTRODUCTION

The motivation for designing a folding stair in bus is to contribute towards the comfortable transportation for old age people, pregnant women and blind people and handicap peron.it is a one type of innovative bus which contains folding stair and battery charger. The goal of our project to provide comfort and safety with affordable cost. In this system by using of PLC, conveyer motor, SMPS, push button, sensor to design the whole logic of the automatic folding of stair in bus. The conveyer motor is use to fold and unfold of step. And the logic of controlling the stair is done by the PLC. The sensors are used to sense the station and passenger. There is an also one strip design at a steps for the climb of a wheelchair in a bus. In this project the solar panel is also include. The solar panel is put on the roof of the bus. By using of the solar panel electricity is generated. And this electricity used for provide battery charging/mobile phone charging to the passenger. The model is look like similar as which is shown below.



Fig. 1: Folding Stair [9]

## II. BLOCK DIAGRAM

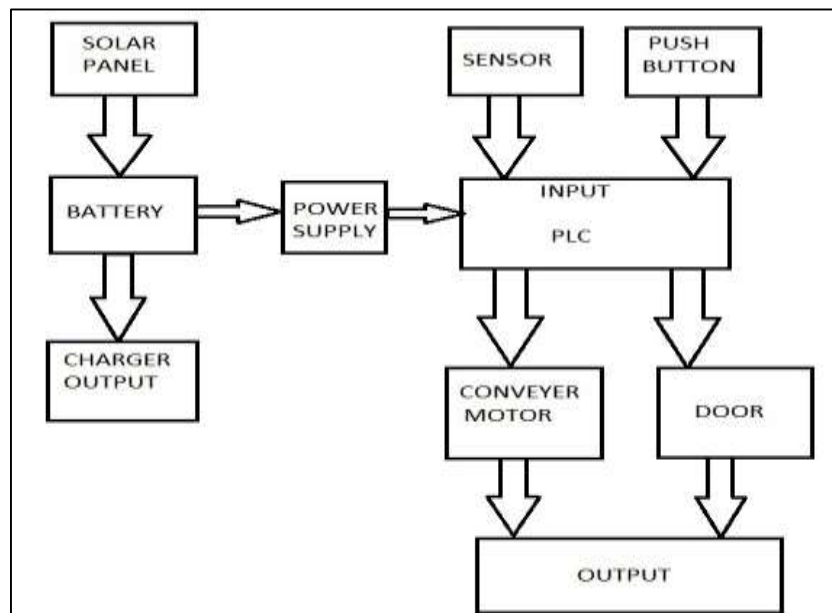


Fig. 2: Block Diagram of System

### A. Explanation of Block Diagram

#### 1) PLC:

PLC is known as programmable logic control. It is a device that can be used as a control equipment in different ways in the industry. In the PLC, it is able to store the data and instruction for long time. In PLC, the main function or PLC's tasks are involving the input signal is given according to the program and if "true" switch the corresponding output which recognizes precisely two defined statuses of one variable "0" and "1" so the output can be assume these two statuses. The Timer and counter functions, memory setting and resetting, mathematical computing operations all represent functions, these all the functions which can be executed by practically any of PLCs. The Programming Logic Control used for industrial fields like automatic machines, cars, and robots. PLC is used in the PLC based elevator control system in which desired position can be forecasted. We will use

24 VDC for input and 230 VAC for driving up output. In this system the DVP14SS2 PLC is used. It has 14 pin. the 8 pin is for input and 6 pi is for output.

2) *Conveyer Motor:*

For conveyer belt applications Oriental Motor offers a wide range options. For fixed or constant speed applications, AC motors & gear motors are well suited. The applications where speed control, higher speeds or maximum torque in a small area may be needed, the AC & brushless DC motor speed control systems can be used for precise positioning Oriental Motor's stepper or servo motor packages are ideal.

3) *Push Button:*

In the industrial and commercial applications, push buttons are can be connected together by a mechanical linkage so that the act of pushing one button causes the other button to be released. By this, a stop button can "force" a start button to be released. This method of linkage is used in simple manual operations in which the machine or process have no electrical circuits for control. Some Push buttons are color-coded to associate them with their function so that the operator will not push the wrong button in error. Red colour is commonly used for stopping the machine or process and green for starting the machine or process.

4) *Power supply:*

A power supply supplies electric energy to an electrical load. The primary function of a power supply is to convert one form of electrical energy to another and, as a result, power supplies are sometimes also referred as the electric power converters. Some power supplies are discrete, stand-alone devices, whereas others are built into larger devices along with their loads.

5) *Solar panel:*

The Solar Panel comprises Solar or photovoltaic cells which convert the Solar energy into electrical energy. Whether they're adorning our calculator or orbiting our planet on satellites, they rely on the: the ability of matter to emit electrons when a light is shone on it. Sunlight is composed of miniscule particles called photons, which radiate from the sun. As these hit the silicon atoms of the solar cell, they transfer their energy to loose electrons, knocking them clean off the atoms. The photons could be compared to the white ball in a game of pool, which passes on its energy to the colored balls it strikes.

6) *Sensors:*

An electronic device used to measure a physical quantity such as temperature, pressure or loudness and convert it into an electronic signal of some kind. Sensor is normally compotes of some larger electronic system such as a computer control or measurement system.

In this system the proxy sensor and the photoelectric sensor is used. The photoelectric sensor is used to sense the passenger. The photoelectric mount at the bus door, when bus door is open the sensor is detecting the passenger. The proxy sensor is used to sense the bus station.

III. WORKING OF SCHEMATIC

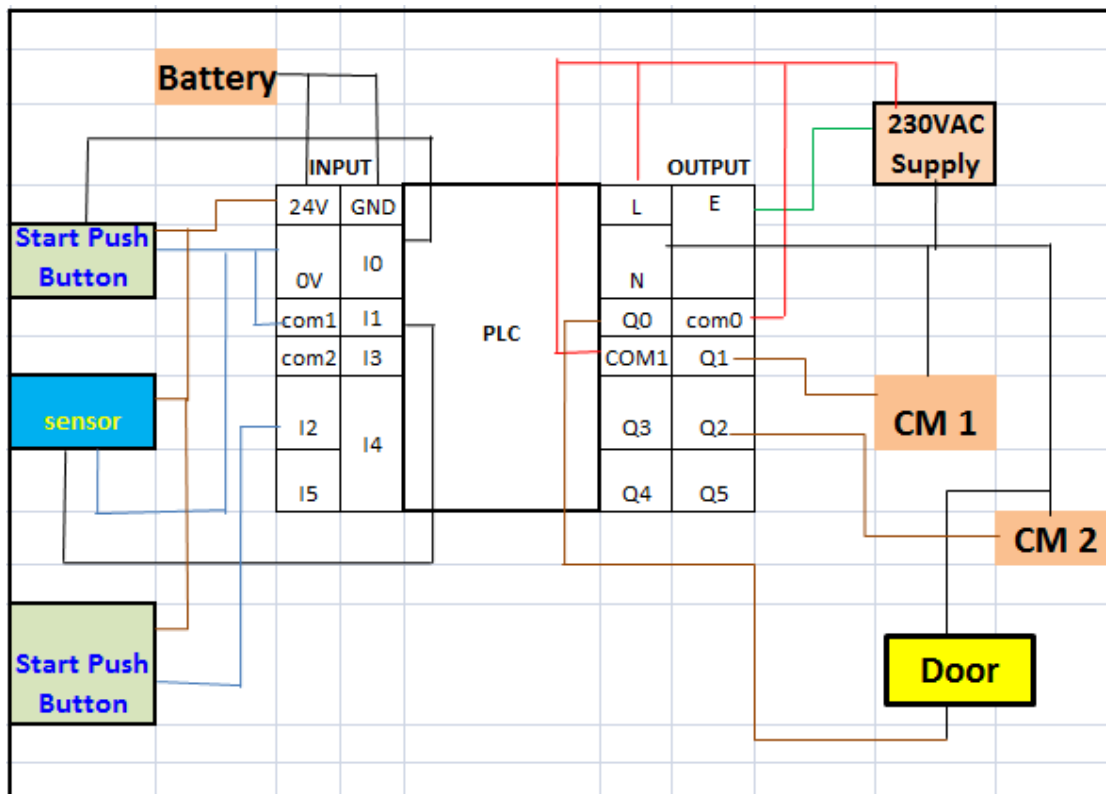


Fig. 3: Schematic Diagram

Table -1  
List of Pin Work:

| SR NO. | PIN        | WORK OF PIN |
|--------|------------|-------------|
| 1      | I0, I1, I2 | Inputs      |
| 2      | Q0, Q1, Q2 | Output      |
| 3      | PIN24 ,GND | SMPS        |
| 4      | Com1 ,com2 | Common      |
| 5      | N          | Neutral     |
| 6      | E          | Earth       |

**A. Operation of Schematic:**

In PLC we will use 24VDC for input and 230 VAC for driving up output. 24 VDC common will connected to all common points say as com0-com1-com2...etc. positive will run in all input as reference and when inputs get on then it will check the PLC input on by giving positive signal on I0 to I10 etc. the push button and sensor are connected to i0, i1, i2 respectively. 24VDC will generate from SMPS by giving 230 VAC to convert 24VDC. Same way in output all common will have to 230 supply connection, so when Q0 to Q9 gets on, we will get supply to get start on motor or door. As per logic output will be gets on motor and door as per our project. Here SMPS is also connected to the battery and battery is connected to the solar panel.

**IV. FLOWCHART OF SYSTEM**

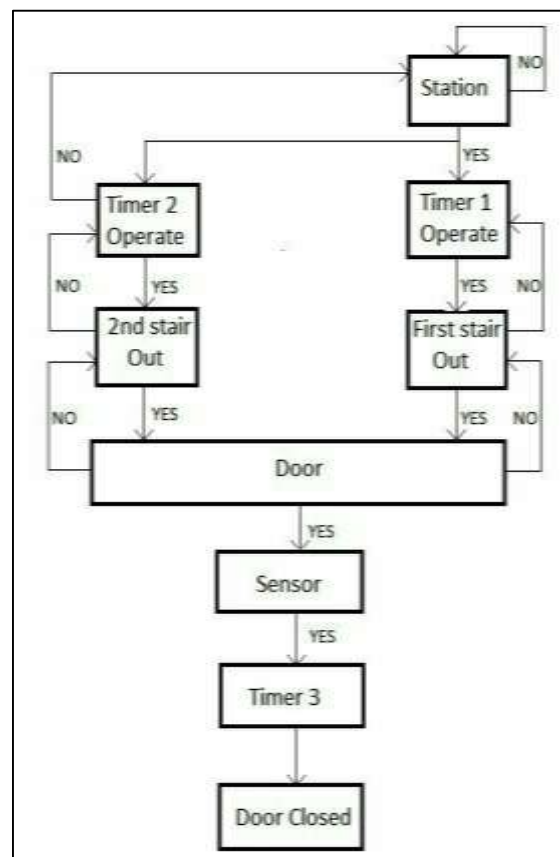


Fig. 4: Flowchart of System

As shown in flowchart when station is detected by the bus. The timer and timer 2 are on and the stairs are coming out. When both stairs come out then the door is open. The sensor is detected by a human until the passenger is detected the door will be open then after some time delay the door will be automatically close.

**V. ADVANTAGES**

**A. Use for long time duration:**

In some case if the bus is damaged we can separate our system and replace it in another bus.

**B. Highly reliable:**

Highly reliable because it is easy to implement and separate in bus.

**C. Provide comfort and safety:**

Comfortable for senior citizens, Blind people, children, handicap etc.

**D. Long-time sustainable:**

The system is used many times in another buses so it is long time sustainable.

Easy to use and manufacture.

Time saving.

Accurate result.

Easy to maintain.

## VI. CONCLUSION

The goal of our project is to provide comfort and safety with affordable cost. Our project is also reusable by exchanging whole system in other bus when the current bus is faulty or damage. In this by using of solar panel generate the electricity and use it for battery charging and this an also eco-friendly.

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