PLC based Industrial Time Management with Safety Integration

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Abstract--*In our day to day life technology plays an important role. The various devices make our life comfortable but we still feel there should be automation provided in our hospitals or industries. There should be devices or remotes to control several appliances. This project proposes a review on time management and safety integration system is designed using the basic programmable logic controller for managing the time intervals and also interfacing the sensors which are used and even necessary in industries for safety purpose.*

I. INTRODUCTION

Industrial automation system has been developed for purpose of time management, security, controlling and monitoring. The main concept is to form a time management system with safety integration for industries because it gives user a comfortable environment to use employees. Time Management systems have captured several technologies so far and many products are available in the market. PLC based time management with safety integration system, is been designed using basic programmable logic controller for managing time intervals and also interfacing the sensors which are needed in industries for safety purpose. Read or Write memory is also necessary for storing bell timings, but for less number of timings this memory is not needed.

This system uses a power-supply block to drive all the circuit components, a PLC to control and manage bell timings, a real-time clock for accurate timing operation, a keypad to enter and configure the bell timings it having additional facility through which we can avoid accident situation in the industry by using sensor and voice operated circuit which announce the hazardous situation. The operation of this system can be easily understood from the block diagram, wherein the keypad entered timings are stored in the PLC, which are responsible for operating the bell based on the program of the programmable logic control

II. SYSTEM OVERVIEW

Though there were many products in the market for industrial automation. In order to overcome the weakness of those project and increase the efficiency and reducing cost .Control the devices with PLC software decreases the programming complexity and increasing the number of inputs. Using of logo PLC one of the advanced PLC technology can produce delays for more than month or year this might overcome the drawbacks of earlier models. The PLC technology will be Economical control of complex systems. It can be reapplied to control other systems easily and quickly. Sophisticated control can be done with computational abilities. Programming is easier and reduces downtime through troubleshooting ability. Reliability and durability of the components make PLCs likely to operate for years.
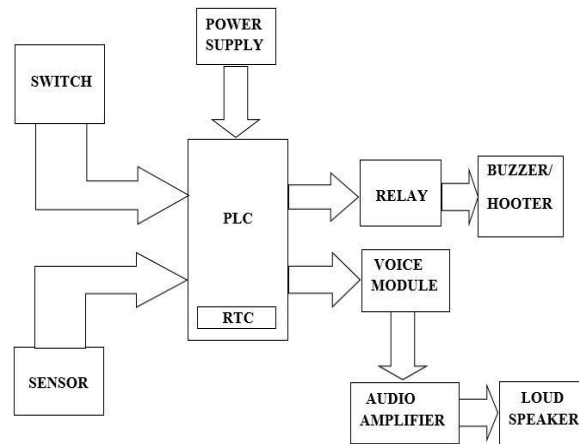
Figure 1: System Block Diagram

The block diagram flow starts from the time management with safety integration. This is done by the use of the PLC and industrial sensors. The power supply block gives about 24V DC as an output. As at the input side of the PLC there is a switch, industrial sensors, opto-coupler circuit. The switches used are micro and emergency switches. The industrial sensors interfacing the PLC are Fire, Moisture and Gas. All of these sensors consists of an IC LM358. The Fire Sensor detects using LDR (Light Dependent Register). The Moisture Sensor detects the moisture level my copper leads. The Gas Sensor senses using MQ6. The opto-coupler circuit consists of IC OP817.

The PLC which we have used is the DELTA DVP-14SS211T. The software for programming PLC is WPL Soft 2.37. We use Ladder Diagram for Programming. It consists of 8 i/p and 6 o/p. The power is 20.4 to 28.8V DC. RTC (Real Time Clock) is inbuilt in this PLC. At the output side of PLC there is a relay circuit, voice module, audio amplifier. The relay is the electromagnetic relay having 24V DC. The Voice Module consists of a programmable IC 89P42. The Audio Amplifier consists of IC LM386.

III. PROGRAMMING IN PLC

The method used for programming PLCs is based on the ladder diagrams. The ladder diagram consists of two vertical lines on either side representing the power rails which are positive and neutral. Circuits are connected in the rungs of the ladder which are horizontal, between these two rails. Each device in the relay rack would be represented by a symbol on the ladder diagram with connections between those devices shown.

Ladder logic is a programming language that represents a program in the form of graphical diagram based on the circuit diagrams of relay logic hardware and used in industrial control applications. The name Ladder Logic is appropriate as it resembles a ladder with two vertical rails on either side with a series of horizontally connected rungs between them. The system in the ladder diagram form will be programmed into the PLC. Once the programs have been downloaded into PLC, it can be monitored in the Diagram Workspace during execution. The Logo PLC provide the easy user interface to download the program, to upload the program, and to go back at online mode to see program desirable state. In this paper, the each home appliance is controlled by using PLC as shown in the flow charts.

IV. FLOWCHART
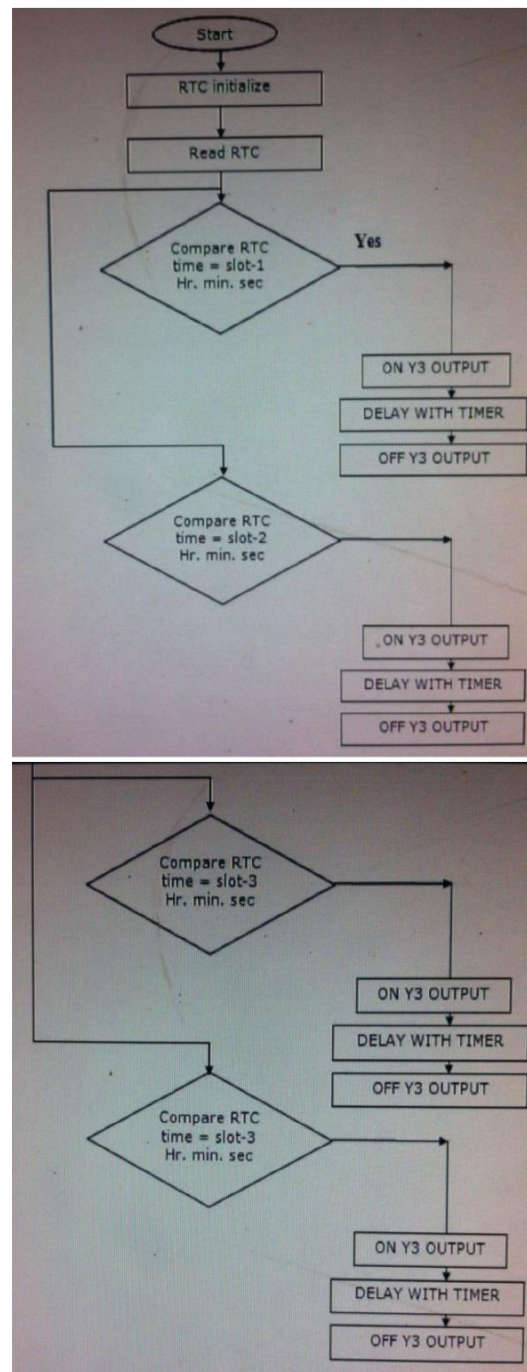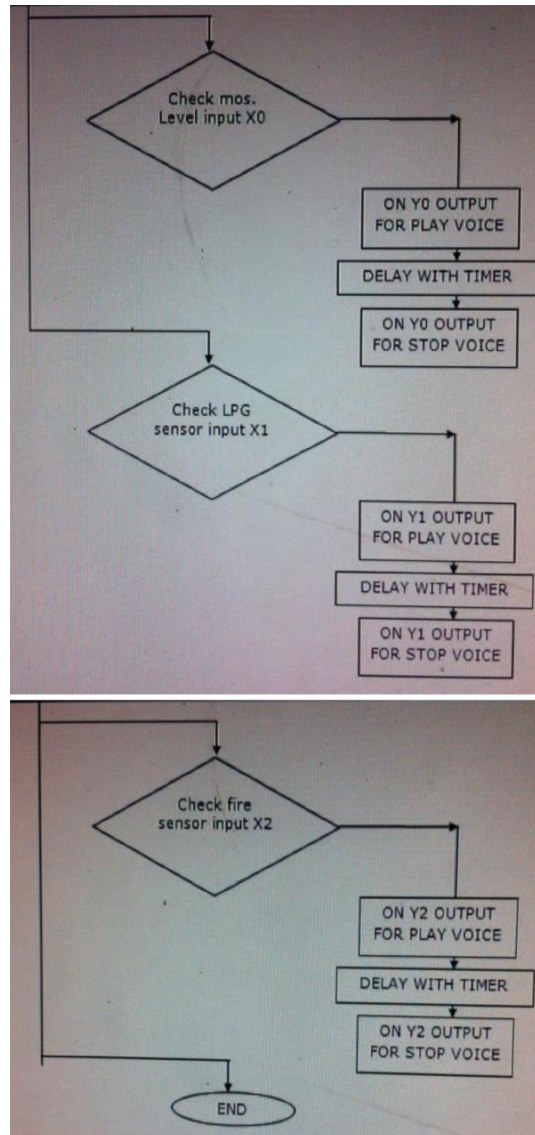
The Flow starts from the RTC (Real Time Clock) Initialize which reads it firstly compares the RTC slots. It also checks the Sensor levels such as Moisture, Gas and Fire and gives the output.

V. HARDWARE

V.I PLC DVP14-SS211T

Fig 4.1.1: Figure of PLC DVP14-SS211T

Description

Programmable Logic Controller (PLC) is a control system using electronic operations. It's easy storing procedures, handy extending principles, functions of sequential/position control, timed counting and input/output control are widely applied to the field of industrial automation control.

The DVP-SS2 Series is Delta Electronics' second generation of slim line industrial PLCs. The DVP-14SS211T features high speed counters and pulse outputs, a flexible serial port, real-time monitoring and an expansion bus that allows matching modules to be mounted on the right side of the PLC without external wiring.

Delta's DVP series programmable logic controllers offer high-speed, stable and highly reliable applications in all kinds of industrial automation machines. In addition to fast logic operation, bountiful instructions and multiple function cards, the cost-effective DVP-PLC also supports various communication protocols, connecting Delta's AC

motor drive, servo, and human machine interface and temperature controller through the industrial network in to a **complete "Delta Solution" for all users.**

Specifications:

Power: 20.4 to 28.8 VDC
Digital Inputs: 8 inputs, 24 VDC sink or source
Digital Outputs: 6 open collector type transistor outputs
Output Rating: 30 VDC, 500 mA each output
Communication Port: RS-232 and RS-485,
Modbus ASCII/RTU master or slave
Program Capacity: 8k steps
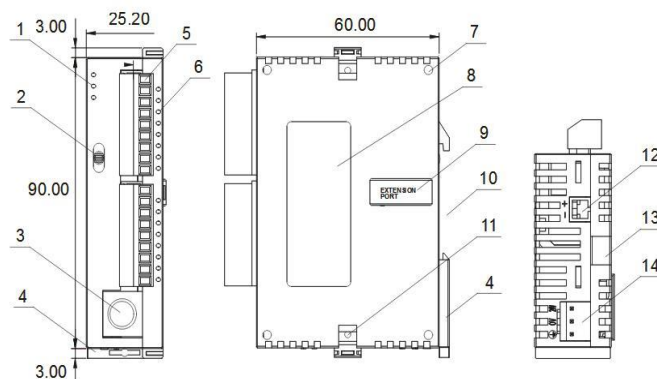IO Points: Up to 238 via expansion modules

Fig 4.1.2.: - Pin diagram of PLC DVP14-SS211T

Pin Description

1. POWER, RUN, ERROR indicator
2. RUN/STOP switch
3. I/O port for program communication (RS-232)
4. DIN rail clip
5. I/O terminals
6. I/O point indicator
7. Mounting hole for extension module
8. Nameplate
9. Extension port
10. DIN rail mounting slot (35mm)
11. Extension unit clip
12. RS-485 communication port
13. Mounting rail for extension module
14. DC power input

V.II   Voice IC 89P42

Fig 4.2.1: - Figure of voice IC 89p42

Description

AP89042 high performance Voice OTP is fabricated with Standard CMOS process with embedded 1M bits EPROM. It can store up to 42 sec voice messages with 4-bit ADPCM compression at 6KHz sampling rate.

8-bit PCM is also available as user selectable option. Two trigger modes, simple Key trigger mode and Parallel CPU trigger mode facilitate different user interface. User selectable triggering and output signal options provide maximum flexibility to various applications.

Built-in resistor controlled oscillator, 8-bit current mode D/A output and PWM direct speaker driving output minimize the number of external components. PC controlled programmer and developing software are available.

Pin Description

| PIN NO.	PIN NAME	DESCRIPTION
1	S8	Trigger pin (input with internal pull-down)
2	OUT1	Programmable output (I/O pin)
3	VOUT1	PWM output to drive speaker directly
4	VOUT2	PWM output to drive speaker directly
5	VSS	Power Ground
6	OUT2	Programmable output (I/O pin)
7	OUT3	Programmable output (I/O pin)
8	COUT	D/A current output
9	OSC	Oscillator input
10	S5	Trigger pin
11	S6	Trigger pin
12	VPP	Supply voltage for OTP programming
13	S1	Trigger pin
14	S2	Trigger pin
15	VDD	3.6 – 5.0V Positive Power Supply
16	S3	Trigger
17	S4	Trigger
18	SBT	Trigger pin
19	RST	Reset pin
20	S7	Trigger pin

V.III   Audio IC LM386
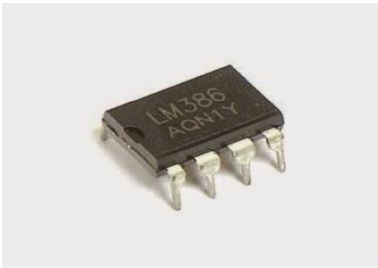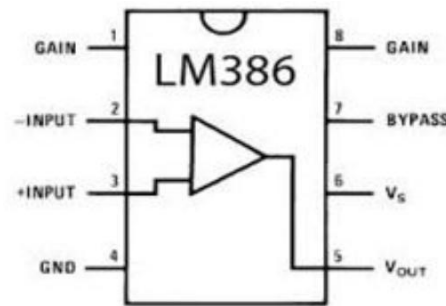

Fig : - Figure of audio IC LM386

Fig : - Pin diagram of audio IC LM386

Description

The LM386 is a power amplifier designed for use in low voltage consumer applications. The gain is internally set to 20 to keep external part count low, but the addition of an external resistor and capacitor between pins 1 and 8 will increase the gain to any value from 20 to 200.

The inputs are ground referenced while the output automatically biases to one-half the supply voltage. The quiescent power drain is only 24 mill watts when operating from a 6 volt supply, making the LM386 ideal for battery operation.

To make the LM386 a more versatile amplifier, two pins (1and 8) are provided for gain control. With pins 1 and 8 **open the 1.35 kΩ resistor sets the gain at 20 (26dB), If a capacitor is put from pin 1 to 8, bypassing the 1.35 kΩ** resistor, the gain will go up to 200(46dB). If a resistor is placed in series with the capacitor, the gain can be set to any value from 20 to 200. Gain control can also be done by capacitive coupling a resistor (or FET) from pin 1 to ground.

V.IV   Sensor IC LM358

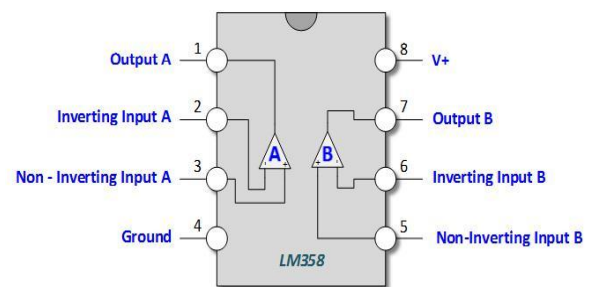*Fig 4.4.1: - Figure of sensor IC LM358*

Fig : - Pin diagram of sensor IC LM358

Description

The LM 358 is a double single supply operational speaker. As it is a solitary supply it takes out the requirement for a double power supply, therefore rearranging configuration and essential application use. One disadvantage is that the single supply does not offer a negative voltage supply. Because of this the yield won't have the capacity to go underneath 0V generally the waveform will cutoff otherwise called cutting. The LM358 is a double operation amp, which means there's two operation amps in one IC. We will just work with one for the time being.
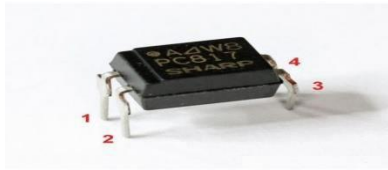
V.V   Opto Coupler

Fig 4.5.1: - Figure of opto coupler

Description

The HCPL-817 opto coupler contains a light transmitting diode optically coupled to a phototransistor. It is bundled in a 4-pin DIP bundle and accessible in wide-lead dispersing choice and lead twist SMD choice. Input-yield voltage is 5000 Vrms. Reaction time tr, is regularly 4 µs least CTR is half at info current of 5 mA.

VI. SENSORS USED

Various sensors are used for implementing the present controllable system.

VI.I   Moisture Sensor

Moisture sensors measure the water content in soil. A dirt dampness test is comprised of different soil dampness sensors. The Moisture Sensor can be utilized to distinguish the dampness of soil or judge if there is water around the sensor, let the plants in your patio nursery connect for human help. Embed this module into the dirt and afterward conform the on-board potentiometer to change the affectability. The sensor would yields rationale HIGH/LOW when the dampness is higher/lower than the limit set by the potentiometer.

VI.II   Gas Sensor

They are utilized as a part of gas spillage identifying types of gear in doctor's facilities and industry, are appropriate for recognizing of LPG, iso-butane, propane, LNG, maintain a strategic distance from the clamor of liquor and cooking exhaust and tobacco smoke. Structure and setup of MQ-6 gas sensor created by miniaturized scale AL2O3 earthenware tube, Tin Dioxide (SnO2) delicate layer, measuring anode and warmer are altered into a hull made by plastic and stainless steel net. The warmer gives vital work conditions to work of delicate segments. The encompassed MQ-6 has 6 pin, 4 of them are utilized to bring signals, and other 2 are utilized for giving warming current.

VI.III   Fire Sensor

The Fire sensor, as the name recommends, is utilized as a straight forward and reduced gadget for insurance against flame. The module makes utilization of IR sensor and comparator to distinguish fire up to a scope of 1 meter. The flame sensor circuit is excessively delicate and it can recognize an ascent in temperature.

The fire sensor module comprises of IR sensor, comparator and LED. It has got three pins gnd, Vcc and out. At whatever point flame is identified by IR sensor LED shines, and out pin is set high. The out pin can be given as contribution to the microcontroller and can be utilized for any flame location applications. At whatever point the LED is ON it shows that flame is distinguished. For instance you can associate it to a signal by means of microcontroller and when out pin of flame sensor module is set high the is ON. What's more, the scope of the sensor is 2 meters.

VII. CONCLUSION

The project presented has involved the development and implementation of time management with safety integration. The motivation of this work is to implement the idea to secure the time and also for safety purpose. This system is used in

industries, hospitals, etc. According to the achieved results the automation done is reliable if it is implemented mainly in industries. The application of this automation leads for the safety in industries and other areas.

VIII. REFERENCES

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