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# Multi Cold Stores Temperature control by SMS

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***Abstract: -*** *Short* message service (SMS) has become familiar and necessary to everyone, and so become the remote control. Therefore, it would be wonderful to use the s*hort* messages for applying remote control.
Here, s*hort* messages are used to serve as a remote control for the co1d-stores. The remote control system consists of microcontroller , GSM modems , a personal computer (PC) , cold stores , and a designed circuit. One PC interfaced to a GSM modem serves as a remote control transmission set, while the other set of microcontroller interfaced along with the GSM modem is used to receive short messages from the transmission set. When a short message is received , it will be analyzed by the microcontroller . The analyzed message gets interpreted by the microcontroller in order to control the operations in the cold store . This remote control system can be used for any electronic or electrical devices to operate them from anywhere using this technique , wherever the mobile network is available.

***Keywords: -*** *control system , PC , Mobile phone , SMS , cold store, microcontroller.*

## I. INTRODUCTION

Systems are designed to perform different tasks according to the required functions. For executing such functions, the system has to be easy to operate, well designed and controlled. The control process can be carried out inside the system or remotely. The remote control process can be easily classified into: first, wired control that uses compatible media such as metallic cable or fiber optics. Second, wireless remote control that uses Infra-Red (IR) technology, Ultrasonic (for short ranges) , and cellular mobile technologies. This paper makes use of the GSM network coverage to give flexibility to the system to be controlled remotely. The exploit of existing wireless mobile networks in different applications normally leads to the systems emerging. This approach of remote control process improves the control system for better operation and performance to meet the recent requirements within reasonable limit of low economical cost and effective impact. The design of the system allows users, upon authentication, to remotely control multiple cold stores in far distances , using GSM modem based interface.

## II. APPROACH

Analysis and design are the two principal phases, which are integrated together to build the circuit. Accordingly, analysis should be taken as a first step for evaluating the system and specifying the new requirements of each functional area of the devices that must be controlled. First of all, it is necessary to put all the general required points as main supports to depend on:

Analysis is highly important phase to be firstly carried out in the system as it parts the system into subgroups. Analysis also consists of examining the requirements of subgroups to be very clear.

According to the analysis procedures, the system behavior will be obvious, and shows the logical sequences of the control process. The logical sequences are being done according to the devices priority to show the consistency of devices in performing the operating process.

All the subgroups which reflect the common characteristic and logical sequences are going to yield various functions that the system performs. Then the functional area of each device can be perceived easily and taken into account in the design phase. The more important thing in this phase is the well-specified overlapped functional areas in order to be well designed.

Then all the above points will show the main features of the developed system, and consequently it is easy to build preliminary diagram of the proposed design as shown in figure (1) for determining the following operations sequence :

- Remote control of the power supply activation or shut down.
- Compressor operation.
- Two minutes delay.
- Evaporator operation.

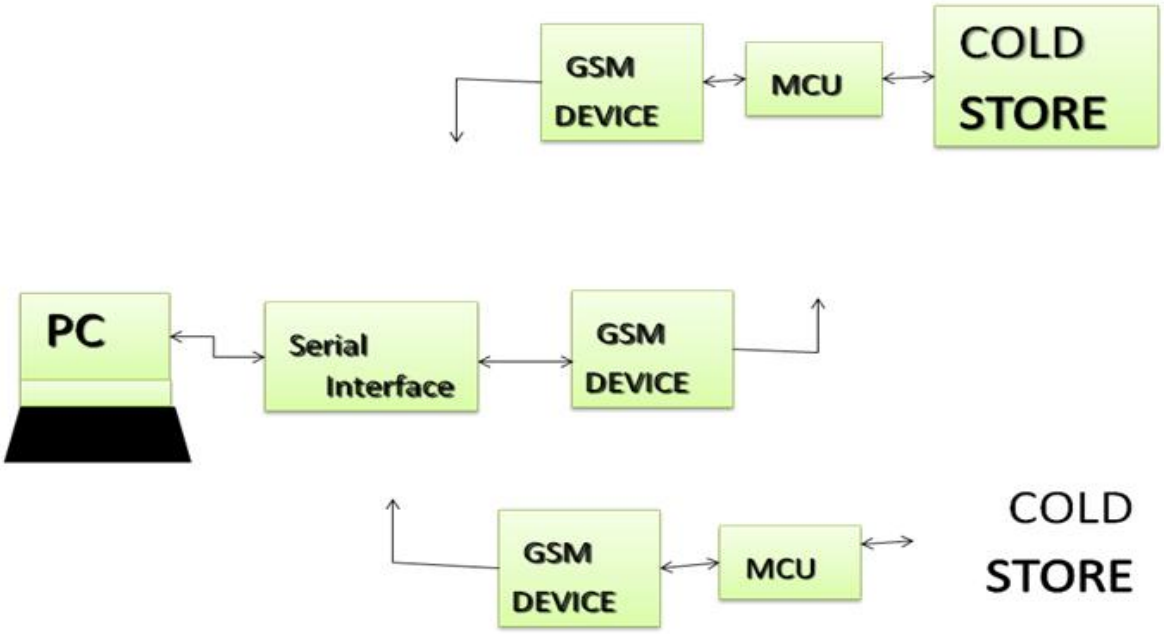


Figure (1) block diagram of the system

After that, the preliminary diagram should be checked to ensure that all the overlapped functional areas and the logical sequences of control signal are determined and specified in the right way.
Testing phase is also very important to be made for all devices and functional areas to reflect devices role in system. The test can be grouped into following:
Integrating test is to show how all the two different technologies (Wireless communications networks and computer) are well-interfaced to each other as well as interfacing the microcontrollers to the GSM modems..
Acceptance testis to shows that the overall system performs according to the requirements.
Modifications process should be done to correct any mistakes that might take place in any phase . Modifications process is made for the improvements of the system to meet all the new requirements.

## III. SYSTEM COMPONENTS

**1. GSM m**odem :
GSM is short for Global System of Mobile. It is a generic communication term .The GSM modem contains a Subscriber Identification Module (SIM) card.
Attention commands abbreviated as AT commands help the microcontroller to get SMS from GSM modem, then reads text of the SMS, display it on LCD, decodes the message and performs the task as the SMS says.
The order of control will change according to the text of the SMS message.

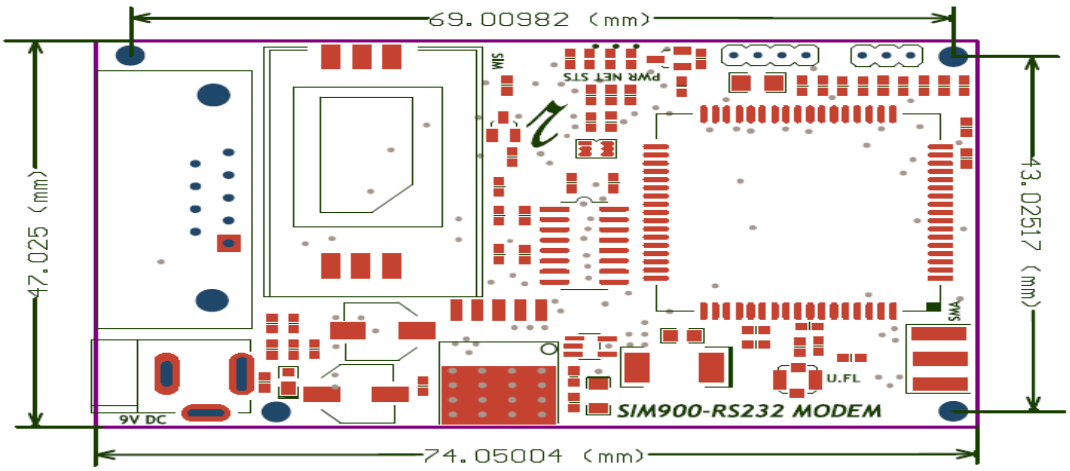


Figure (2) The GSM modem SIM 900

SMS appeared on the wireless scene in 1991 in Europe. The European standard for digital wireless, now included short messaging services from the outset.
In North America, SMS was made available initially on digital wireless networks built by early pioneers such as BellSouth Mobility, PrimeCo, and Nextel, among others. These digital wireless networks are based on GSM, code division multiple access (CDMA), and time division multiple access (TDMA) standards.

**2. PC Computer:**

PC computer hosts developed software. The PC computer is connected with the GSM modem via the seial port. The software dictates the processor to handle controlling process. A corresponding SMS is then sent by the GSM modem.

**3. HD74LS373 Latching IC:**

The HD74LS373 is eight bit is register IO mapped used as a buffer which stores signals for future use. Different types of latches are available HD74LS373 octal D-type transparent latch will be used in this system. This type of latch is suitable for driving high capacitive and impedance loads.

**4. ULN 2001A Darlington IC:**

The ULN2803A is a high-voltage, high-current Darlington transistor array. The device consists of eight NPN Darlington pairs that feature high-voltage outputs with common-cathode clamp diodes for switching inductive loads. The collector-current rating of each Darlington pair is 500 mA. . The Darlington pairs may be connected in parallel for higher current capability.

5.. cold store :

The cold store is a chamber used for storage of food products. It is supplied with a manual control panel.

6.. The microcontroller :

Atmega32 microcontrollers are used in the design .It contains of four ports .The ports can be programmed as input for data acquisition or as output for control tasks .Figure (3) shows the layout of the Atmega 32 microcontroller .

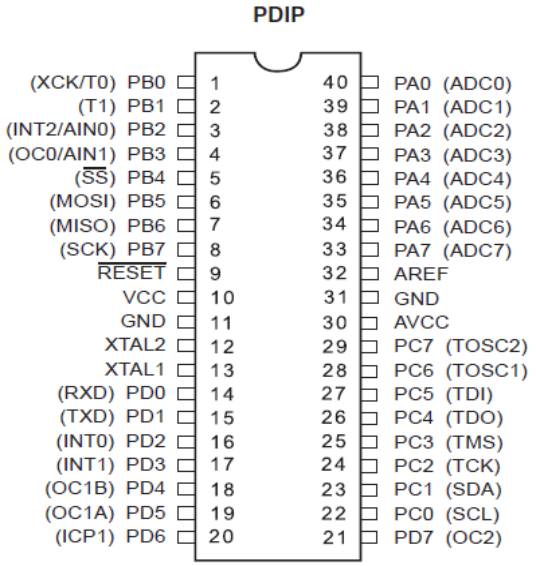


Figure (3) Layout of the Atmega 32 microcontroller

## IV. ALGORITHM

The proposed computer algorithm includes a strict sequence of steps for the operation of the cold stores . Similarly reverse steps are to be conducted to shut down the cold stores .It is assumed that there are seven cold stores (1 To 7) under remote control . The algorithm is :

Start
Initialization :
--- Clear all output control signals.
Check address phase:
--- Put the system into wait for SMS status.

--- Check the incoming SMS message l..
--- Analyze the incoming address in the SMS message..
--- If the address is equal to (001)2 , then call the turn ON subroutine to perform the sequence of operating the cold store No.1**.**
--- If the address is equal to (010)2 , then call the turn ON subroutine to perform the sequence of operating the cold store No.2**.**
--- If the address is equal to (011)2 , then call the turn ON subroutine to perform the sequence of operating the cold store No.3**.**
--- If the address is equal to (0100)2 , then call the turn ON subroutine to perform the sequence of operating the cold store No.4.
--- If the address is equal to (101)2 , then call the turn ON subroutine to perform the sequence of operating the cold store No.5**.**
--- If the address is equal to (110)2 , then call the turn ON subroutine to perform the sequence of operating the cold store No.6**.**
--- If the address is equal to (111)2 , then call the turn ON subroutine to perform the sequence of operating the cold store No.7**.**

--- Go to check address phase.
End.

ON sequence operation subroutine :
Start:
--- Put on the power supply.
--- wait for 30 seconds.
--- Put on the compressor.
---- Wait for two minutes.
----- Put on the evaporator.
Return..

Remark : The shut down algorithm is just the opposite of the turn on algorithm.

## V. RESULTS

Table (1) below shows the results based on proposing seven cold stores system control The table shows the addresses of the cold stores in binary .When the cold store address is recognized by the microcontroller ,the cold store concerned will respond.

Table 1 System SMS commands and their corresponding action on the seven cold stores .

| (SMS) Cold store addr. (BIN) | Cold store No. 1 | Cold store No. 2 | Cold store No. 3 | Cold store No. 4 | Cold store No. 5 | Cold store No. 6 | Cold store No. 7 |
|---|---|---|---|---|---|---|---|
| 001 | -Power supply ON -30 secs. Delay - Compressor ON -Two minutes delay -Evaporator ON | | | | | | |
| 010 | | -Power supply ON -30 secs. Delay -Compressor ON -Two | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | minutes delay -Evaporator ON | | | | | |
| 011 | | | -Power supply ON -30 secs. Delay -Compressor ON -Two minutes delay -Evaporator ON | | | | |
| 100 | | | | -Power supply ON -30 secs. Delay - Compressor ON -Two minutes delay -Evaporator ON | | | |
| 101 | | | | | -Power supply ON -30 secs. Delay -Compressor ON -Two minutes delay -Evaporator ON | | |
| 110 | | | | | | -Power supply ON -30 secs. Delay -Compressor ON -Two minutes delay -Evaporator ON | |
| 111 | | | | | | | -Power supply ON -30 secs. Delay -Compressor ON -Two minutes delay -Evaporator ON |

## VI. CONCLUSION

A remote control is an electronic device used for the remote operation of a machine. The designed circuit make use of the already established wireless GSM networks to transmit SMS messages as a control signals and hence it can be used for control from almost anywhere at any time once the mobile phone ( GSM ,CDMA, etc) network is available.

Hence using SMS messages, we can control any device remotely.

Security is essential to ensure that the system is accessible by the authorized personnel only. Non authorized commands to the system will be denied.

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