

Accident Avoiding System in Powerline Transmission Embedded based System

V Shenbagavalli
Asst.Prof. Dept of Physics
Loyola Institute of Technology
Tamilnadu, India

M Lawrence² K Dinesh³
Asso.Prof² PG Scholar³. Dept of Physics² Dept of EEE³
Loyola Institute of Technology
Tamilnadu, India

Abstract— The data communication over the electric power lines can be managed easily and economically since the grid connections are already spread around all over the world. This proposed system is based on a novel method to use the electrical power lines not only for carrying the line voltage but also to communicate between the two systems. Hence, the proposed system aimed to minimizing the power accidents, when the power line cables are slice due to natural disaster, manmade disaster. The proposed model consist a zigbee module to communicate, when a power line cable is sliced the power of the cable is stopped and the cables sliced information is transmitted over through the zigbee module. At same time both microcontrollers getting communication loss. So both microcontroller activate relay and switch over the power from failure line to temporary line. By this process we can product power loss and accident, beyond that it will provide uninterrupted power to the user and it will save time of electricity person to problem solve.

Keywords— *Microcontroller, Zigbee, Relay, Max 232.*

I. INTRODUCTION

1.1 General

In this project we will monitor transmission line multiple fault detection and indication send to electricity board via through alarm and message. The steady state operating mode of a power system is balanced 3-phase ac. However, due to sudden external or internal changes in the system, this condition is disrupted. When the insulation of the system fails at one or more points or a conducting object comes in contact with a live point, a short circuit or fault occurs. The causes of faults are numerous, e.g., lightning, heavy winds, trees falling across lines, vehicles colliding with towers or poles, birds, line breaks etc. A fault involving all the three phases is known as symmetrical fault while one involving only or one or two phases is known as unsymmetrical fault. We are working on monitoring these faults during occurring on transmission line. In this project we indicate the fault on LCD and transmit the fault message via GSM. These faults are monitoring by using microcontroller. In this the information is passed using the zigbee module by wireless communication. The step down transformer is used for reduce the voltage in microcontroller to control the entire simulation which consist of twopole x& y which is communicate using the zigbee module. We use the relay for the transmission of power from one node to other by using the embedded system simulation using Isis pro in real time

1.2 Design Consideration

Perfectly regulated power supply must be separately used for analog and digital sections.

1. External clock source must be used i.e. only Quartz Crystal Oscillator is recommended.
2. External power on reset circuit must be used to interface with PC for synchronization purpose. Processor must starts from 0thaddress for session initiation protocol-based operation.
3. External RS232 converter to be used for PC interface (optional).RS232 is a one chip consist one voltage Quadra puller & one dividing network.
4. Output current control to avoid thermal problems
5. I/P to ADC must be clamped with zener diode of 5V.

Radio-frequency identification(RFID) is a generic term that is used to describe a system that transmits the identity (in the form of a unique serial number) of an object or person wirelessly, using radio waves. It's grouped under the broad category of automatic identification technologies

2. BLOCK DIAGRAM

Transmitter

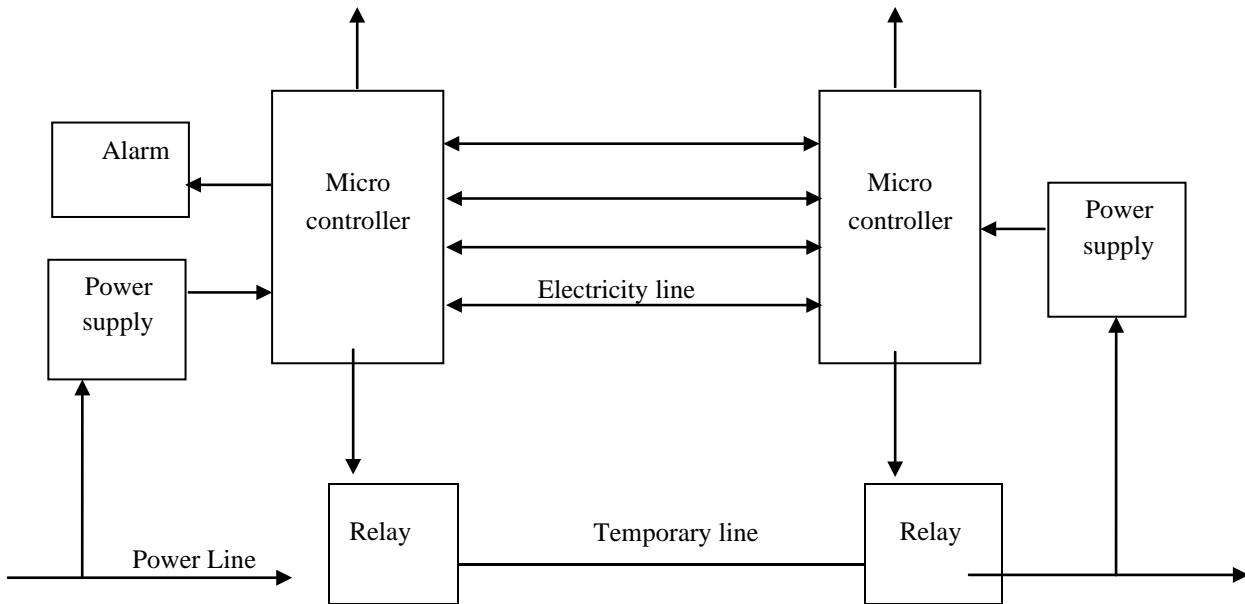
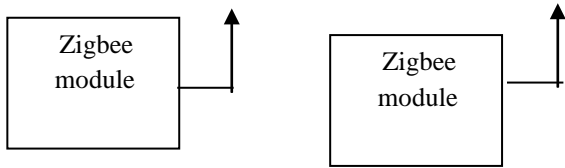
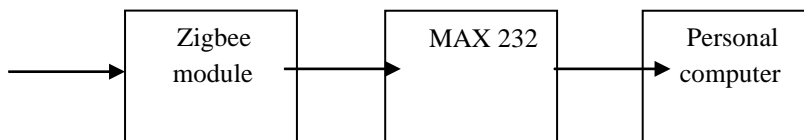


Fig: 2.1 Transmission Block Diagram

Fig: 2.2 Receiver Block Diagram



3. EASE OF ACCESS

3.1 MICROCONTROLLER

A Microcontroller is a single-chip microcomputer that contains all the components such as the CPU, RAM, some form of ROM, I/O ports, and timers. Unlike a general purpose computer, which also includes all of these components, a microcontroller is designed for a very specific task – to control a particular system.

3.2 POWER SUPPLIES

The ac voltage, typically 220V rms, is connected to a transformer, which steps that ac voltage down to the level of the desired dc output. A diode rectifier then provides a full-wave rectified voltage that is initially filtered by a simple capacitor filter to produce a dc voltage. This resulting dc voltage usually has some ripple or ac voltage variation

3.3 RELAY

A relay is nothing but a switch. In the figure below, I have shown a simplest relay with five terminals. A coil is attached to the terminals 1 and 2 and the remaining terminals are free to use. This one is the simplest relay. There are many kinds of relays but in all the relays there is just one coil. Some relays have four switches, some has eight but the coil is always one. But the coil specifications may differ like some relays have coils of 5V, some of 12V and they also differ in DC and AC. This specification always written on the coil you are purchasing.

3.4 ZIGBEE

ZigBee is a specification for a suite of high level communication protocols using small, low-power digital radios based on an IEEE 802 standard for personal area networks. ZigBee devices are often used in mesh network form to transmit data over longer distances, passing data through intermediate devices to reach more distant ones. This allows ZigBee networks to be formed ad-hoc, with no centralized control or high-power transmitter/receiver able to reach all of the devices. Any ZigBee device can be tasked with running the network.

3.5 MAX232

The MAX232 IC is used to convert the TTL/CMOS logic levels to RS232 logic levels during serial communication of microcontrollers with PC. The controller operates at TTL logic level (0-5V) whereas the serial communication in PC works on RS232 standards (-25 V to + 25V). This makes it difficult to establish a direct link between them to communicate with each other.

4. SERIAL COMMUNICATION

4.1 GENERAL

A microcontroller (sometimes abbreviated **μC**, **uC** or **MCU**) is a small computer on a single integrated circuit containing a processor core, memory, and programmable input/output peripherals. Program memory in the form of Ferroelectric RAM, NOR flash or OTP ROM is also often included on chip, as well as a typically small amount of RAM. Microcontrollers are designed for embedded applications, in contrast to the microprocessors used in personal computers or other general purpose applications.

Microcontrollers are used in automatically controlled products and devices, such as automobile engine control systems, implantable medical devices, remote controls, office machines, appliances, power tools, toys and other embedded systems. By reducing the size and cost compared to a design that uses a separate microprocessor, memory, and input/output devices, microcontrollers make it economical to digitally control even more devices and processes. Mixed signal microcontrollers are common, integrating analog components needed to control non-digital electronic systems.

Some microcontrollers may use four-bit words and operate at clock rate frequencies as low as 4 kHz, for low power consumption (single-digit milliwatts or microwatts). They will generally have the ability to retain functionality while waiting for an event such as a button press or other interrupt; power consumption while sleeping (CPU clock and most peripherals off) may be just nanowatts, making many of them well suited for long lasting battery applications. Other microcontrollers may serve performance-critical roles, where they may need to act more like a digital signal processor (DSP), with higher clock speeds and power consumption.

4.2 MICROCONTROLLER AT89S59

Microcontrollers are sometimes called embedded microcontrollers, which just mean that they are part of an embedded system. A microprocessor is a general-purpose digital computer with central processing unit (CPU), which contains arithmetic and logic unit (ALU), a program counter (PC), a stack pointer (SP), some working registers, a clock timing circuit, and interrupts circuits. The main disadvantage of microprocessor is that it has no on-chip memory. So we are going for micro controller since it has on-board programmable ROM and I/O that can be programmed for various control functions.

The microcontroller development effort resulted in the 8051 architecture, which was first introduced in 1980 and has gone on to be arguably the most popular micro controller architecture available. The 8051 is a very complete micro controller with a large amount of built in control store (ROM & EPROM) and RAM, enhanced I/O ports, and the ability to access external memory. The maximum clock frequency with an 8051 micro controller can execute instructions is 20MHz. Microcontroller is a true computer on chip. The design incorporates all of the features found in a microprocessor: CPU, ALU, PC, SP and registers. It also has the other features needed to, make complete computer: ROM, RAM, parallel I/O, serial I/O, counters and a clock circuit. The 89C51/89C52/89C54/89C58 contains a non-volatile FLASH program memory that is parallel programmable.

For devices that are serial programmable (In-System Programmable (ISP) and In- Application Programmable (IAP) with a boot loader) All three families are Single-Chip 8-bit Microcontrollers manufactured in advanced CMOS process and are Derivatives of the 80C51 microcontroller family. All the devices have the same instruction set as the 80C51.

4.2.1 Features

- 4.2.1.1 Compatible with MCS@-51 Products
- 4.2.1.2 8K Bytes of In-System Programmable (ISP) Flash Memory
- 4.2.1.3 Endurance: 10,000 Write/Erase Cycles
- 4.2.1.4 4.0V to 5.5V Operating Range
- 4.2.1.5 Fully Static Operation: 0 Hz to 33 MHz
- 4.2.1.6 Three-level Program Memory Lock
- 4.2.1.7 256 x 8-bit Internal RAM
- 4.2.1.8 32 Programmable I/O Lines
- 4.2.1.9 Three 16-bit Timer/Counters
- 4.2.1.10 Eight Interrupt Sources
- 4.2.1.11 Full Duplex UART Serial Channel
- 4.2.1.12 Low-power Idle and Power-down Modes
- 4.2.1.13 Interrupt Recovery from Power-down Mode
- 4.2.1.14 Watchdog Timer
- 4.2.1.15 Dual Data Pointer

- Fast Programming Time
- Flexible ISP Programming (Byte and Page Mode)
- Green (Pb/Halide-free) Packaging Option

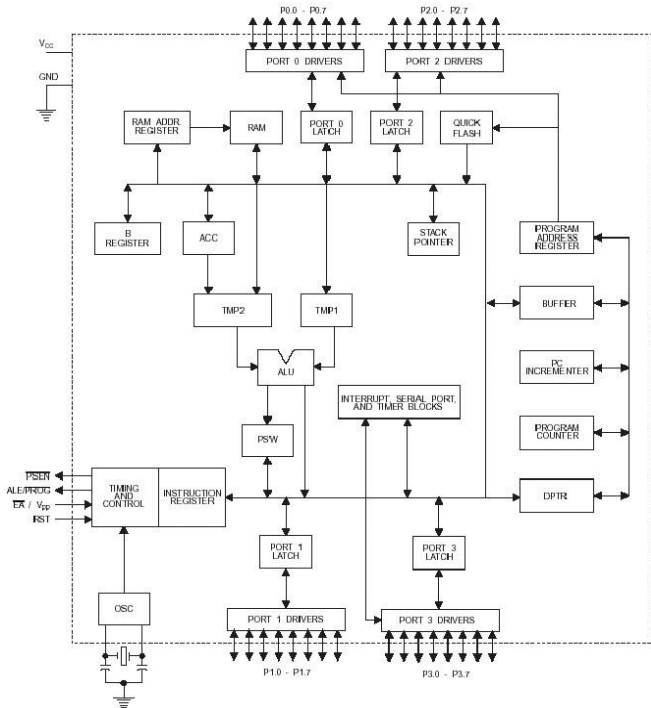
The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the industry-standard 80C51 instruction set and pinout. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer.

By combining a versatile 8-bit CPU with in-system programmable Flash on a monolithic chip, the Atmel AT89S52 is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications. The AT89S52 provides the following standard features: 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry. In addition, the AT89S52 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port, and interrupt system to continue functioning. The Power-down mode saves the RAM contents but freezes the oscillator, disabling all other chip functions until the next interrupt or hardware reset.

The AT89s52 is a low power, high performance CMOS 8-bit micro computer with 8Kbytes of flash programmable and erasable read only memory (PEROM). The device is manufactured using Atmel's high density nonvolatile memory technology and is compatible with the industry standard 80c51 and 80C52 instruction set and pin out. The on-chip flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with flash on a monolithic chip, the Atmel AT89s52 Is a powerful microcomputer which provides a highly flexible and cost effective solution to many embedded controls applications. The 89s52 microcontroller has excellent software compatibility, i.e. the software used can be applicable to any other microcontroller. The program written on this microcontroller can be carried to any base. Program compatibility is the major advantage in 89s52. The program can be used in any other advanced microcontroller. The program can be reloaded and changed for nearly 1000 times.

4.2.2 ARCHITECTURE

The AT89s52 provides the following standard features: 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full-duplex serial port, on-chip oscillator, and clock circuitry. In addition, the AT89s52 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port, and interrupt system to continue functioning. The Power-down mode saves the RAM contents but freezes the oscillator, disabling all other chip functions until the next hardware reset.



4.3 MAX 232

A. The MAX232 IC is used to convert the TTL/CMOS logic levels to RS232 logic levels during serial communication of microcontrollers with PC. The controller operates at TTL logic level (0-5V) whereas the serial communication in PC works on RS232 standards (-25 V to + 25V). This makes it difficult to establish a direct link between them to communicate with each other.

B. The intermediate link is provided through MAX232. It is a dual driver/receiver that includes a capacitive voltage generator to supply RS232 voltage levels from a single 5V supply. Each receiver converts RS232 inputs to 5V TTL/CMOS levels. These receivers (R₁ & R₂) can accept ±30V inputs. The drivers (T₁ & T₂), also called transmitters, convert the TTL/CMOS input level into RS232 level.

The transmitters take input from controller’s serial transmission pin and send the output to RS232’s receiver. The receivers, on the other hand, take input from transmission pin of RS232 serial port and give serial output to

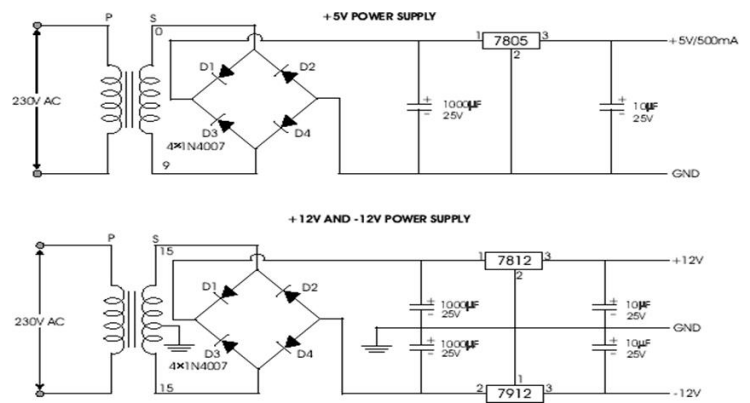
microcontroller’s receiver pin. MAX232 needs four external capacitors whose value ranges from 1μF to 22μF.

Microcontrol ler	MAX232		RS232
Tx	T _{1/2} In	T _{1/2} Out	Rx
Rx	R _{1/2} Out	R _{1/2} In	Tx

Table 4.1

4.4 Transformer

The potential transformer will step down the power supply voltage (0-230V) to (0-6V) level. Then the secondary of the potential transformer will be connected to the precision rectifier, which is constructed with the help of op-amp. The advantages of using precision rectifier are it will give peak voltage output as DC rest of the circuits will give only RMS output.



II. 4.5 ULN2003

ULN2003 is a high voltage and high current Darlington array IC. It contains seven open collector Darlington pairs with common emitters. A Darlington pair is an arrangement of two bipolar transistors.

ULN2003 belongs to the family of ULN200X series of ICs. Different versions of this family interface to different logic families. ULN2003 is for 5V TTL, CMOS logic devices. These ICs are used when driving a wide range of loads and are used as relay drivers, display drivers, line drivers etc. ULN2003 is also commonly used while driving Stepper Motors. Refer Stepper Motor interfacing using ULN2003.

The zero crossing feature of the TRIAC driver, (an opto-isolator) ensures low noise generation thus avoiding sudden inrush of current on resistive and inductive loads. In this project, two push buttons are used for generating the output pulses from the microcontroller randomly, away from the ZVS ie not coinciding with zero voltage supply voltage of the waveform.

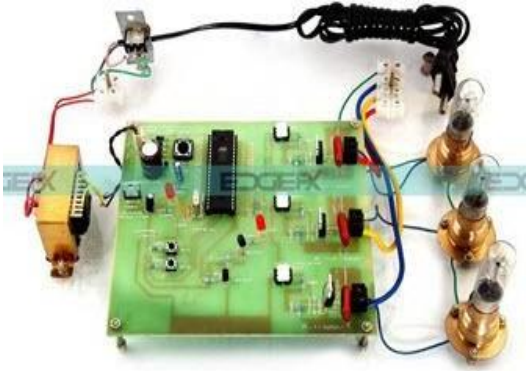


Fig: 4.5 Semiconductor Relay with ZVS Project Kit by Edgefxkits.com

4.6 ZIGBEE TRANSCEIVER

ZigBee is targeted at applications that require a low data rate, long battery life, and secure networking. ZigBee has a defined rate of 250 Kbit/s, best suited for periodic or intermittent data or a single signal transmission from a sensor or input device. Applications include wireless light switches, electrical meters with in-home-displays, traffic management systems, and other consumer and industrial equipment that requires short-range



Fig: 4.15 ZigBee Transceiver

wireless transfer of data at relatively low rates. The technology defined by the ZigBee specification is intended to be simpler and less expensive than other WPANs, such as Bluetooth or Wi-Fi.

5. SOFTWARE IMPLEMENTATIONS

5.1 KEIL SOFTWARE

III. Keil MicroVision is an integrated development environment used to create software to be run on embedded systems (like a microcontroller). It allows for such software to be written either in assembly or C programming languages

and for that software to be simulation a computer before being loaded onto the microcontroller.

5.1.1 μ Vision3

μ Vision3 is an IDE (Integrated Development Environment) that helps write, compile and debug embedded programs. It encapsulates the following components:

- A project manager.
- A make facility.
- Tool configuration. Editor.
- A powerful debugger.

5.1.2 STEPS FOLLOWED IN CREATING AN APPLICATION IN μ Vision3:

To create a new project in μ Vision3:

- Select Project - New Project.
- Select a directory and enter the name of the project file.
- Select Project - Select Device and select a device from Device Database.

Create source files to add to the project

- Select Project - Targets, Groups, and Files. Add/Files, select Source Group1, and add the source files to the project.

Select Project - Options and set the tool options. Note that when the target device is selected from the Device Database. All-special options are set automatically. Default memory model settings are optimal for most applications.

- Select Project - Rebuild all target files or Build target

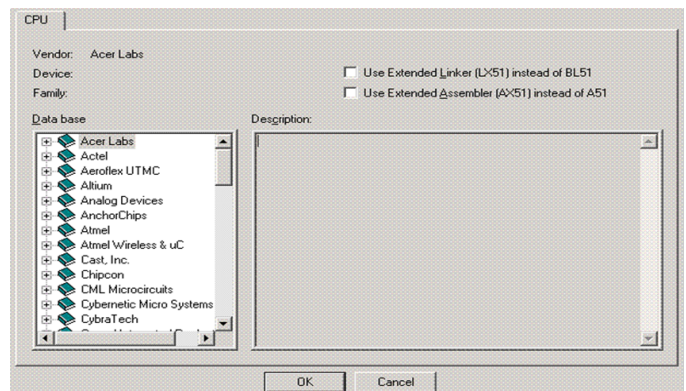


Fig 5.1 Window for Choosing the Target Device

Fig: 5.1 shows next, Micro Vision must be instructed to generate a HEX file upon program Compilation. A HEX file is a standard file format for storing executable code that is to be loaded onto the microcontroller. In the “Project Workspace” pane at the left, right-click on “Target 1” and select “Options for ‘Target 1’ ”. Under the “Output” tab of the resulting options dialog, ensure that both the “Create Executable” and “Create HEX File” options are checked. Then click “OK” as shown in the two figures.

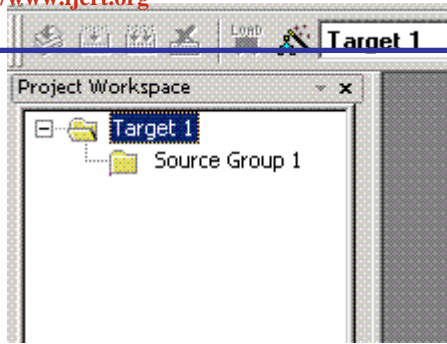


Fig: 5.2 Project Workspace Pane

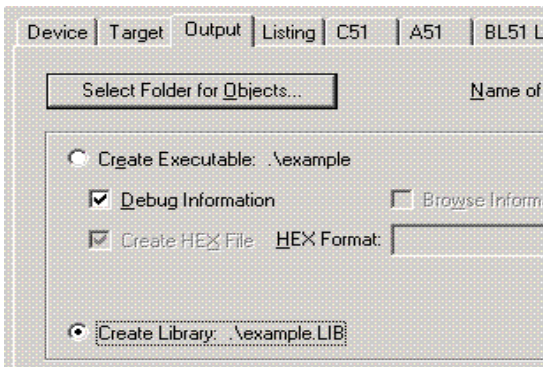


Fig: 5.3 Project Options Dialog

Fig: 5.3 shows the next, a file must be added to the project that will contain the project code. To do this, expand the “Target 1” heading, right-click on the “Source Group 1” folder, and select “Add files...” Create a new blank file (the file name should end in “.asm”), select it, and click “Add.” The new file should now appear in the “Project Workspace” pane under the “Source Group 1” folder. Double-click on the newly created file to open it in the editor. All code for this lab will go in this file. To compile the program, first save all source files by clicking on the “Save All” button, and then click on the “Rebuild All Target Files” to compile the program as shown in the figure below.

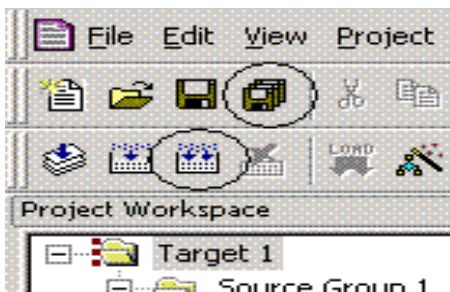


Fig: 5.4 “Save All” And “Build All Target Files” Buttons

Fig: 5.4 shows the program has been successfully compiled, it can be simulated using the integrated debugger in Keil MicroVision. To start the debugger, select “Debug”=>”Start/StopDebug Session” from the pull-down menus.

At the left side of the debugger window, a table is displayed containing several key parameters about the simulated microcontroller, most notably the elapsed time (circled in the figure below). Just above that, there are several buttons that control code execution. The “Run” button will cause the program to run continuously until a breakpoint is reached, whereas the “Step Into” button will execute the next line of code and then pause (the current position in the program is indicated by a yellow arrow to the left of the code).

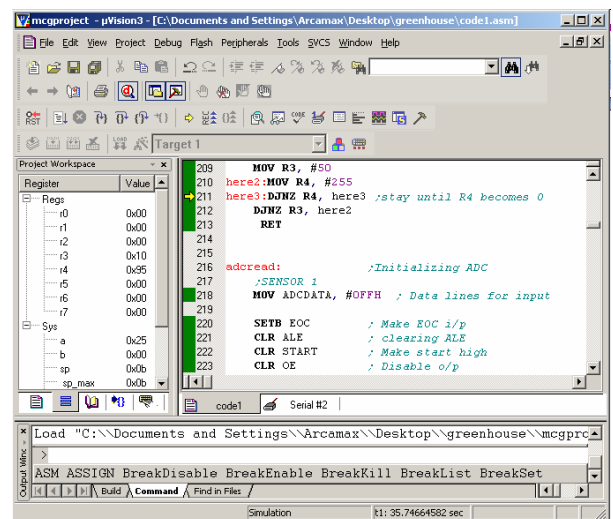


Fig: 5.5 μ Vision3 Debugger Window

Fig: 5.5 shows the breakpoints can be set by double-clicking on the grey bar on the left edge of the window containing the program code. A breakpoint is indicated by a red box next to the line of code.

Proload PROGRAMMING SOFTWARE

‘ProLoad’ is a software working as a user friendly interface for programmer boards from Sunrom Technologies. Proload gets its name from “Program Loader” term, because that is what it is supposed to do. It takes in compiled HEX file and loads it to the hardware. Any compiler can be used with it, Assembly or C, as all of them generate compiled HEX files. ProLoad accepts the Intel HEX format file generated from compiler to be sent to target microcontroller. It auto detects the hardware connected to the serial port. It also auto detects the chip inserted and bytes used. The software is developed in Delphi and requires no overhead of any external DLL.

The programmer connects to the computer's serial port (Comm 1, 2, 3 or 4) with a standard DB9 Male to DB9 Female cable. Baud Rate - 57600, COMx Automatically selected by window software. No PC Card Required. After making the necessary selections, the 'Auto Program' button is clicked as shown in the figure below which burns the selected hex file onto the microcontroller.

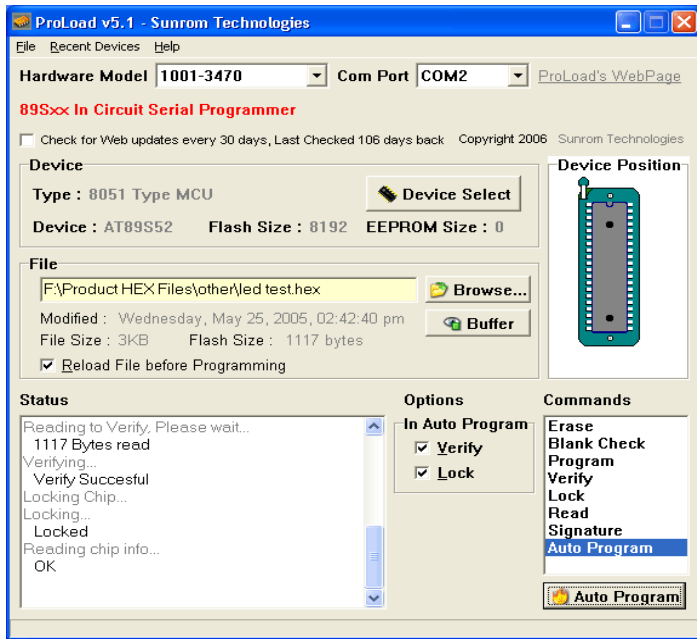


Fig: 5.6 Programming window

5.2 EMBEDDED C

Use of embedded processors in passenger cars, mobile phones, medical equipment, aerospace systems and defence systems is widespread, and even everyday domestic appliances such as dish washers, televisions, washing machines and video recorders now include at least one such device. There is a large - and growing - international demand for programmers with 'embedded' skills, and many desktop developers are starting to move into this important area. These popular chips have very limited resources available: most such devices have around 256 bytes of RAM, and the available processor power is around 1000 times less than that of a desktop processor. As a result, developing embedded software presents significant new challenges, even for experienced desktop programmers.

SIMULATION DIAGRAM:

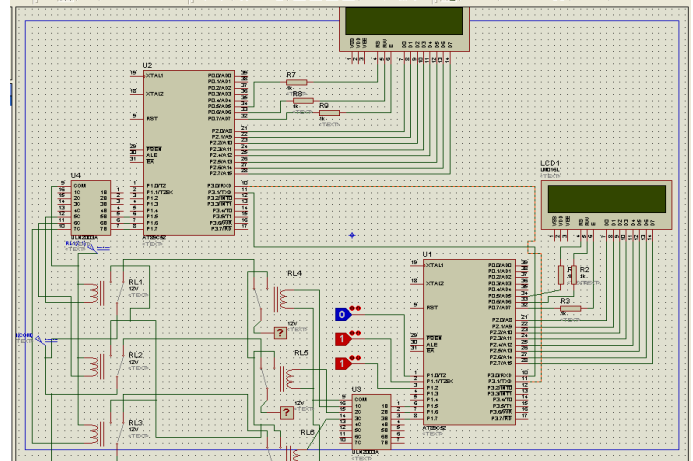


Fig:5.3 Simulation Diagram

6. RESULT AND CONCLUSIONS

Electrical power is transmitted over high voltage transmission lines, distributed over medium voltage, and used inside buildings at lower voltages. Power line communications can be applied at each stage. Most PLC technologies limit themselves to one set of wires (for example, premises wiring), but some can cross between two levels (for example, both the distribution network and premises wiring). Typically the transformer prevents propagating the signal which allows multiple PLC technologies to be bridged to form very large networks.

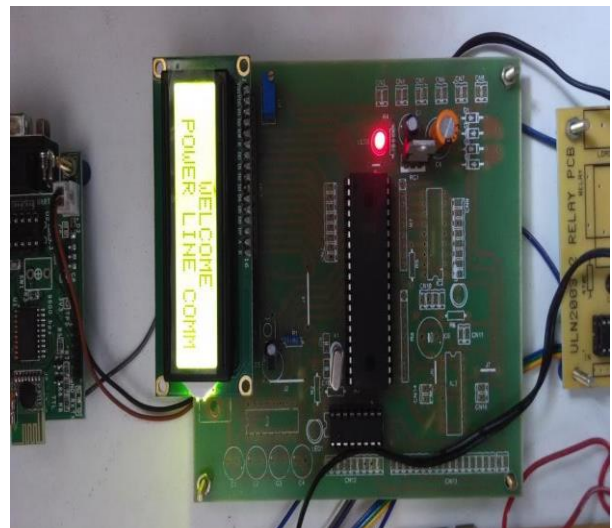


Fig: 6.1 HARDWARE DISPLAYING SYSTEMS

Generally power networks can be classified into three broad categories: dc current supply used in industrial applications such as automotive; sinusoidal supply used for electrical distribution networks or domestic applications; and pulse width- modulated (PWM) networks used in the vast majority of applications involving converters and actuators. Power line communication (PLC) technology is widely used over sinusoidal and continuous electrical networks and data rates up to several hundred megabits per second are guaranteed.

The PLC is nothing but the communication media in between the transmitter and the receiver which is known as power line channel or power line carrier modem

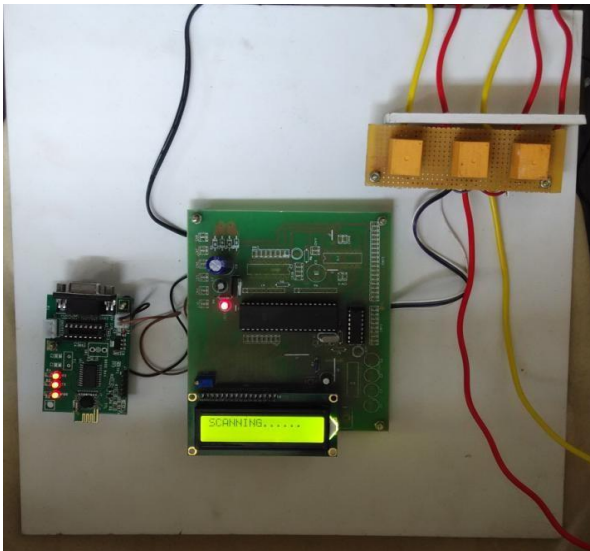


Fig: 6.2 DETECTING THE FAULTS

Higher data rates generally imply shorter ranges; a local area network operating at millions of bits per second may only cover one floor of an office building, but eliminates installation of dedicated network cabling. Breakage mishaps compared to short circuit fuse blowing mechanism which is now used in practice. Also Wireless communication RTU technology can be used over years without any maintenance. Breaking mechanism technology now is so much advanced with microprocessor based and compact, also they can be controlled remotely by using a shunt trip mechanism signal. This integration of breaking mechanism + Wireless link + open circuit detection will give an excellent result and avoid any electrical accidents due to open hanging wires.

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