

# Morse Code - A Security Enhancer

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**Abstract:** Morse code was popularly known as the language of dots and dashes. Years later, this language came up with improvised versions like transmitting text information as a series of toggling tones, changing brightness levels, or ticks that can be directly decoded by a skilled listener or an observer without the use of any special type of equipment. It has been the most simplest and inexpensive method of transmitting and receiving messages. Over the years this method was mainly used in radio communication but today this methodology has many applications in aviation, navy and assistive methodology like helping people with disabilities to communicate. This paper demonstrates a basic model of transmitting Morse code through the keyboard via DB9 connector, encoding the alphabets with the help of PIC microcontroller and displaying the transmitted as well the decoded alphabets on the LCD.

**Keywords:** Morse code, telegraph, manual message transmission, cipher text, signaling conditions

## 1. Introduction

Morse code which was originally transmitted by telegraph is actually an alphabetic code of long and short sounds. Each alphabetic letter has a corresponding sound or series of sounds unique to it. The sounds which last a little longer are referred to as dashes, while the sounds which comparatively last for a shorter duration are dots. Length of silence denotes spaces and by varying this length of silence, one can differentiate between the letters or words. In a telegraph, for dot, the telegraph key or switch was pressed and it quickly rebounded. For a dash, the key was held down longer before allowing it to spring back. Compared to a dot, a dash lasts for three times longer time unit. Thus messages were sent by pressing the keys in a rhythm of coded symbols. Messages were obtained via a radio transceiver, sounding like dots and dashes.

However, to read Morse code is not a child's play as one thinks, especially for those who are not skilled in reading Morse code. So this paper is to study about the Morse code and to develop its reader that can read and translate Morse code to text. This is a very simple methodology and hence requires no other heavy equipment. The project implementations go through the following process:

1. Select the microcontroller and programming environment.
2. Design and develop a reader for Morse code as a receiver and using software in the PC as a transmitter.

This application can read the data of dots and dashes accurately and quickly and then translate each message in the corresponding text. This translated reading will be displayed on the Liquid Crystal Display (LCD) screen. It is much easier than the old method of manual transmission.

Finally, this is simple to use and very user friendly which uses only 5V power supply. It uses a PIC microcontroller, where it has been programmed to compare each combination of dot and dash with its matching letter, of input given through the keyboard with the help of DB9 connector.

## 2. Background

The Morse code was developed in the early 19<sup>th</sup> century when the people did not have any idea of constructing circuits to send voice messages from one place to another. The telegraph systems were means of sending and receiving messages with help of electronic impulses. The Morse code was named so after its inventor, Samuel F B Morse. It continues to be the easiest, efficient and affordable means of communication as the apparatus required by it was very simple. This method proved that proficiency in English was a requirement to communicate with the rest of the world. Later on, this code was accepted globally and a common International Morse code has been developed and used.

1. A dash is equal to three dots.			
2. The space between parts of the same letter is equal to one dot.			
3. The space between two letters is equal to three dots.			
4. The space between two words is equal to seven dots.			
A	• —	U	• • —
B	— • • •	V	• • • —
C	— • — •	W	• — —
D	— • •	X	— • • —
E	•	Y	— • — —
F	• • — •	Z	— — • •
G	— — •		
H	• • • •		
I	• •		
J	• — — —		
K	— • —	1	• — — — —
L	• — • •	2	• • — — —
M	— —	3	• • • — —
N	— •	4	• • • • —
O	— — —	5	• • • • •
P	• — — •	6	— • • • •
Q	— — • —	7	— — • • •
R	• — •	8	— — — • •
S	• • •	9	— — — — •
T	—	0	— — — — —

Figure1: International Morse Code

### 3. Method and Discussion

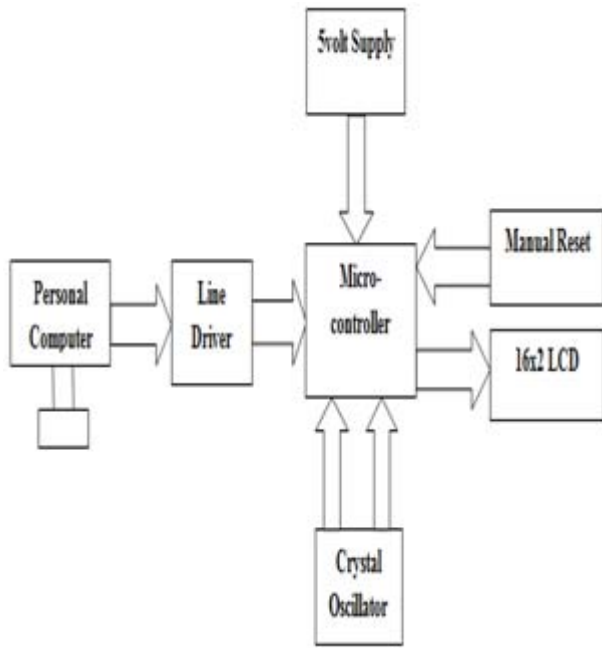


Figure 2: Block Diagram

#### 3.1 Description

Text input message in the form of Morse code is given by pressing the keyboard keys of a personal computer. It is then connected to PIC18F452 microcontroller via DB9 connector. MAX 232 is line driver or a voltage converter. PIC microcontroller is compatible with TTL standard whereas Personal Computers are compatible with RS232 standard. According to RS232 standard, logic 0 corresponds to +10volts and logic 1 to -10volts. And according to TTL standard, logic 0 corresponds to 0volts and logic 1 to 5volts. So when these two need to communicate with each other, MAX232 is used for conversion between these two different standard devices. Now the text information is received by the PIC microcontroller. In the PIC microcontroller, a database is created for the alphabets and numerical with their corresponding Morse code. As soon as the Morse input is given, its respective symbol gets selected. PIC is also interfaced with the LCD. The Morse code and its alphabet are then displayed on the LCD. The LCD can be used in 4-bit mode in order to save the input/output lines. These vacant lines can be further utilized in the advancement of project. Manual Reset is present because when it is pressed, 0volt is applied to Reset pin and microcontroller starts executing its code from 0000H location.

In a similar manner a model can be designed which can be used to transmit the read Morse code and deliver the original text message to the recipient over long distances. These encoder and decoder modules can communicate via wired or wireless media as per requirement.

### 4. Simulation Results

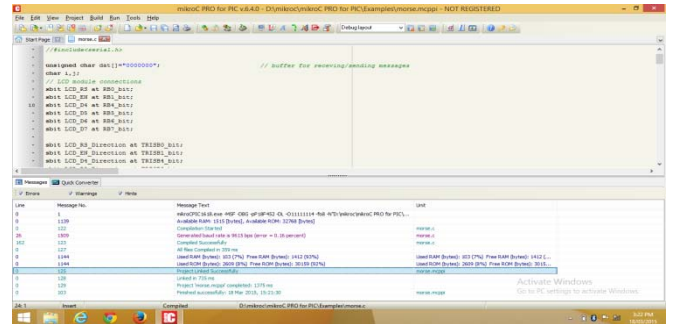


Figure 3: C Code compilation in MikroC for PIC

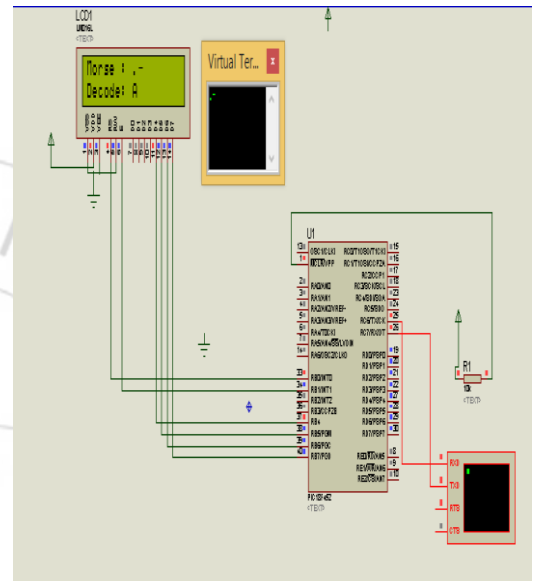


Figure 4: Simulation of C code in Proteus

In Proteus the hex file of compiled C code is dumped into PIC microcontroller to check for the rightness of the code. On the virtual terminal input Morse code is typed with the help of keyboard. Then on the LCD Morse code along with its corresponding decoded alphabet is displayed.

For example, in the above simulation, on pressing ‘.-’ as input through the keyboard, it is displayed along with its corresponding alphabet which is ‘A’ on the LCD.

### 5. Test Results

#### 2.1 Enclosure Designs

##### 1) Top View

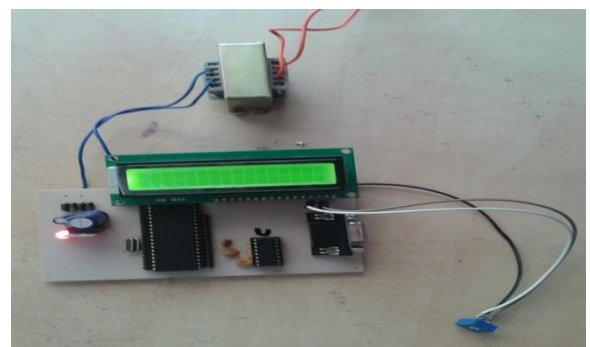


Figure 5: Top view of design

## 2) Bottom view

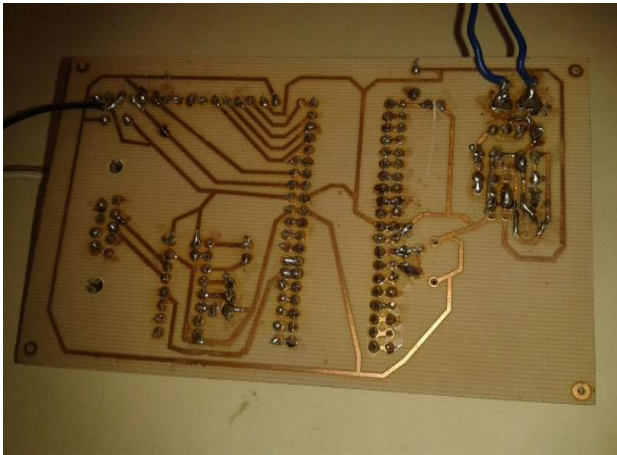


Figure 6: Bottom view of the design

## 2.2 Test Result

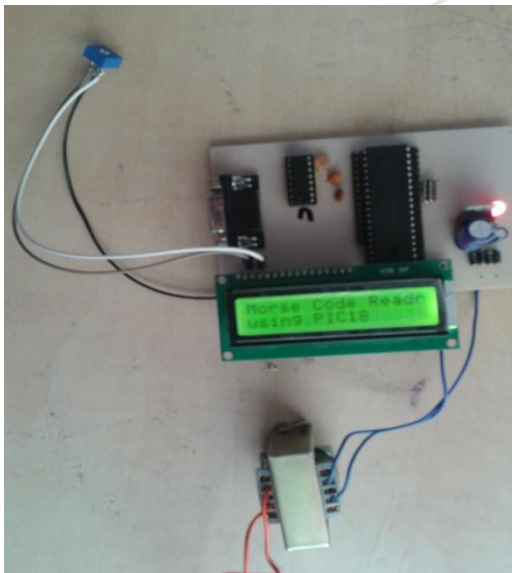


Figure 7: Test Result

Thus input message is transmitted in encoded sequence for some characters and the output obtained is displayed on the LCD as above. It starts with a message as "Morse Code Reader using PIC18".

## 6. Conclusion and Future Work

Thus this paper gives successful implementation of the Morse code encoder and decoder circuitry. Information could be easily transmitted in the form of dots and dashes through the keyboard to obtain decoded output on the LCD in the form of alphabets and numbers. The circuit is very simple to implement and Morse code has high security as only skilled and learned persons can decode the information. This method of communication has got dual benefit of good bandwidth efficiency and low transmission power as compared to the other complex coding schemes used in communication. Also it is comparatively more immune to interference both natural and man-made. Morse code no longer remains only the language of dots and dashes used in telegraph but it has also found a great scope in the fields of aviation to

communicate with the base station, in navy to communicate with different ships, radio communication like the Amateur Radio, and recently has proved to be a great boon and an important communication tool for the people with various disabilities to communicate.

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