

MICROWAVE LINK OPTIMIZATION

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ABSTRACT

This paper presents a method to optimize microwave link alignment using a microcontroller. A microwave link provides the connection between base stations of mobile communication networks. Failures in microwave link occur due to various reasons such as wind, causing breakdown in mobile network. The general practice of aligning microwave link is manual process by monitoring the signal strengths. This study proposes a method to automate the microwave link alignment. This system stores the initial alignments of the microwave antenna. When changes are occurred, re-alignment can be done easily selecting the initial location and the antenna will aligned automatically. The proposed system increases the efficiency of re-storing breakdown networks due to miss-alignment of microwave link.

Keywords: Microwave link, Base Transceiver Station, Signal Strength, Stopper Motor

1. INTRODUCTION

Telecommunication industry currently experiences an exponential growth in technological advancements. New Technologies demand new regulations and the regulator is forced to keep abreast with its regulations, especially with the burden of installation at a level field. A microwave connection is very important to a telecommunication network because a fault of the link may drive the sites out of control. Microwave link alignment is a somewhat difficult task in the microwave installation and maintaining process, because it is done manually. In the installation process a lot of problems can occur. Sometimes manual alignment cannot find the most accurate aligned position.⁵

In the existing method, industry uses manual system for resetting the most of system. Especially they used very hard & manual way to link alignment. Because they had to reset the link alignment until detect the each signals correctly. But it was a very hard way and this designed system is to overcome this circumstances.

This research is to propose and design a prototype system to minimize the alignment time and to simplify the operator's job in the installation and aligning the microwave link in the telecommunication field. Initially manual way is utilized to detect of different highest strength levels of signal. Stepper motor is used to analyze the degree of the angle. Using the microcontroller, degree of the angle of the link is stored and they are used to rotate the link for different angles. Finally the highest strength signal is detected login to the link. As a result of this study it helps to minimize the work load for adjusting the link alignment to detect the suitable signal to each link.⁵

2. EXPERIMENTAL

The block diagram of the proposed system for the microwave link optimization is shown in the figure 1.

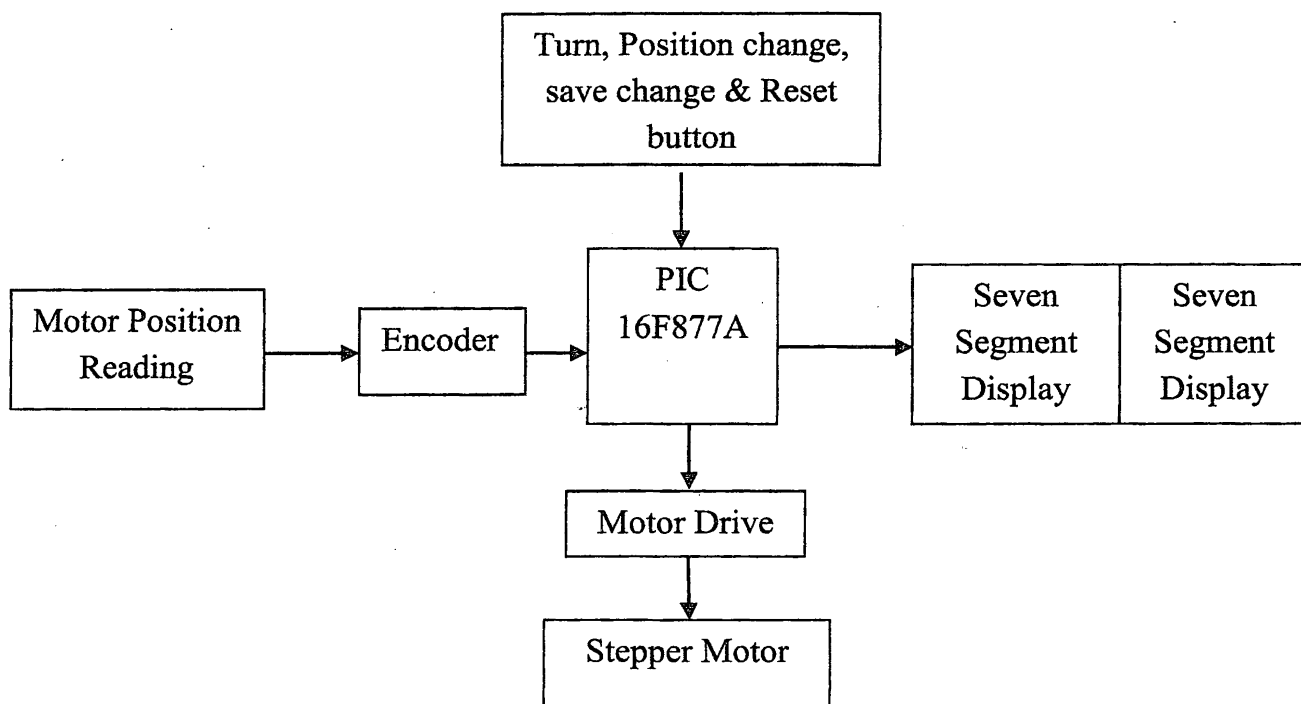


Figure 1 : Block diagram of the system

Turn, Position change, save change & Reset buttons are used to perform rotation for a particular position, change the saved number, save the changed number and reset the system respectively.

Encoder and IR sensor are used to identify the position where the identified positions exist.

The main part of the proposed system is PIC micro controller 16F877A. In this micro controller, set of the pre-defined receiving levels are manually saved. The maximum receiving levels are identified and saved them in the PIC 16F877A.

Those saved values are displayed by using seven segment displays from the beginning to the end respectively. If there is an issue in misalignment, the required position will be given to the system by manually entering the relevant number of the required position to the system. Then the link will be positioned in to the correct position automatically.

Stepper motor is used to rotate the microwave link automatically to the required position. L293D IC (Motor controller) is used to control the stepper motor.

2.1 Circuit Design of the System

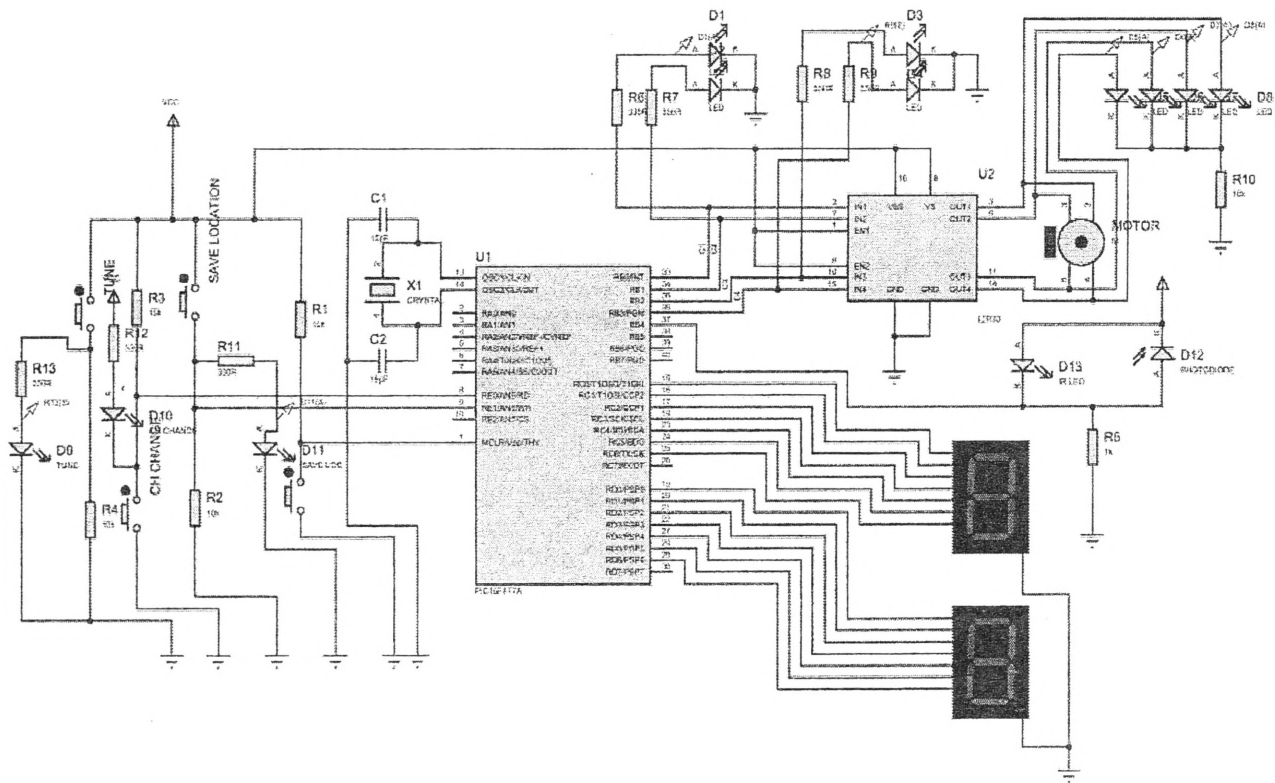


Figure 2: Circuit Design of the System

When the Position change button is pressed once the motor is goes to its initial position and display the number which indicated as one. Then the button is pressed twice the motor goes to second step and display the number two. Same as when a button is pressed number of times the motor will goes to their suitable position. These are displayed in the seven segment display.

3. RESULTS AND DISCUSSION

At the initial stage of the proposed system, all the signal positions within 40 degrees are identified by logging into link. Several numbers of set of receiving levels from both upper and lower sides of the maximum level are taken. Those identified positions are saved and numbered one by one, starting from one. Saved number will be displayed on the seven segment display, Link will be positioned for a particular position when the operator enters a previously saved number.

This system is very useful to any service provider because it decreases their labor cost as the maintaining time and the required number of labors will get reduced. Also this is the solution for detecting RX level change due to environmental condition. Furthermore, the link can be automatically adjusted to right position at any time such as at night time. The solution proposed by the research requires only an initial investment cost to implement the solution.

As the drawbacks of the solution, when the number of the signal link increases, the total investment may be also increased due to the fact that the developed device to optimize the microwave links should be installed to each and every microwave antenna. This initial investment is draw back when the research goes for the implementation. And also, high powerful stepper motors are required to rotate the link for each developed device. Normally, in a single tower there are around 20 to 30 microwave links.

4. CONCLUSION

Telecommunication services which use microwave link needs continuous maintenance to keep the microwave linked aligned between base stations. Alignment issues occur due to various reasons such as wind and rain. We proposed a method to re-align the microwave links when issues are occurred. This solution helps to recover the miss-aligned microwave link quickly, thus minimize the breakdown time of mobile telecommunication services saving large amount of money.

ACKNOWLEDGEMENTS

We would like to thank staff at ATSL International (Pvt) Ltd for the support given for this project.

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