Generation of Control Signals for A Transmitter in Troop Level Radar of Akash Missile System

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ABSTRACT

In the pulsed radar transmitter system the amount of the Radio Frequency (RF) signal to be transmitted by the Travelling wave tube (TWT) plays an important in order to track the enemy targets. Therefore the pulse generated has to be fed to the control grid of TWT which in turn determines the power required for the transmission.Here, we are generating and controlling the 32 combination of pulses which enables to gets the information of targets distance using 8051 Microcontroller with LCD and keypad interface. Transmitter control signals (Grid pulses) generation to perform stand-alone test of transmitterused in TLR (Troop level radar) of Akash Missile System. Akash Missile System is a part of Indian Defence and TLR is tracking radar of this system, TWT (Travelling Wave Tube) based transmitter is used in TLR. This interface is used in our project so as to make it cost effective and to control the required signals manually. The pulses thus generated are fed to the Differential Line Driver (DLD) circuit as the radar consists of differential receiver. DLD helps to carry the RF signal in a parallel line Transmission line with no noise addition.

INTRODUCTION:

As TLR is main radar of AKASH MISSILE SYSTEM. To perform testing of transmitter (TWT) of TLR, number of control pulses required from PSPU (Programmable signal processing unit) but it is difficult to cascade PSPU all time with transmitter. So an operating tool or a device (JIG) is needed to stimulate all control pulses.
This JIG should work in two modes: Local mode and Remote mode. These two modes works using mainly four hardware's and three software's. Here the program is fused directly to the microcontroller 8051 with the help of PC (personal computer). With the help of keypad and LCD we can assign the control pulses dimensions. Then the output of the microcontroller is then fed to differential line driver PCB to strengthen the output signal of 8051 for the communication purpose of transmitter.

METHODOLOGY:

The LCD and keypad are used as an input and output devices for the microcontroller 8051 as shown in block diagram in Local mode (figure.1). By using pulse width and pulse repetition time specifications are loaded into the PSU.This JIG should work in two modes: Local mode and Remote mode. These two modes works using mainly four hardware's and three software's.

Hardwares:

- Microcontroller board
- Differential line driver PCB
- LCD
- Keypad

Softwares:

- Keil V.4
- Flash Magic
- Visual C++
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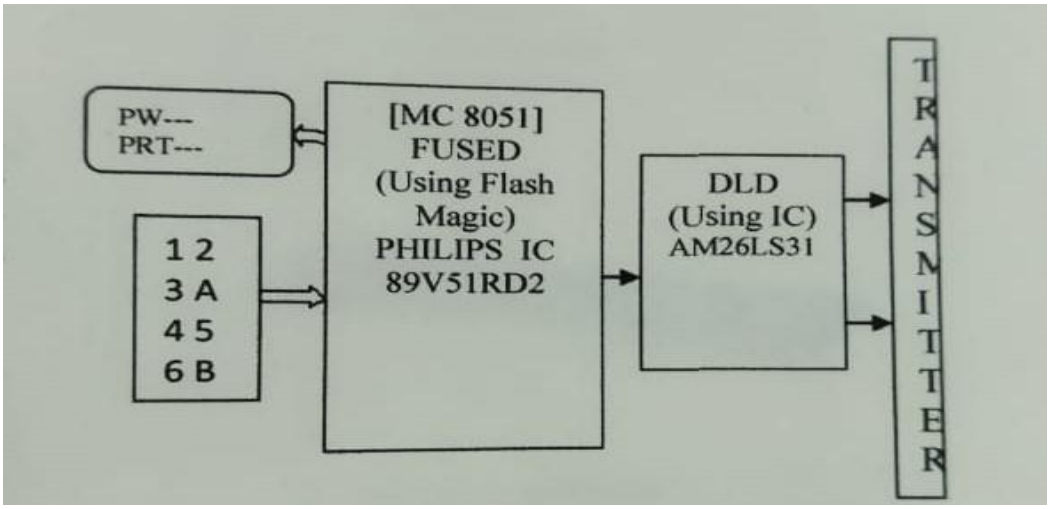

Fig 1: Block diagram of local mode

The microcontroller 8051 containing PHILIPS 89V51RD2 IC is fused using the flash magic software which is been programmed for the LCD display, keypad interfacing as well as the program for a 32 combinations of control pulses. After getting output pulses of required specifications, then it is fed to a differential line driver board, where the pulses are strengthened and the final output is in the form of both positive and negative cycles. From this pulses obtained is given as a control signal for the troop level radar, the transmitter of an AKASH MISSILE SYSTEMS(fig 1).

In Remote mode, laptop is used as a source for fusing the microcontroller 8051 as shown in figure(2). By using VISUAL C++ software to create an HMI (Human machine interface)window for assigning a control signal dimensions (pulse width, pulse repetition time). Then the further operation is same as in the local mode.

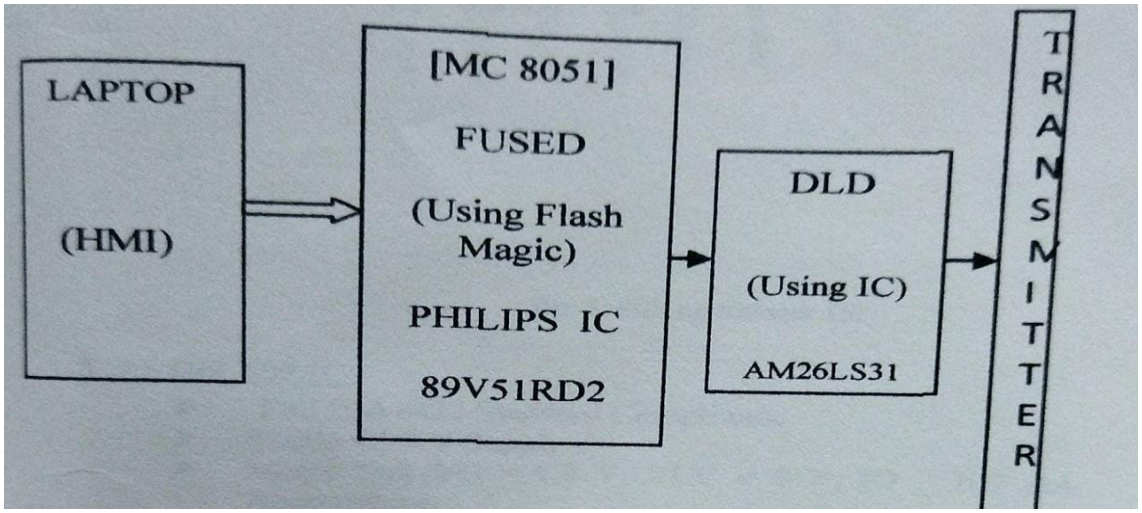

Fig 2: Block diagram of remote mode

RESULT:

The 32 different combinations of control pulses for the transmitter are achieved. Realization of correct delay and duty cycle of pulses have got with the help of microcontroller. Creation of HMI WINDOW with the help of VISUAL C++/ VISUAL BASICS. The figure 3 and fig 4 shows the positive and negative control pulses output.

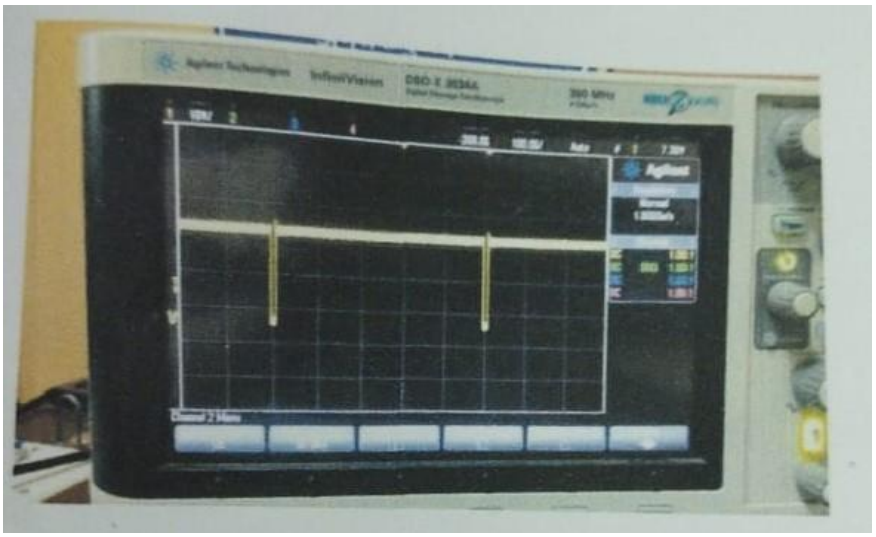

Fig 3: Negative control pulse results

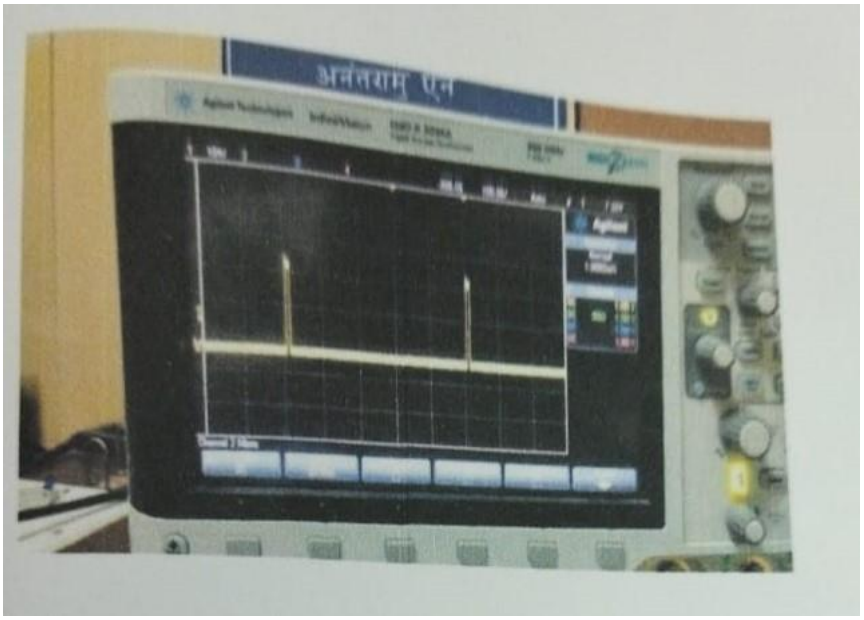

Fig 4: Positive control pulse results

CONCLUSION:

The JIG size is reduced by using the microcontroller applications instead of the bulk hardware which was employed earlier called PLC. Now the JIG is very light weighted so that it can be easily carried and used during the field works. And also created the 32 different combinations of grid pulses and it is easy for the user to change pulse specifications. And also this work can reduce the cost issues because of hardware used is cheaply available in market compared to the earlier hardware employed.

REFERENCES:

8051 Muhammad Ali Mazidi book referred for assembly language programs and microcontroller interfacing and its applications

Ewell, G.W, Radar Transmitters, New York, McGraw-Hill, 1981

NadavLevanon and Eli Mozeson Radar signals, Wiley.com,2004

Pozar, D.M, Microwave Engineering, New Jersey, Wiley, 3rd Ed, 2005

Radar Technologies to address evolving threats, Northrop Grumman 2011 Ground Based Radar Conference. Introduction to Airborne Radar, G.W Stimson, 2nd Edition, 1998, SciTech Publishing

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