

## HM2007 IC INTERFACED WITH AT89S52 TO AID THE QUADRUPLE AMPUTEES

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### ABSTRACT

The article “HM-2007 IC Interfaced with AT89S52 to Aid the Quadruple Amputee” is mainly to help people who lost their hands and legs in an accident and to those who were devoid of hands and legs by birth. The main concept is to control the wheel chair movement by giving voice instructions or commands, rather than by the physical actions, which is much more useful for the quadruple amputees and also for those who were devoid of hands and legs by birth. The microcontroller used is (ATMEL-AT89S52). Others components are microphone, **voice recognizing IC (HM2007)**, signal conditioning unit, driver circuits, Relays along with motor and wheel chair model. The desired data's are stored in the voice process IC's RAM memory. In microcontroller we have already programmed so it receives the pulse signal from signal conditioning unit and activates the relay driver circuits. Driver circuits consists of transistor, it just acts as switch to turn ON and turn OFF the relays. Relay outputs are directly connected to motors which are attached to the wheel chair. Thus by using this setup the wheel-chair movement can be controlled by the quadruple amputees and also for those who were devoid of hands and legs by birth.

**KEYWORDS:** Microcontroller (ATMEL-AT89S52), Voice Process IC (HM2007), Driver Circuits, Relay, Microphone

### INTRODUCTION

Nowadays the accident occurring rate goes on increasing as a result the number of quadruple amputees also increases. Also the birth rate of people who were devoid of both hands and legs also increases .so it's very difficult for them to survive in the current society. It's also very difficult for them to move from one place to another without somebody's help. They also get frustrated often because they need to seek others help frequently.so inorder to eliminate their frustrations and to make their thoughts positive this system is much more helpful. One can control the wheel chair by giving some voice commands, the commands can be changed to one's own wish.

### OVERALL BLOCK DIAGRAM

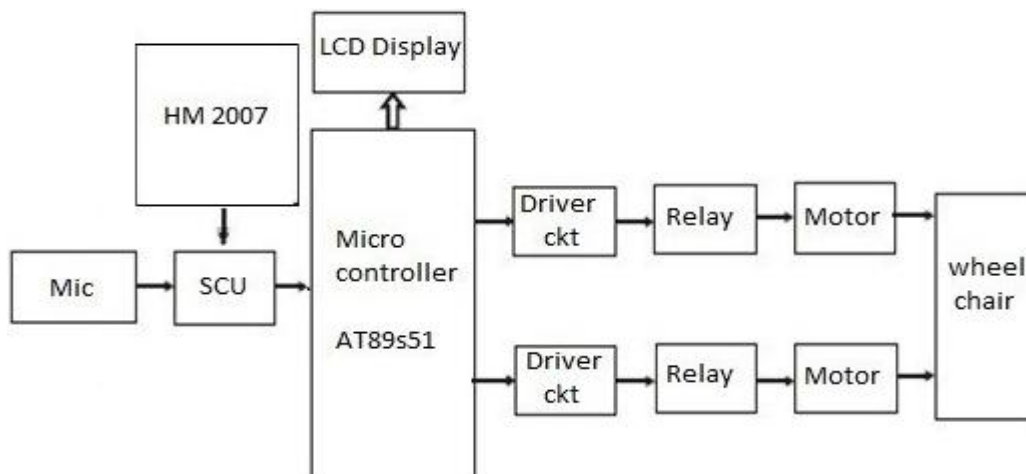


Figure 1: Block Diagram of the Overall System

## DIFFERENT BLOCKS INVOLVED

- Microcontroller(ATMEL-AT89S52)
- Voice process IC (HM2007)
- Motors and Relays
- LCD Display
- Driver circuits
- Microphones
- SCU

## DESCRIPTION OF IMPORTANT BLOCKS

### Microcontroller (ATMEL-AT89S52)

The AT89S52 is a low power, high performance CMOS 8-bit microcontroller with 4K bytes of in-system programmable flash memory. The on chip flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer.

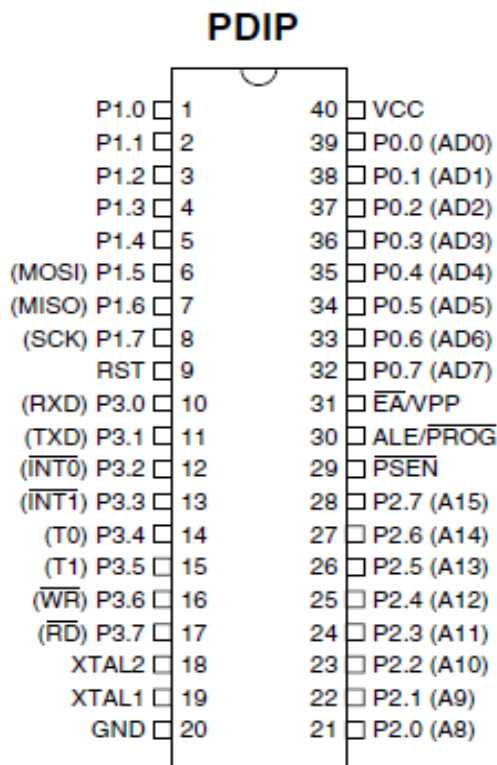


Figure 2: Pin Configuration of AT89S52

### Voice Process IC (HM2007)

HM 2007 is a single chip CMOS voice recognition LSI circuit with on-chip analog front end, voice analysis, recognition process and system control functions.

A 40 isolated word voice recognition system can be composed of external microphone, keyboard, 64k SRAM and some other components. Combined with microprocessor, an intelligent recognition can be built.

**Training Voice Process IC (HM2007)**

Press “1” (display will show “01” and the LED will turn off) on the keypad, then press the TRAIN key (the LED will turn on) to place circuit in training mode, for word one. Say the target word into the onboard microphone (near LED) clearly. The circuit signals acceptance of the voice input by blinking the LED off then on.

The word (or utterance) is now identified as the “01” word. If the LED did not flash, start over by pressing “1” and then “TRAIN” key. You may continue training new words in the circuit. Press “2” then TRN to train the second word and so on. The circuit will accept and recognize up to 20 words (numbers 1 through 20). It is not necessary to train all word spaces. If you only require 10 target words that’s all you need to train.

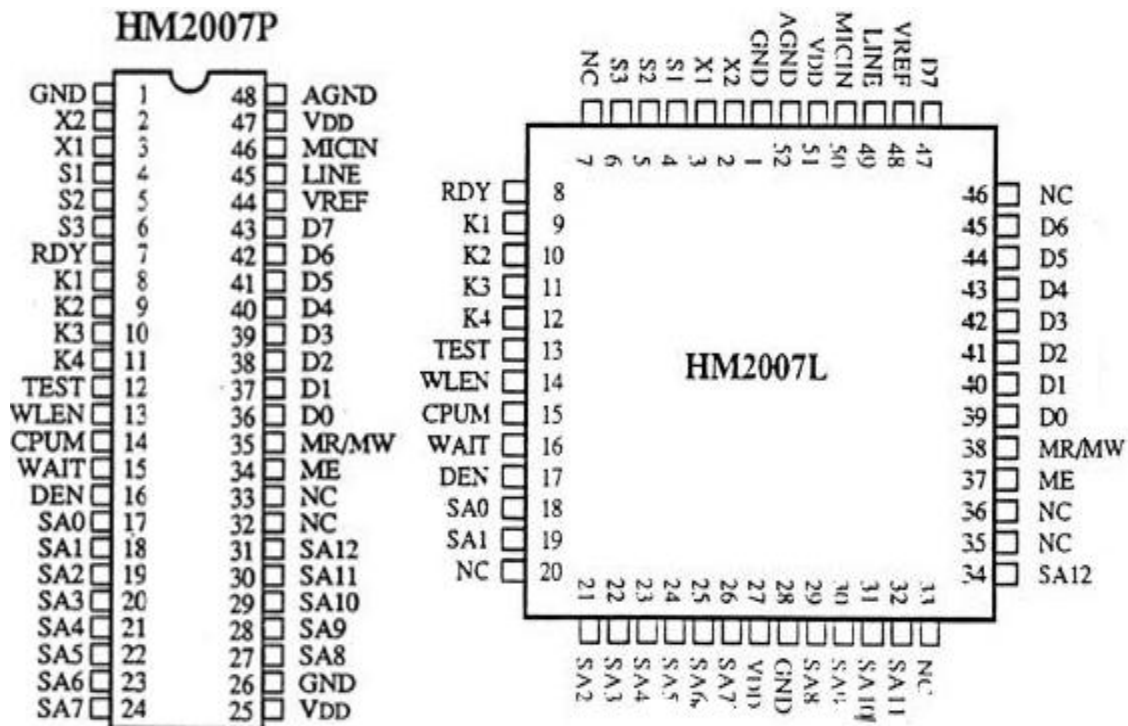
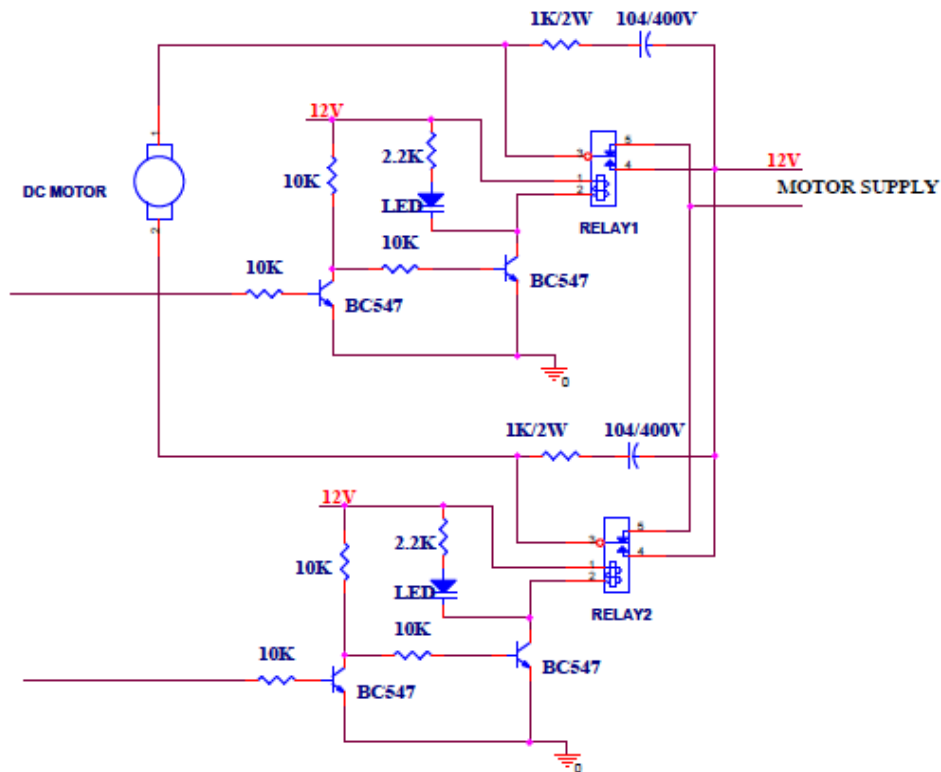


Figure 3: Pin Configuration of HM2007 IC (Different Models)

**FEATURES**

- Speaker dependent isolates-word recognition system.
- Maximum 40 words can be recognized for one chip.
- Maximum 1.92sec of word can be recognized.
- Multiple chip configuration is possible.
- A microphone can be connected directly.
- Two control mode is supported: Manual mode and CPU mode.
- Response time: less than 300ms.
- 5v single power supply.
- 48 pin PDIP, 52 pin PLCC, 48 pad bare chip.

## Motors and Relays



**Figure 4: Circuit Diagram of Motors and Relays**

This circuit is designed to control the motor in the forward and reverse direction. It consists of two relays named as relay1, relay2. The relay ON and OFF is controlled by the pair of switching transistors. A Relay is nothing but electromagnetic switching device which consists of three pins. They are Common, Normally close (NC) and normally open (NO). The common pin of two relay is connected to positive and negative terminal of motor through snubber circuit respectively. The relays are connected in the collector terminal of the transistors Q2 and Q4. When high pulse signal is given to either base of the Q1 or Q3 transistors, the transistor is conducting and shorts the collector and emitter terminal and zero signals is given to base of the Q2 or Q4 transistor. So the relay is turned OFF state. When low pulse is given to either base of transistor Q1 or Q3 transistor, the transistor is turned OFF. Now 12v is given to base of Q2 or Q4 transistor so the transistor is conducting and relay is turn ON. The NO and NC pins of two relays are interconnected so only one relay can be operated at a time. The series combination of resistor and capacitor is called as snubber circuit. When the relay is turn ON and turn OFF continuously, the back emf may fault the relays. So the back emf is grounded through the snubber circuit.

- When relay 1 is in the ON state and relay 2 is in the OFF state, the motor is running in the forward direction.
- When relay 2 is in the ON state and relay 1 is in the OFF state, the motor is running in the reverse direction

## OVERALL OPERATION

This system is designed with microcontroller, microphone, voice process IC and signal conditioning unit, driver circuits along with motor. The voice represents different operations such that forward, reverse, left, Right and so on. Micro phone is the one type of transducer which converts voice signal to electrical signal. These electrical signals are in very small mill voltage signals, so it is given to signal conditioning unit which is also constructed with operational amplifier. In this circuit, operational amplifier **act as comparator** and generates the square pulse which is given to microcontroller.

Here the microcontroller is flash type reprogrammable microcontroller. The desired data's are stored in the voice process IC's RAM memory. That data stored is compared with the received data from the mic. In microcontroller we have already programmed and it receives the pulse signal from signal conditioning unit and activates the relay driver circuits accordingly to the square pulse received. Driver circuits consists of transistors, it just acts as switch to turn ON, turn OFF the relays. Relay outputs are directly connected to motors which are attached in the vehicle (wheel-chair). Now the wheel chair can be controlled only by the particular quadruple amputee, as his voice was only recorded initially and none of the other people can access the wheel chair. This matter of fact seems to be a high security to the quadruple amputees. The command for the different directional moves can be altered according to one's own wish by resetting it. The microphone can be attached near the person's mouth.

## CONCLUSIONS

Thus the article "**HM-2007 IC Interfaced with AT89S52 to Aid the Quadruple Amputee**" is very supportive for the quadruple amputees and also for those who were devoid of hands and legs by making them more confident and compete with the current world. This makes them to feel as if they are standing on their own legs. This article also paves a way for the **dawn of next era of innovation**.

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