

Simple Alarm System

Author: ANWARUDDIN BIN SULAIMAN

I'm receiving lots of letters about car alarm system based on PIC 12C508 Version 1.0 (link broken). The system described was introduced as a simple circuit only. I tried to focus on using one and the same pin as input and output in different situations. Parts of code were taken from my previous alarm projects ([AS1](#) and [AS2](#)), which were a success. The code wasn't totally debugged and I have no time to revise it now. Instead, I'm introducing a new Version 1.1.

Version 1.1

Click to view a larger picture (520Kb)



A PIC12C508 based security system is described in this project. It implements the following features:

- IR remote keyless system
- 72 bits transmission length (64bits password, 4bit CRC, and 4bits for commands)
- Arm/Disarm
- Immobilizer
- Two stage sensors, door and shock sensor trigger inputs
- Locking/unlocking of doors
- Normal/Silent modes
- Inside zone intrusion memory
- Transmitter low battery indication

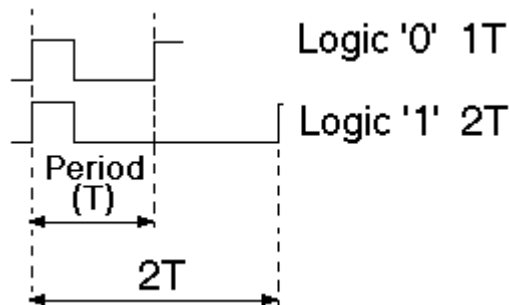
This system is a perfect solution for unidirectional remote keyless entry systems and access control systems. Such system may be implemented in:

- Automotive alarm systems
- Automotive immobilizers
- Gate and garage door openers
- Burglar alarm systems

This Alarm Sytem is based on two PIC12C508 (one is used in transmitter and the other one in the main unit). Transmitter uses infra red beam to send code name to main unit. The commands are:

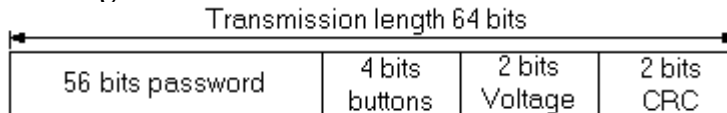
- Arm/Disarm
- Silent Arm/Disarm
- Weak battery in transmitter

Figure 1: CODE WORD TRANSMISSION FORMAT



Each pulse in a packet sets a bit in a message. Pulse width is 256 us. This pulse is modulated at 38kHz. Delay between pulses sets the bit value. Single delay (256us) means "0" bit, double delay (512us) means "1" bit, and tripple delay (768us) is a start bit. It is used to synchronise two RC generators in the main unit and in the transmitter and it shows the start of a new packet. Packets are 72 bits long. First 64 bits are password key. The last byte is divided into two nibbles. One for commands and another for CRC. Code word transmission format is shown in figure 1. It took about ~36ms (min) to ~56 ms (max) to send a message. With more than 10^{19} combinations and minimum delay between packets of about 110ms it will take almost $3,2 \cdot 11^{10}$ years to scan the code.

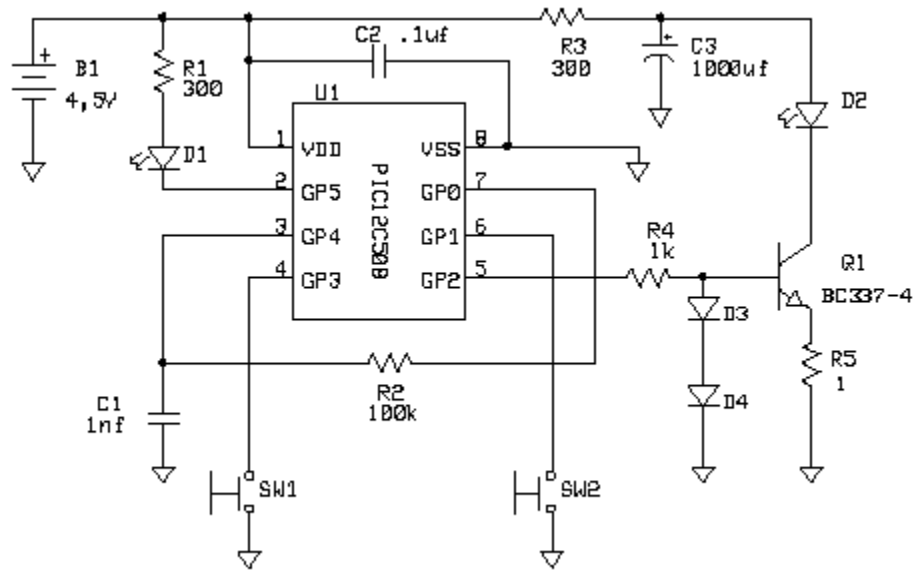
Figure 2: CODE WORD ORGANIZATION



Transmitter

Transmitter schematic diagram is shown in figure 3.

Figure 3: TRANSMITTER SCHEMATIC DIAGRAM



Transmitter Parts List

Capacitors:

- C1 - 1nF (10V min)
- C2 - 0.1uF (10V min)
- C3 - 2x470 uF 6,3V (electrolytic)

Diodes:

- D1 - Red light emitting diode
- D2 - CQY99 (Infra Red light emitting diode)
- D3,D4 - any type diodes

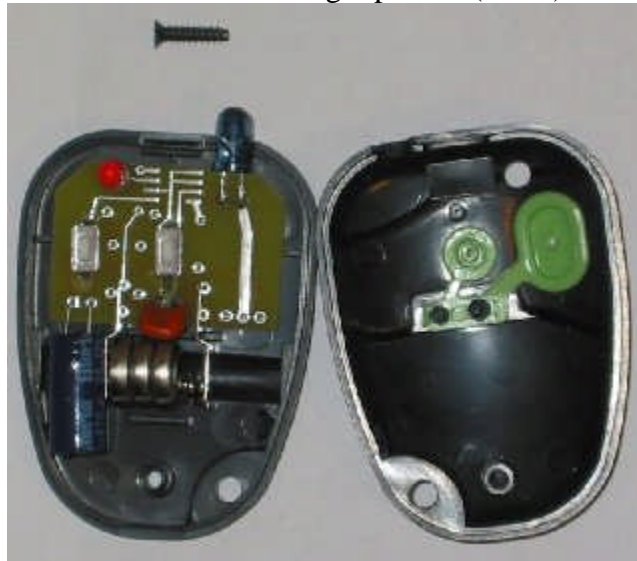
Resistors:

- R1 - 300 Ohm (.125W)
- R2 - 100 kOhm (.125W)
- R3 - 300 Ohm (.125W)
- R4 - 1 kOhm (.125W)
- R5 - 1 Ohm (.125W)

Miscellaneous:

- U1 - PIC12C508 programmed with transmitter code
- S1-S2 - normally open pushbutton switches

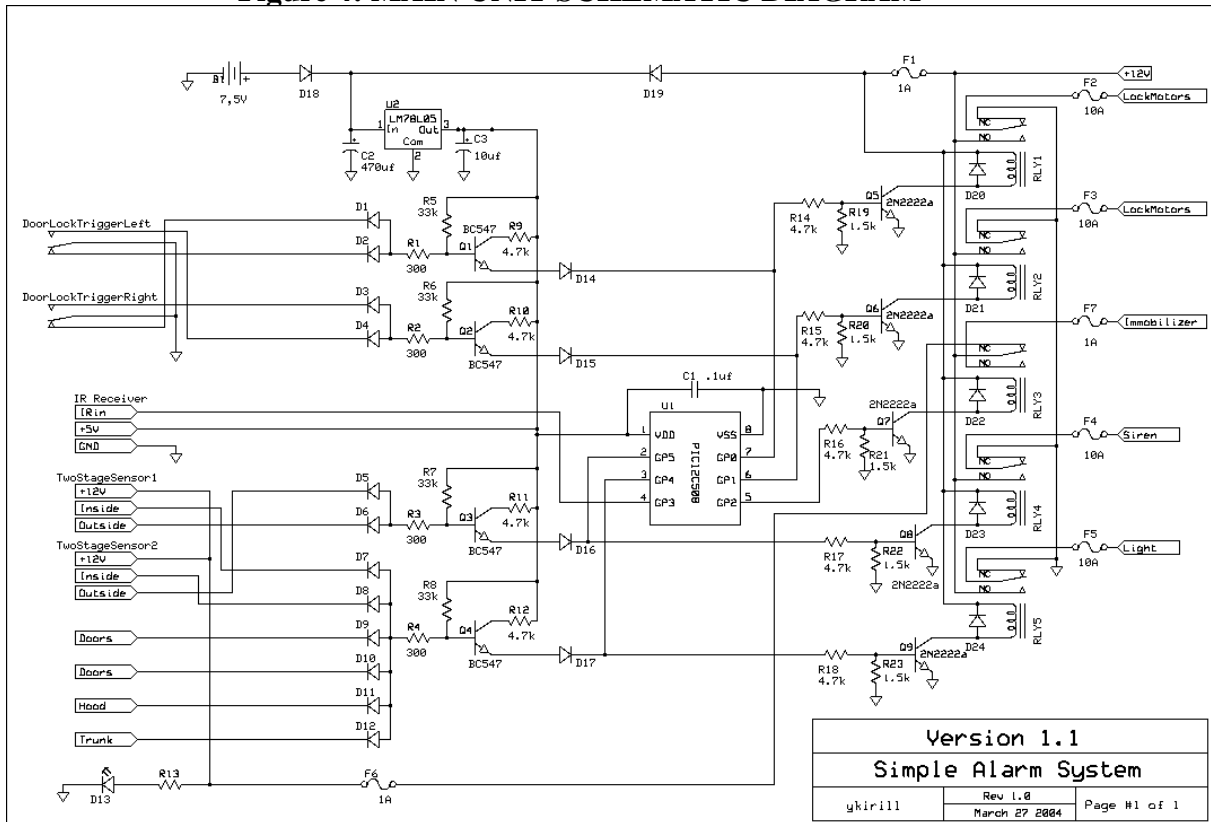
Click to view a larger picture (76Kb)



Here you can find [transmitter](#) assembler code (updated on April 29, 2004) and a [password.inc](#) file. Don't forget to change processor type in MPLAB or you will get errors. I've added PIC16F84 family processors for debug.

Main Unit

Figure 4: MAIN UNIT SCHEMATIC DIAGRAM



Main Unit Parts List

Capacitors:

- C1 - .1 uF
- C2 - 470 uF 25V (electrolytic)
- C1 - 10 uF 6,3V (electrolytic)

Diodes:

- D1-D12,D14-D17,D20-D24 - 1N4148
- D18,D19 - 1 amp rectifiers
- D13 - blinking LED

Resistors:

- R1-R4 - 300 Ohm (.125W)
- R5-R8 - 33 kOhm (.125W)
- R9-R12,R14-R18 - 4,7 kOhm (.125W)
- R19-R23 - 1,5 kOhm (.125W)
- R13 - depends on the type of LED you will use

Miscellaneous:

- Q1-Q4 - BC547
- Q5-Q9 - 2N2222A
- U1 - PIC12C508 programmed with main unit code
- U2 - 78L05

Click to view a larger picture (364Kb)

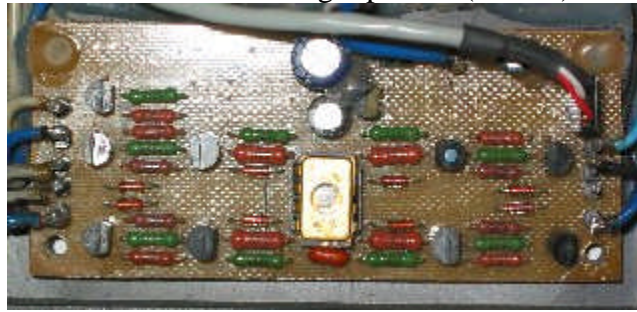
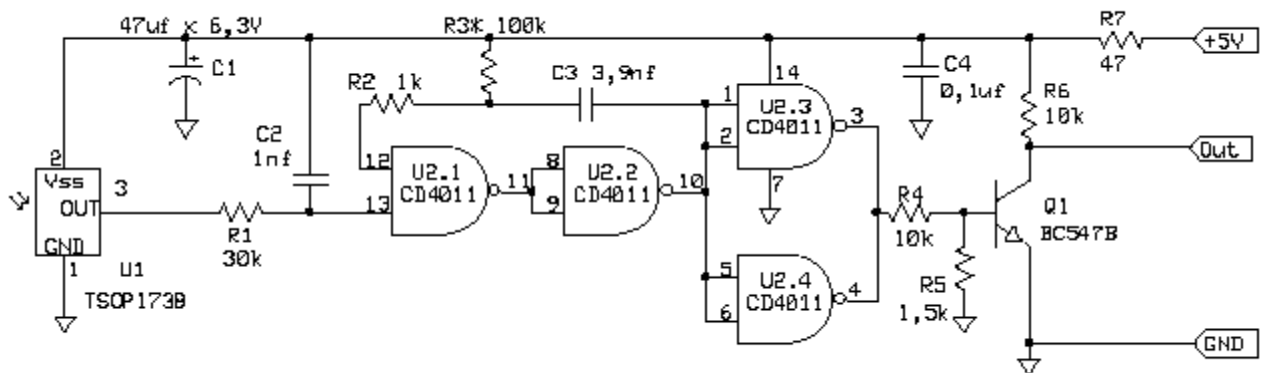


Figure 5: IR RECEIVER SCHEMATIC DIAGRAM



IR Receiver Parts List

Capacitors:

- C1 - 47 uF (electrolytic) 6,3V
- C2 - 1000 pF
- C3 - 3900 pF (NP0, +30...-75ppm/C)
- C4 - 0,1 uF

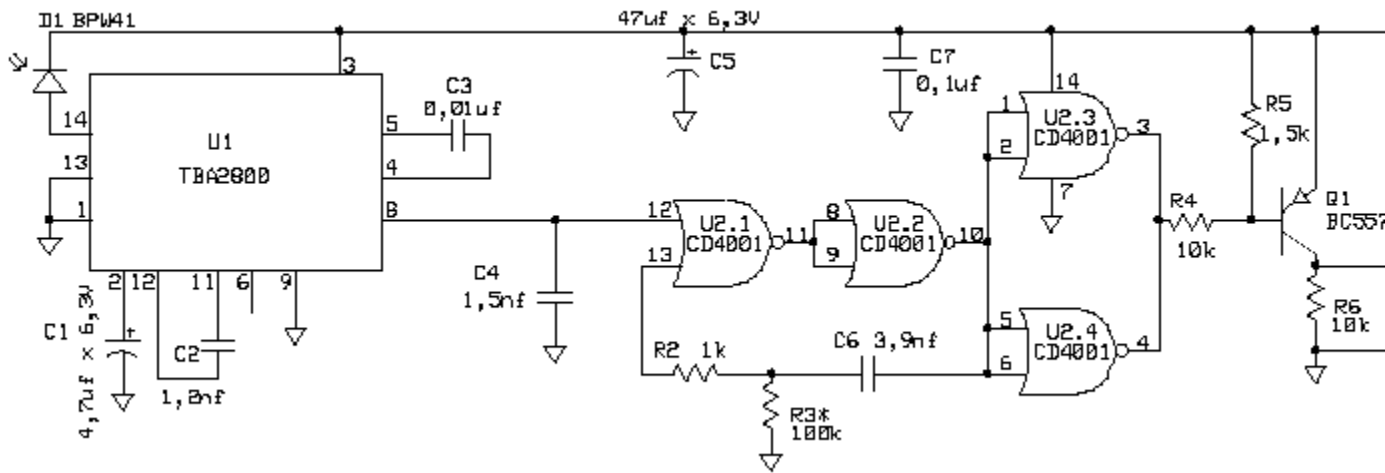
Resistors:

- R1 - 30 kOhm (.125W)
- R2 - 1 kOhm (.125W)
- R3 - 100 kOhm (.125W)
- R4 - 10 kOhm (.125W)
- R5 - 1,5 kOhm (.125W)
- R6 - 10 kOhm (.125W)
- R7 - 47 Ohm (.125W)

Miscellaneous:

- Q1 - BC557
- U1 - TSOP1738, BRM1020
- U2 - CD4011

Figure 6: IR RECEIVER SCHEMATIC DIAGRAM (TBA2800 BASED)



IR Receiver Parts List

Capacitors:

- C1 - 4,7 uF (electrolytic)6,3V
- C2 - 1200 pF
- C3 - 0,01 uF
- C4 - 1500 pF
- C5 - 47 uF (electrolytic)6,3V
- C6 - 3900 pF (NP0, +30...-75ppm/C)
- C7 - 0,1 uF

Diodes:

- D1 - BPW41 (Photo diode)

Resistors:

- R2 - 1 kOhm (.125W)
- R3 - 100 kOhm (.125W)
- R4 - 10 kOhm (.125W)
- R5 - 1,5 kOhm (.125W)
- R6 - 10 kOhm (.125W)
- R7 - 47 Ohm (.125W)

Miscellaneous:

- Q1 - BC557
- U1 - TBA2800
- U2 - CD4001

Here you can find [main unit](#) assembler code (updated on April 29, 2004). This is a Release Candidate version 5a. Don't forget to change processor type in MPLAB or you will get errors. I've added PIC16F84 family processors for debug. And here is a picture of a [test alarm](#) (153Kb) I built using PIC16F84.