Programmable Home Security Alarm System

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In this project we design low cost high performance programmable home security system using few LDR's as an input sensors. When above sensor(s) get triggered system may dial the user specified phone number (using build-in DTMF generator) and activate the high power audio alarm and lights. All the parameters of DTMF generator, audio alarm and light interface are programmed through the RS232 serial interface.

Current firmware of this system presents interactive control system through the RS232 interface. This control system consist with the menu driven configuration options, self tests, system report generators, etc.

This system also contain 5W (with 4Ω speaker) audio alarm with three selectable tone configurations, which include Police siren, Fire engine siren and Ambulance siren.

Integrated Circuits

This system uses a Microchip's PIC16F877A as a main controller, LM339 as sensor interface, UM3561 as a

SYSTEM FEATURES

- **Touch tone phone dialing interface**

- **5W High powerful audio alarm**

- **2 sensor interface with separate sensitivity adjustments**

- **Programmed through the RS232 interface**

- **Build-In intelligent light ON/OFF switch**

tone generator and µPC2002 as a speaker driver (audio amplifier). LM7805, LM7812 and LM317 voltage regulators are used to obtain +5V, +12V and +3V respectively.

Assembly

The PCB design given with this article makes the assembly much simpler. As PCB contain 230V AC main lines care must be taken while assembling the circuit. As shown in the fig.1 all the photoelectric
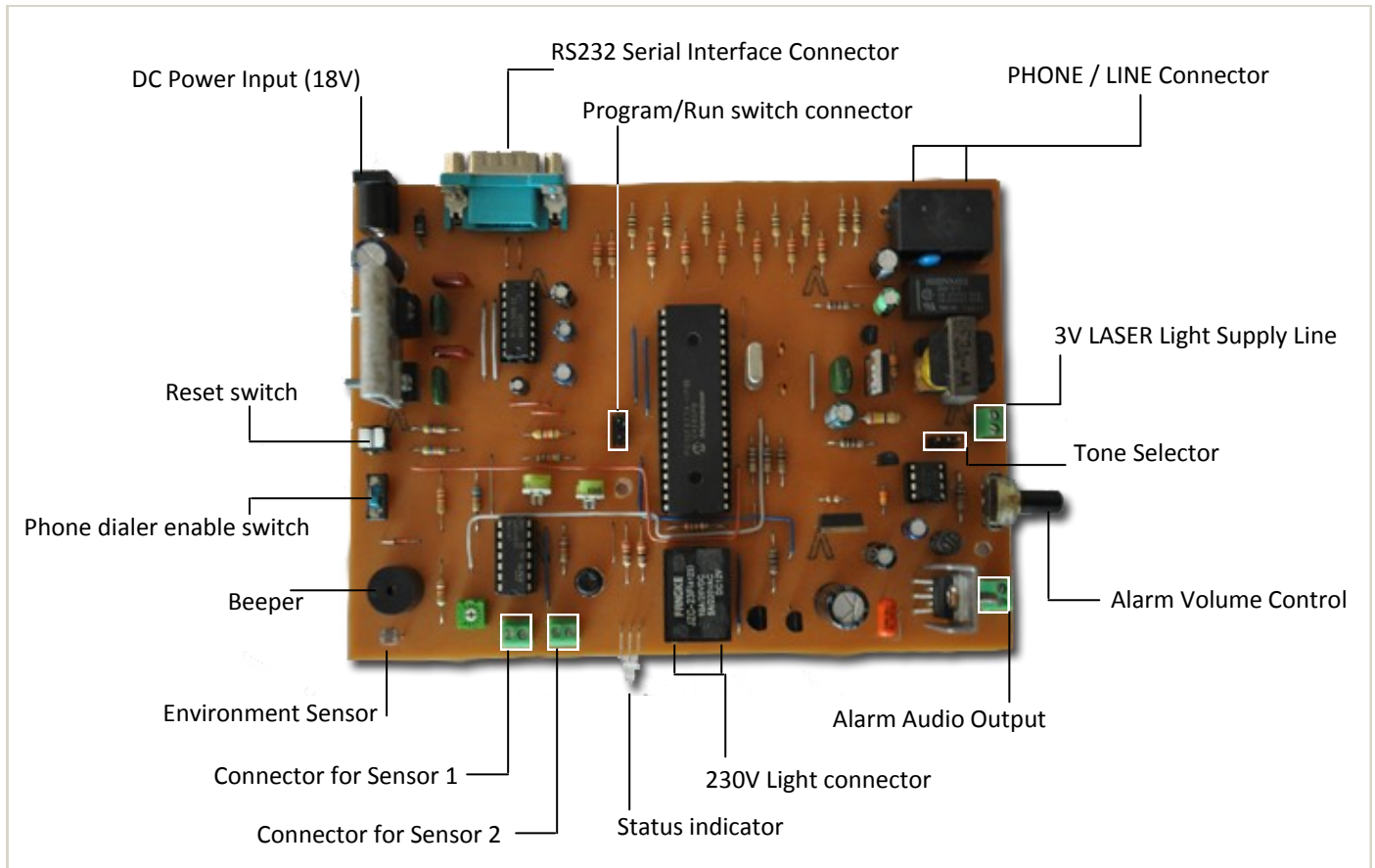
Fig.1 - Connectors, Jumpers and other controls of the Programmable Home Security Alarm System

sensors, some of the switches and alarm speaker are connected with the circuit through the connector bars.

External connectors and controls

DC Power input : Attach DC power supply with 18V - 25V (2A Max.) output.

RS232 Connector : Connect RS232 serial cable to the port to configure the system. Do not use RS232 Null Modem cable with this port.

PHONE/LINE connector : Attach standard RJ12/RJ11 telephone cable connector to this port. One port is need to use with the phone line and remaining port is for the phone (and it is optional).

3V LASER supply : 3V supply line for LASER diode assembly.

Connectors for Sensor 1/2 : Attach high sensitive LDRs for these ports. To get the maximum sensitivity it is recommended to use *EG&G VACTEC* LDRs.

Status Indicator : Indicate run, program and sensor trigger modes.

Reset Switch : Press this button to reset entire alarm

system. This button enable only when the audible alarm get activated. It is not possible to use this function at the phone dialing/ringer states.

Phone dialer enable switch : Turn on this switch to enable the phone dialing feature of this system.

Environment Sensor : In-circuit LDR to detect light conditions of the environment.

Alarm Volume Control : Use this to control the output power (volume) of the audible alarm.

230V Light connector : Attach 230V AC light (or related peripheral) to these terminals.

Tone Selector : Configure the master alarm tone from this jumper as follows,

1—2	: Fire Engine Siren
2—3	: Ambulance Siren
Open	: Police Siren

(Do not connect jumper terminal 1—3, this combination may permanently damage the entire system)

Beeper : Produce beeps (e.g: at the input error, etc.)

Program / Run Switch connector : Attach switch to this header to select Program or Run mode.

Alarm Audio Output : Attach 8Ω (8W) or 4Ω (10W) speaker to this connector.

Calibration and Testing

Once everything is assembled take following steps to calibrate the system,

1. Remove IC1, IC2, IC3 and IC4 from the IC bases.

2. Apply 18V (to 22V Max.) DC source to the power connector (J3).

3. Check the voltage between Pin12 (GND) and Pin3 of IC2. It need to be 4.8V - 5.1V DC.

4. Check the voltage between GND and E$4 jumper. It need to be 11.7V - 12.3V DC.

5. Check the voltage between Pin1 and Pin3 (GND) of JP1. It need to be 2.5V - 3.1 V

6. If all the above Step 3, 4 and 5 are correct, disconnect the power supply and insert IC1, IC2, IC3 and IC4 in to the appropriate IC bases. Attach suitable speaker to the X4 and connect RS232 cable to the system.

7. Close the jumper J2 (Program Mode) and power on the system.

8. [Download](#) and install PuTTY on to the target computer and setup the "Serial" connection with 9600 baud rate (see Fig. 3).

> **RS232 Configuration settings for Programmable Alarm System**
>
> - **Speed (baud)** 9600
> - **Data bits** 8
> - **Stop bits** 1
> - **Parity** OFF
> - **Flow control** XON/XOFF

9. Press "2" and enter into the "Parameter Setup" mode. Configure all the parameter options with the appropriate settings.

10. Attach phone line to the PHONE/LINE connector and fix photoelectric LDR sensors to the X1 and

Fig.2 - DTMF output generated by the system at the testing stages. (Test points : TRN1 input terminals)

X2 connectors.

11. Press "3" and execute "Self Test".

12. Adjust R4*, R6* and R8* preset controls, if the sensors are not trigged as expected.

13. Adjust R11 preset to control the "Day" and "Night" mode detection.

14. Open the Jumper J2 and press 5 to return to the Run mode.

15. Shutdown the power supply and disconnect the RS232 cable.
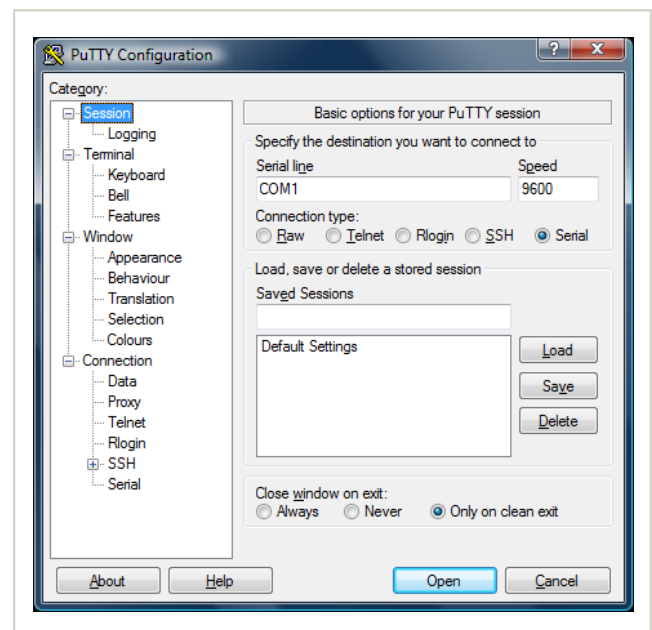

Fig.3 - PuTTY configuration setup for Programmable Home Security Alarm System

* R6 - X1 sensor sensitivity, R8 - X2 sensor sensitivity, R4 - sensor gain controller (Common mode)

Parts List

C1, C18, C19	0.1µF (25V)		IC1	PIC16F877A
C2, C3	10pF		IC2	LM339N
C11	0.22µF (100V)		IC3	MAX232
C16, C17	0.33µF (50V)		IC4	UM3561
C4, C5, C6, C7	1µF (50V)		IC5	µPC2002 / TDA2002
C13, C14	1µF (100V)		IC6	7805TV
C9	10µF (35V)		IC7	7812TV
C10	1000µF (35V)		IC8	LM317
C12	220µF (35V)		D1	1N4004 Diode
C20	100µF (35V)		D2	1N4148 Diode
C21	470µF (35V)		C8	VE09-0151 MOV
R1, R2, R3, R1, R19	10K		T1, T3	2SC945
R5, R7, R9, R10	22K		T2	2SD400
R12	68K		Q2	BS170
R13, R14	2.2K		Q3	IRF9640
R15	330K		Q1	20.00MHz Crystal
R16, R20	1K		R4, R8	30K (LIN) Potentiometer
R21, R22, R42	330Ω		R6	20K (LIN) Potentiometer
R23, R24, R25, R26, R27,R28, R29, R30	100Ω		R11	50K (LIN) Potentiometer
R31, R32, R33, R34, R35, R36, R37, R38	220Ω		R18	50K (LOG) Gang Potentiometer
R39, R40, R41	47K		L1	4.8 µH Inductor
R43	240Ω (0.5 W)		LDR1	VT90N2 LDR
TRN1	600Ω : 600Ω isolation transformer		LD1	5mm Tri-Color LED
SG1	F/QMX Buzzer		JP1	3 Pin Jumper Header
RL1	SHINMEI RSB-5-S Relay		J1	Tyco Electronics 2RJ11-6L-B
RL2	FANGKE JZC-23F 12V Relay (220V 5A)		J2	1X2MTA header
S1	B3F-10XX - push on switch		J3	DCJ0303 DC Jack connector
S2	M251 SPDT micro switch		X3	H3M09RA D-SUB9 connector
			X1, X2, X4, X5	Phoenix 350 connector
			SPK	8Ω (8W) or 4Ω (10W) Speaker

All the resistors are 1/4W unless otherwise specified