

ELECTRICAL DOOR CHIMES

1. INTRODUCTION:

A doorbell is a signaling device typically placed near a door to a building's entrance. When a visitor presses a button the bell rings inside the building, alerting the occupant to the presence of the visitor. Although the first doorbells were mechanical, activated by pulling a cord, modern doorbells are generally electric switch. This doorbell chime project provides the schematic and the parts list needed to construct a very simple wired doorbell alarm that you can place on the door of your house. It is a very low cost and affordable project that every beginner to electronic design can handle.

Door chime, is a simple electric circuit containing a battery, a switch, and an electric motor standing on a large cardboard box. When a caller pressed the switch, the battery fed power to the motor and made it spin around with a buzzing noise (a bit like the vibrating alert on a cellphone or pager). Standing on the box, the motor made a reasonably audible but rather dull humming noise. Real electric doorbells aren't that different. Instead of using an electric motor and a cardboard box, they use an electromagnet (a temporary magnet whose magnetism can be turned on and off instantly by electricity) to make a more attractive sound, either with an electric bell, a buzzer, or chime bars struck by a magnetic hammer.

2. PRODUCT & ITS APPLICATION:

- ***Wired doorbells***

In most wired systems, a button on the outside next to the door, located around the height of the doorknob, activates a signaling device (usually a chime, bell, or buzzer) inside the building. Pressing the doorbell button, a single-pole, single-throw (SPST) push button switch momentarily closes the doorbell circuit. One terminal of this button is wired to a terminal on a transformer. A doorbell transformer steps down the 120 or 240-volt AC electrical power to a lower voltage, typically 10 to 20 volts. The transformer's other terminal connects to one

of three terminals on the signaling device. Another terminal is connected to a wire that travels to the other terminal on the button. Some signaling devices have a third terminal, which produces a different sound. If there is another doorbell button (typically near a back door), it is connected between the transformer and the third terminal. The transformer primary winding, being energized continuously, does consume a small amount (about 1 to 2 W) of standby power constantly; systems with lighted push button switches may consume a similar amount of power per switch.[\[3\]](#) [\[4\]](#) the tradeoff is that the wiring to the button carries only safe, low voltage isolated from earth ground. A common signaling device is a chime unit consisting of two flat metal bar resonators, which are struck by plungers operated by two solenoids. The flat bars are tuned to two pleasing notes. When the doorbell button is pressed, the first solenoid's plunger strikes one bar, and when the button is released, a spring on the plunger pushes the plunger up, causing it to strike the other bar, creating a two-tone sound ("ding-dong"). If a second doorbell button is used, it is wired to the other solenoid, which strikes only one of the bars, to create a single-tone ("ding") sound.

- ***Wireless doorbells***

In recent decades, wireless doorbell systems that do not require wall wiring have become popular. The doorbell button contains a built-in radio transmitter powered by a battery. When the button is pushed, the transmitter sends a radio signal to the receiver unit, which is plugged into a wall outlet inside the building. When the radio signal is detected by the receiver, it activates a sound chip that plays the sound of gongs through a loudspeaker—either a two-note "ding-dong" sound or a longer chime sequence such as *Westminster Quarters*. To avoid interference by nearby wireless doorbells on the same radio frequency, the units can usually be set by the owner to different radio channels. In larger metropolitan cities, a trend has developed over the past decade that uses telephone technology to wirelessly signal doorbells as well as to answer the doors and remotely release electric strikes. In many cities throughout the world, this is the predominant form of doorbell signaling.

- ***Musical and continuous power doorbells***

As with wireless doorbells, musical doorbells have also become more common. Musical and continuous power doorbells serve as an attempt to bridge the gap between newer digital circuitry and older doorbell wiring schemes. A major difference between the standard set up of a wired doorbell and a musical doorbell is that the musical doorbell must maintain power after the doorbell button is released to continue playing the doorbell song. This can be achieved in one of two ways. For simple single-pole, single-throw doorbell buttons, the chime device employs a rectifier diode and ballast capacitor at the voltage input stage of the circuit. Upon pressing the doorbell button, power is connected through the rectifier diode or series of rectifier diodes called a full wave rectifier, which allows the current to flow in only one direction, into the ballast capacitor. The ballast capacitor charges at a rate far greater than the rest of the circuit needs to complete a given song. Once the button is released, the capacitor retains the charge and maintains power for a short duration to the rest of the circuit.

For mixed wireless and wired input doorbells, a special doorbell button is needed to maintain power continuously to the doorbell chime. The circuit is similar to the one above, except that the rectifier diode is now moved into the doorbell button housing. Pressing the doorbell button allows both negative and positive sides of the AC power signal to flow into the circuit, while releasing the button only allows either the positive or negative side to flow into the circuit. By differentiating the full and half wave signals, the doorbell is able to function as it does in the previous wired case, while also providing continuous power to the doorbell for other purposes, such as receiving wireless doorbell button input.

3. DESIRED QUALIFICATIONS FOR PROMOTER:

Promoter for this project may have any graduation plus background of electronics or electrical maintenance knowledge or experience. Although wiring a door bell involves purely electrical knowledge, working with the present theory will require some basic knowledge of electronics.

4. INDUSTRY LOOK OUT AND TRENDS

This doorbell chime project provides the schematic and the parts list needed to construct a very simple wired doorbell alarm that you can place on the door of your house. It is a very low cost and affordable project that every beginner to electronic design can hand on.

Constructing this project will help the beginners to electronics to understand one of the applications of 555 timers that is configured in an astable mode. This project uses a 555 timer integrated circuit, a speaker, 5 resistors, 4 electrolytic capacitors, 1 ceramic capacitor, 3 diodes, 1 push-button switch and 9 V batteries as power supply

5. MARKET POTENTIAL AND MARKETING ISSUES:

Door bells are perhaps among the most commonly and cheaply available electrical device available in the market, and there are hundreds of varieties to choose from. However with many companies joining the fray, the competition has become fierce, due to which the overall quality of such items has deteriorated with time. Initially these gadgets seem to work very fine, but pretty soon they just stop working and call for a replacement. The Indian middle class is prospering and even the 20% of the Indian population which is considered as the middle class constitute a huge market for any product/service. India's urban population is the second largest in the world, greater than the combined urban populations of all countries except China, the US and Russia. Most of the doorbell manufacturers in India are from the un-organized sector. The Indian chimes industry, fueled by the vast domestic market, has now turned its attention to global markets and is fast gearing up to meet international demands. The strong points of Indian chimes industry are skilled workforce, diverse range, focus on innovation and creativity. Indian manufacturers are catering to both large and small volume requirements and exporting too few of the most developed nations. Indian chimes industry set to grow at 25% in the coming years.

6. REQUIREMENTS - Material/Equipment:

Constructing this project will help the beginners to electronics to understand one of the applications of 555 timers that are configured in and a stable mode. This project uses a 555 timer integrated circuit, a speaker, 5 resistors, 4 electrolytic capacitors, 1 ceramic capacitor, 3 diodes, 1 push-button switch and 9 V batteries as power supply.

555 Timer Configuration: A stable timer operation is achieved by configuring the circuit in such a way that its output will be triggered continuously. The result of the output is a stream of clock pulses with a fixed pulse width and duty cycle determined by the resistors and capacitor connected to the IC. In the eternal discharging T_r turns off and the V_{C1} increases by exponential function with the timetable operation, the trigger terminal and the threshold terminal are connected so that a self-trigger is formed, operating as a multi vibrator. When the timer output is high, its time constant $(R_A+R_B)*C$. When the V_{C1} , or the threshold voltage, reaches $2V_{cc}/3$, the comparator output on the trigger terminal becomes high, resetting the Flip/Flop and causing the timer output to become low. This in turn turns on the discharging T_r and the $C1$ discharges through the discharging channel formed by R_B and the discharging T_r . When the V_{C1} falls below $V_{cc}/3$, the comparator output on the trigger terminal becomes high and the timer output becomes high again. The discharging T_r turns off and the V_{C1} rises again. Although a bit elaborate, the proposed design of a musical doorbell circuit provides some useful features like a built-in timer and a pleasing, replaceable audible note. Moreover, unlike conventional units, the present design is highly reliable and permanent in its operation.

Machinery and equipment are Digital Multimeter, Temp Controlled Soldering Unit, LCR Meter, Drilling machine, Analog Multimeter, Tool Kit, Electronic screw driver & screw feeder, Combined Soldering De soldering Station, High speed mini drill set, Digital Storage Oscilloscope 60 MHz, Personal Computer with UPS and Printer, Tools, Dies and Equipments, Total fixed cost would be Rs. 5,10,500.00.

Land & Building:

Total Built up area required will be rented cover shed of floor area of about 1500 sq. mtrs. To be taken on rent @ Rs. 200 per sq. Mtrs. Per annum. MOTIVE POWER: Motive Power required would be 5 HP.

7. MANUFACTURING PROCESS:

The radio controlled chimes have four main parts: Transmitter - The transmitter sends radio waves to the receiver. Receiver - An antenna and circuit board inside the doorbell receives signals from the transmitter and activates motors inside the chimes as commanded by the transmitter. Motor(s) - The transmitter sends a control signal to the receiver using radio waves, which then drives a motor, causing a specific action to occur. The motor in chimes may cause the music. Power source, the power source is typically a rechargeable battery pack, but sometimes it's just normal batteries. Manufacturing process involves the assembly of electronic circuits, electro mechanical hardware parts, Mechanical assembly and other sub assembly parts as per the design. Subsequently, the electronics assembly - the ICs, transistor, diodes, resistors, capacitors, coils, electromagnetic relays, are assembled on PCBs as per design. The assembled PCBs are tested for the desired sound and music. The electronics assembly along with electro mechanical assembly, hardware such as connectors/switches, mechanical assembly and light emitting diodes are assembled and housed in a fiber / plastic case.

Slightly more sophisticated electric doorbell, dating from the early 20th century, uses two interlinked circuits. The first one connects a pressure switch, battery, and lamp. The switch is placed under a doormat so it closes, operates the circuit, and lights the lamp whenever someone approaches the house. The lamp is meant to be placed right next to the push-button doorbell switch, perhaps even to shine right through it, so it indicates what the caller should press when he or she arrives in the dark. When the switch is pressed, it breaks the circuit and operates the one instead. Now power from the batteries energizes the electromagnet, bringing the bell clapper, repeatedly in contact with the bell itself.

8. MANPOWER REQUIREMENT:

Sr. No.	Designation of Employees	Salary Per Person	Monthly Salary ₹	Number of employees required				
				Year-1	Year-2	Year-3	Year-4	Year-5
1	Operators	12,000	12000.00	1	1	1	1	1
2	Helpers	10,000	10000.00	1	1	1	1	1
1	Admin Manager	12,000	12000.00	1	1	1	1	1
2	Office Boy	10,000	10000.00	1	1	1	1	1
	Total		44000.00	4	4	4	4	4

9. IMPLEMENTATION SCHEDULE

The project can be implemented in 2 months' time as detailed below:

Sr. No.	Activity	Time Required
1	Acquisition of premises	1.00
2	Construction (if applicable)	1.00
3	Procurement & installation of Plant & Machinery	1.00
4	Arrangement of Finance	2.00
5	Recruitment of required manpower	1.00
	Total time required <i>(some activities shall run concurrently)</i>	2.00

10. COST OF PROJECT:

Sr. No.	Particulars	₹ in Lacs
1	Land	0.00
2	Building	0.00
3	Plant & Machinery	5.10
4	Furniture, Electrical Installations	1.00
5	Other Assets including Preliminary / Pre-operative	0.51
6	Working Capital	4.50
	Total	11.11

11. MEANS OF FINANCE:

Bank term loans are assumed @ 75 % of fixed assets.

Sr. No.	Particulars	₹ in Lacs
1	Promoter's contribution	2.78
2	Bank Finance	8.33
	Total	11.11

12. WORKING CAPITAL CALCULATION:

Sr.	Particulars	Gross	Margin %	Margin Amt	Bank Finance
1	Inventories	2.25	0.25	0.56	1.69
2	Receivables	1.13	0.25	0.28	0.84
3	Overheads	1.13	100%	1.13	0.00
4	Creditors	-		0.00	0.00
	Total	4.50		1.97	2.53

13. LIST OF MACHINERY REQUIRED:

Sr. No.	Particulars	UOM	QUANTITY	Rate (₹)	Value
					(₹ in Lacs)
	Plant & Machinery /				
a)	Main Machinery				
1	Digital Multimeter	NOS.	1	60000	0.60
2	Temp Controlled Soldering Unit	NOS.	1	65000	0.65
3	LCR Meter, Drilling machine	NOS.	1	100000	1.00
4	Other machineries.	NOS.	1	150000	1.50
5	Testing Equipments	NOS.	1	50000	0.50
6	Installation, Electrification, taxes	NOS.	1	125000	1.25
	<i>sub-total Plant & Machinery</i>				5.00
	Furniture / Electrical				

a)	Office furniture	LS	1	50000	0.50
b)	Stores cupboard	LS	1	0	0.00
c)	Computer & Printer	L. S.	1	50000	0.50
	<i>sub total</i>				1.00
	Other Assets				
a)	preliminary and preoperative				0.51
	<i>sub-total Other Assets</i>				0.15
	Total				6.61

All the machines and equipment are available from local manufacturers. The entrepreneur needs to ensure proper selection of product mix and proper type of machines and tooling to have modern and flexible designs. It may be worthwhile to look at reconditioned imported machines, dies and tooling. Some of the machinery and dies and tooling suppliers are listed here below:

1. Bhavya Machine Tools
A-601, 6th Floor, Sapath-4, Opp. Karnavati Club,
S.G. Highway Road, Satellite, Ahmedabad-380051, Gujarat, India.
Phone No: +91- 79 - 4024 2800, +91- 79- 4024 2880
2. ifine Machine
5, New India Estate, Inside Relief Hotel,
Sanand Char Rasta, Sarkhej, Ahmedabad-382210, Gujarat
Phone: 079 26891274, 079 26890274
3. Heena Machine Product
No. 1, Samrat Industrial Area,
Near Ban Labs, Rajkot - 360004, Gujarat, India
4. Sagar Engineering Works
A-129, Road No. 9 D,
V. K. I. Area, Jaipur - 302013,
Rajasthan, India
Phone: +91-9829024358, +91-141-4064876
5. Uday Enterprises

Khasra No. 1108, Village Makanpur, Behind Indian Child School
 Opposite Janta Flat No. 433, Nyay Khand 1,
 Indirapuram, Ghaziabad - 201010, Uttar Pradesh, India
 Phone: +91-9212320224.

14. PROFITABILITY CALCULATIONS:

Sr. No.	Particulars	UOM	Year-1	Year-2	Year-3	Year-4	Year-5
1	Capacity Utilization	%	60%	70%	80%	90%	100%
2	Sales	₹. In Lacs	13.50	15.75	18.00	20.25	22.50
3	Raw Materials & Other direct inputs	₹. In Lacs	10.46	12.21	13.95	15.70	17.44
4	Gross Margin	₹. In Lacs	3.04	3.54	4.05	4.55	5.06
5	Overheads except interest	₹. In Lacs	2.31	2.46	2.75	2.83	2.89
6	Interest	₹. In Lacs	0.83	0.83	0.56	0.42	0.33
7	Depreciation	₹. In Lacs	3.57	2.55	1.79	1.28	1.15
8	Net Profit before tax	₹. In Lacs	-3.68	-2.30	-1.04	0.03	0.69

The basis of profitability calculation:

The growth of selling capacity will be increased 10% per year. (This is assumed by various analysis and study; it can be increased according to the selling strategy.)

Energy Costs are considered at Rs 7 per Kwh and fuel cost is considered at Rs. 65 per liter. The depreciation of plant is taken at 10-12 % and Interest costs are taken at 14 -15 % depending on type of industry.

15. BREAKEVEN ANALYSIS:

Sr. No.	Particulars	UOM	Value
1	Sales at full capacity	₹. In Lacs	22.50
2	Variable costs	₹. In Lacs	17.44

3	Fixed costs incl. interest	₹. In Lacs	3.22
4	$BEP = FC/(SR-VC) \times 100$	% of capacity	63.70%

16. STATUTORY / GOVERNMENT APPROVALS

As per the allocation of business rules under the Constitution, labour is in the concurrent list of subjects. It is dealt with by the MOLE at the Central and Departments of Labour under State Governments in respective States / UTs. The MOLE has enacted workplace safety and health statutes concerning workers in the manufacturing sector, mines, ports and docks and in construction sectors.

Further, other Ministries of the Government of India have also enacted certain statutes relating to safety aspects of substances, equipment, operations etc. Some of the statutes applicable in the manufacturing sector are discussed below:

The Manufacture, Storage and Import of Hazardous Electronic Rules (MSIHC), 1989

These MSIHC Rules are notified under the Environment (Protection) Act, 1986. These rules are aimed at regulating and handling of certain specified hazardous chemicals. The rules stipulate requirements regarding notification of site, identification of major hazards, taking necessary steps to control major accident, notification of major accident, preparation of safety report and on-site emergency plan; prevention and control of major accident, dissemination of information etc. These rules are notified by the Ministry of Environment and Forests (MOEF) but enforced by the Inspectorates of Factories of respective States / UTs in the manufacturing sector. Entrepreneur may contact State Pollution Control Board where ever it is applicable.

17. BACKWARD AND FORWARD INTEGRATIONS

Both forward and backward integration for any Electrical Industry are strategies to gain better control over the supply chain, reduce dependency on the suppliers

and increase their competitiveness. The two strategies can help companies reduce their dependency on suppliers and increase their influence over the customers. The benefits of these strategies can be big. Both impact the bottom line directly. Integration happens if a company moves upward or downward in its supply chain. Starting from the suppliers from whom the raw materials are obtained, the chain moves downstream towards the distributors and the retailers. If the suppliers' power is very high, it can create financial burdens for the company. Suppose the number of suppliers of a company is low, then the control in their hands would be low. The burden in that case will fall upon company's shoulders. Its expenditure on raw material will be high.

18. TRAINING CENTERS AND COURSES

There is no such training required to start this business but, basic Electrical or IC bachelor's degree is plus point for enterpriser. Promoter may train their employees in such specialized institutions to grow up the business. There are few specialized Institutes provide degree certification in chemical Technology, few most famous and authenticate Institutions are as follows:

1. Department of Electrical LD College of engineering
No.120, Circular Road, University Area, Navrangpura,
Opposite Gujarat University, Ahmedabad, Gujarat 380015
2. MIT College of Engineering, Pune
Gate.No.140, Raj Baugh Educational Complex,
Pune Solapur Highway,
Loni Kalbhor, Pune - 412201
Maharashtra, India

Udyamimitra portal (link : www.udyamimitra.in) can also be accessed for handholding services viz. application filling / project report preparation, EDP, financial Training, Skill Development, mentoring etc.

Entrepreneurship program helps to run business successfully is also available from Institutes like Entrepreneurship Development Institute of India (EDII) and its affiliates all over India.

Disclaimer:

Only few machine manufacturers are mentioned in the profile, although many machine manufacturers are available in the market. The addresses given for machinery manufacturers have been taken from reliable sources, to the best of knowledge and contacts. However, no responsibility is admitted, in case any inadvertent error or incorrectness is noticed therein. Further the same have been given by way of information only and do not carry any recommendation.

Source:- Udyami Mitra/Sidbi