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A preview on experimentation on Laser security system

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Abstract:
LASER-Ray goes through long distance without scattering effect and the Ray is almost invisible. Only the radiation point and incident point is visible. So by this security project we can make an invisible boundary of a sensitive area. There is two part of the system. One is transmitter and other is receiver. The transmitter part is built with a LASER radiator, a pair of dry cell batteries, an on-off switch and a stand to hold it. The receiver side, there is a focusing LDR (Light depending Resistor) sensor to sense the LASER continuously. The LDR sensor also holds with a stand and it connected with the main driver circuit. The circuit has two parts. One is filtered the signal of discontinuity ray and others is alarm circuit. When anybody crossover the invisible ray the main circuit sense the discontinuity by sensor and turn on the alarm circuit. If once the alarm circuit is on it will still ringing until push the reset button. There is two option of ringing. One is the duration of ringing depends on preset timer and another reset manually. Any option can be set by DPDT switch. If anybody wants to bind a sensitive area with the single ray he has to use mirror at every corner to reflect it. The system has built with low cost and high performance. The power consumption of the system is very low.

Keywords Trigger, 555 Timer, Laser security etc

Introduction: Security is a most important factor today. Technology develops day by day in the world. The crime gang also improves their technology to perform their operation. So technology of security should be modern with time to protect the crime works. We decide to make a security project as our project. In this project we have used laser light to cover a large area. We know laser light goes through long distance without scattering effect. It's also visible only at source and incident point, otherwise invisible. These two properties help us to build up a modern security system, which may name as "laser security". When any person or object crossover the laser line the security alarm will ringing and also the focus light will "on" to focus the entrance of unauthorized person. We can make a security boundary of single laser light by using mirror at every corner for reflection. Four lines running between the Computer Interface Unit (CIU) and each of the modules are used to communicate with the Remote Information and Control Equipment (RICE). A fifth line carries the command to pulse the RF power and ion source as demanded by the master pulser control unit. The transmission of the data to and from the RICE consists essentially of a burst of pulses on two lines. On the timing line, these pulses are 1.75 μs apart (pulse repetition rate is approximately 570 kilopulses/second with a 50% duty cycle). The control line carries the information to the RICE unit using an NRZ (nonreturn-to-zero) code. This means that any given pulse may be as short as 1.75 μs or nearly as long as the complete burst on the timing line (more than 20 μs). The information carried on the data line to the CIU is quite similar to that found on the control line. It is pulsed out of the RICE unit onto the line in serial form by the pulses carried on the timing line. The fifth line carries the master pulser signals to the ion source pulser. The computer may vary the output of the master pulser from one pulse period or 1.75 μs to 1790 μs. The transmission system must handle pulses as short as 800 ns or as long as 1.8 ms. In order to make the SNR high, the signals transmitted on these control lines have an initial amplitude of 10 V. Pulse delay characteristics of the system are important because of the length of the machine and the distances over which the pulses must be transmitted; however, the additional delay introduced by the light link will be relatively easy to compensate. The rise and fall times of the pulses being transmitted should not be restricted by the rise and fall time of the system used to transmit the signals to the head [4]. A rise time of less than 200 ns was selected as the target value. Since the use of a light link appeared to offer advantages from both cost and simplicity standpoints, several infrared sources and detect were purchased and tests run on them. Most other light devices, while attractive from the gain standpoint, were too slow to handle pulses of less than one rs. The General Electric LED-ll infrared source and the EG&G SD-100 photodiode were selected as the pair to be used in the prototype. Curves for the LED-ll with the lens in place show a power output of about 0.8 mW at approximately 300 ma of drive. The receiver specifications give a sensitivity of 0.25 μA/μW. If all the emitted radiation were received, we would expect a current of 200μ. A from the receiver. Attempts to design a system which would handle a 40 dB light loss resulted in a receiver which was judged a bit too complex; therefore, a receiver threshold current of 10 μA was chosen.

It is of interest, in regard to future laser communication links, to discuss the question of whether the information transmitted along a narrow line-of-sight path to a receiver is proof against interception. The automatic assumption that a beam of light whose beam diameter is of the order of magnitude of the collector mirrors is "secure" in principle is strictly true only for propagation in empty space. In transmission through the atmosphere, scattering phenomena due to water droplets in fog, cloud or rain, ice crystals, snowflakes, dust particles, and Rayleigh scattering from the air molecules themselves produce diffusion of the light from the direct path of the beam. This diffused light can be detected, and, as shown by King and Kainer [l], can be utilized .to transmit information for long distances out of the line-of-sight path of the directed beam. The conditions that determine whether information can be transmitted to the interceptor are similar to those discussed in connection with optical scatter links and microwave troposcatter links with the important exception that the information bandwidth is determined by the direct communication system, not the interceptor. Therefore, to determine whether the direct link is secure against interception, we must consider under what conditions the bandwidth of the intercepting system is comparable to that of the direct system. The maximum bandwidth for the interceptor link is a function of the common volume subtended by the acceptance cone of the interceptor and the beam width of the transmitter, as well as the strength of the signal scattered into the acceptance cone. The geometrical bandwidth is found from the path difference of the extreme rays bounding the common volume (taken to be symmetrical) which is given for small angles by

$$\delta = a\theta^2[(1+\alpha T/\theta)(1+\alpha R/\theta)-1]$$

and for larger angles by

$$\delta = a\alpha^2 \cos\theta + 2a\alpha \sin\theta$$

For a particular case we choose the distance between the intersection of the interception acceptance angle and laser beam ***a*** to be ten miles, and the beam width of the laser beam to be10^{-4} radians and equal to the acceptance angle of the receiver,

$\alpha T = \alpha R = a$.

The bandwidth falls off rapidly with the increasing angle from the direct line of sight, about 0.6 kmc at 10 degrees, which is, therefore, the maximum theoretical bandwidth in which information can be intercepted at that angle. This holds for both forward and backward scattering from the beam. The geometrical bandwidth equals the actual bandwidth of the system only when the power collected by the receiver exceeds the quantum noise limit. hvB where *h* is Plank's constant, $6.23\text{X}10^{-34}$ joule second, ***v*** is the central frequency, and *B* the bandwidth. For the bandwidth we are considering, 0.6 kmc, and a center frequency of $\mathbf{10^{14}}$ which is in the infrared, the minimum power required is of the order of $\mathbf{10^{-10}}$ watts. The power scattered into the intercepting receiver can be written approximately as

$F(\theta) A_R / a^2 PT$

where A_R is the area of the receiver, ***PT*** is the power in the direct beam at the scattering volume, and *F(θ)* is the scattering function defined as the ratio of the power scattered by the actual scatterer at an angle e and an isotropic scatterer. Scattering mechanisms due to water drop distributions have been discussed by Deirmendgian who shows that the single drop diffraction scattering is peaked strongly in the forward direction and falls to isotropic scattering at about seven degrees. Backward scattering is also peaked at small angles but below the intensity due to isotropic scattering. Searly isotropic scattering would arise from double scattering in more dense concentrations of water vapor such as fogs than under the conditions of hazes and clouds, considered by Deirmendgian. For our problem, ***a*** = 10 miles, we do the calculation for ***F(θ)=*** 1 and ***A*** $=\text{Im}^2$ and ***P=*** 1 watt, giving the power entering the collector to be of the order of 10^{-10}watts, which is greater by a factor of $\mathbf{10^2}$ than the quantum noise limit. Thus, for an isotropic scatter, the information can be actually intercepted within a cone of directions whose half angle is 10 degrees in the forward and backward direction. For **less** dense scattering conditions, under which single scattering processes predominate, the information could only be usefully transmitted in the forward direction within angles of five to seven degrees. The background noise power due to sunlight for a 1 **A** band-pass filter, collected by the receiver under consideration, is approximately $\mathbf{10^{-10}}$ watts. Thus, the point-to-point laser link cannot, in general, be considered absolutely secure and the possibility of interception must be taken into consideration in the operation of the link. To obtain maximum security under the most general conditions, it would be desirable to operate the direct link at minimum power and with the maximum utilization of the frequency bandwidth, thus operating with the minimum acceptable signal-to-noise ratio.

Methodology

The output of this pair of transistors is coupled through C3 to the next pair. The first pair uses negative feedback for stabilization. The second pair uses positive feedback to operate in a switching mode. When the input signal exceeds the level determined in part by the value of Rl6, Q3 is turned on. The signal couples from Q3 through R10 and C6 to Q4 turning this transistor on. The rising voltage across R12 is fed back to the base of Q3 as positive feedback and causes the pair to switch on in approximately 20 ns. Since Q4 is-driven into saturation, the output impedance of the amplifier is very low. This low impedance allows the amplifier to drive a 75 ohm load to very nearly the supply voltage value. Both the transmitter and the receiver use a printed circuit board with a ground plane as the common connection to the power supply. Filters have been provided in the positive side to reduce transmission of the fast current changes through the power system. Since the load impedance as seen by capacitor C3 swings from relatively low value when Q3 is turned on to a relatively high value when Q3 is off, CR1 has been added to provide a rapid discharge path for C3 when the pulse is terminated. a photograph of the transmitter receiver combination. The lens has been provided with a threaded mounting for proper focusing of the infrared beam. A cover is slipped over the outside of the mounting hardware to provide shielding both for radiation from the high current pulses and external coupling into the receiver [2]. This system was set up with a separation of approximately 6 ft between the transmitter and receiver. The transmitter input pulse on the upper trace and the receiver output pulse on the lower trace. One pair of traces shows the response for a short pulse; the other pair, the response for a relatively long pulse. Both sets of output traces were taken at the end of 100 ft of RG-591 coax cable terminated in 75 ohms. The fast trace shows a small "glitch" near the center of the pulse top. This was found to be due to a slight mismatch in the cable termination. One system has been assembled and put into operation to control the high voltage head on an electron acceleration experiment. This uses a manual control panel to replace the computer and operates at approximately a 35 kilo pulse/s rate with pulse widths of the order of 17 4s. The system operates in essentially the same manner as described above; however, the command busy signal is not used. Separation between the transmitter and receiver is approximately 8 ft. The transmitters and receivers are mounted in a row with a spacing of approximately 3 inches between centers. No problem was experienced with cross talk between any of the transmitters or receivers. The alignment was considerably less of a problem than had been anticipated. No readjustments have been necessary. A second receiver using linear integrated circuits, has been completed and'breadboarded Linearity and response tests have not been completed although preliminary tests show a bandwidth

Here is a low-cost, invisible laser circuit to protect your house from thieves or trespassers. A laser pointer torch, which is easily available in the market, can be used to operate this device. The block diagram of the unit shown in depicts the overall arrangement for providing security to a house. A laser torch powered by 3V power supply is used for generating a laser beam. A combination of plain mirrors M1 through M6 is used to direct the laser beam around the house to form a net. The laser beam is directed to finally fall on an LDR that forms part of the receiver unit as shown in Any interruption of the beam by a thief/trespasser will result into energisation of the alarm. The 3V power-supply circuits a conventional full-wave rectifier-filter circuit. Any alarm unit that operates on 230V AC can be connected at the output. The receiver unit comprises two identical step-down transformers (X1 and X2), two 6V relays (RL1 and RL2), an LDR, a transistor, and a few other passive components. When switches S1 and S2 are activated, transformer X1, followed by a full-wave rectifier and smoothing capacitor C1 drives relay RL1 through the laser switch. The laser beam should be aimed continuously on LDR. As long as the laser beam falls on LDR, transistor T1 remains forward biased and relay RL1 is thus in de-energised condition[1]. When a person crosses the line of laser beam, relay RL1 turns on and transformer X2 gets power supply and RL2 energises. In this condition, the laser beam will have no effect on LDR and the alarm will continue to operate as long as switch S2 is on. When the torch is switched on, the pointed laser beam is reflected from a definite point/ place on the periphery of the house. Making use of a set of properly oriented mirrors one can form an invisible net of laser rays as shown in the block diagram. The final ray should fall on LDR of the circuit. Noted that LDR should be kept in a long pipe to protect it from other sources of light, and its total distance from the source may be kept limited to500 meters.

2.2 Circuit diagram of laser security system

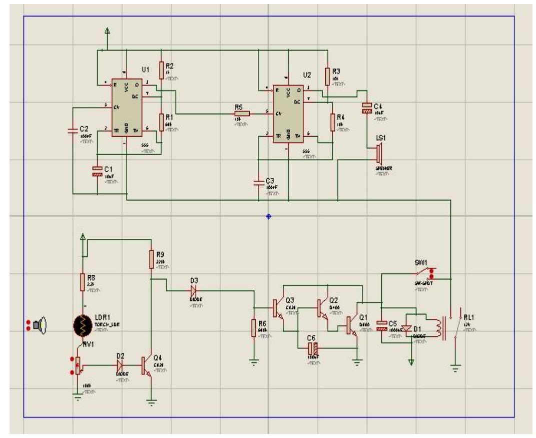

Fig: Circuit diagram of Laser Security System

When the LASER ray incident on the LDR, the impedance become very low (around 500Ω where it was 600KΩ).Then a voltage go through variable resistor RV1 to transistor Q4 base. So the Q4 transistor collector become grounded and diode D3's internal current following is zero. But the absence of LASER the base current of Q4 transistor is around zero and the collector works as open circuit from emitter. As a result, a current following through resistor R9 and diode D3. So the input LASER and output D3's current can said a NOT gate logically.The D3's current reduced by resistor R6. The Q3, Q2, Q1 transistor works as Darlington pair and it drive the relay switch. When Q3 transistor is biased by the absence of LASER, the relay switch becomes 'on' and the alarm circuit gets power. Same time the capacitor C6 is charging quickly. So when the LASER again incident on LDR after a short intervals (some obstacle crosses the LASER line), the relay remaining 'on' and also the alarm until Capacitor C6 fully discharged. So if LASER incidence disturbed by any obstacle for a short time the alarm circuit activated for a specific time depend on capacitor C6. There has also an option to remaining alarm circuit 'on' after disturbance of LASER incidence until manually 'off' by switch SW1.The Siren circuit has been uses as alarm circuit. There uses two 555's to produce an up-down wailing sound. The first 555 is wired as a low-frequency oscillator to control the VOLTAGE CONTROL pin 5 of the second 555. The voltage shift on pin 5 causes the frequency of the second oscillator to rise and fall. There uses twelve volt transformer for power supply and diodes to get DC volt and also a capacitor to get pure DC.

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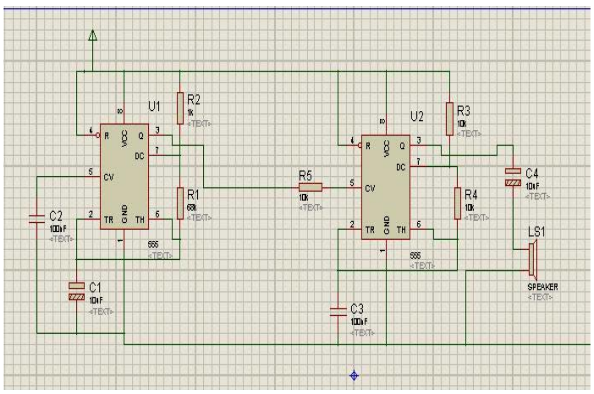


Fig: siren circuit

The siren circuit uses two 555`s to produce an up-down wailing sound and siren. The first 555 is wired as a low-frequency oscillator to control the voltage control pin 5of the second 555. The voltage shift on pin 5 causes the frequency of the second oscillator to rise and fall.

If the capacitor is replaced with an electrolytic the frequency of oscillation will reduce. When the frequency is less than 1Hz the oscillator circuit is called a timer or delay circuit. The 555 will produce delays as long as 30 minutes but with long delays the timing is not accurate. Depending on the manufacturer, the standard 555 package includes over 20 transistors, 2 diodes and 15 resistors on a silicon chip installed in an 8-pin mini dual-in-line package (DIP-8).[3] Variants available include the 556 (a 14-pin DIP combining two 555s on one chip), and the 558 (a 16-pin DIP combining four slightly modified 555s with DIS & THR connected internally, and TR falling edge sensitive instead of level sensitive). Low-power versions of the 555 are also available, such as the 7555 and CMOS TLC555.[4] The 7555 is designed to cause less supply glitching than the classic 555 and the manufacturer claims that it usually does not require a "control" capacitor and in many cases does not require a decoupling capacitor on the power supply. Such a practice should nevertheless be avoided, because noise produced by the timer or variation in power supply voltage might interfere with other parts of a circuit or influence its threshold voltages.

Parameter	Symbol	Value	Unit
Supply Voltage	VCC	16	V
Lead Temperature (Soldering 10sec)	TLEAD	300	°C
Power Dissipation	PD	600	mW
Operating Temperature Range (LM555)	TOPR	0 ~ +70	°C
Storage Temperature Range	TSTG	-65 ~+150	°C

Absolute Maximum Ratings (TA = 25°C)

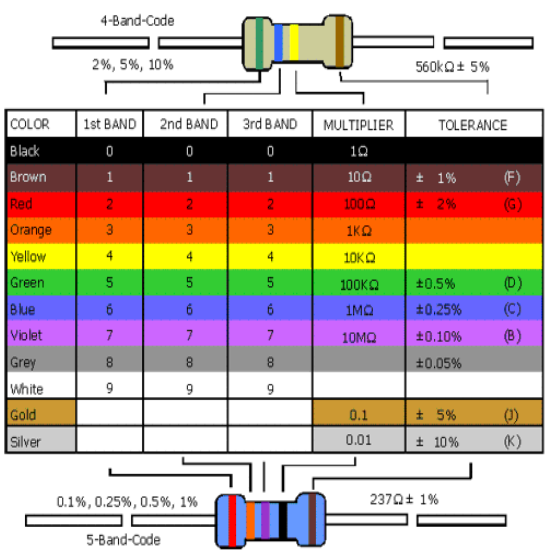
1. When the output is high, the supply current is typically 1mA less than at VCC = 5V.
2. Tested at VCC = 5.0V and VCC = 15V.
3. This will determine the maximum value of RA + RB for 15V operation, the max. total R = 20MΩ, and for 5V operation, the max. total R = 6.7MΩ.
4. These parameters, although guaranteed, are not 100% tested in production.

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply Voltage	VCC	-	4.5	-	16	V
Supply Current (Low Stable) (Note1)	ICC	VCC = 5V, RL = ∞	-	3	6	mA
		VCC = 15V, RL = ∞	-	7.5	15	mA
Timing Error (Monostable) Initial Accuracy (Note2) Drift with Temperature (Note4) Drift with Supply Voltage (Note4)	ACCUR Δt/ΔT Δt/ΔVCC	RA = 1kΩ to100kΩ C = 0.1µF	-	1.0 50 0.1	3.0 0.5	% ppm/°C %/V
Timing Error (Astable) Intial Accuracy (Note2) Drift with Temperature (Note4) Drift with Supply Voltage (Note4)	ACCUR Δt/ΔT Δt/ΔVCC	RA = 1kΩ to 100kΩ C = 0.1µF	-	2.25 150 0.3	-	% ppm/°C %/V
Control Voltage	VC	VCC = 15V	9.0	10.0	11.0	V
		VCC = 5V	2.6	3.33	4.0	V
Threshold Voltage	VTH	VCC = 15V	-	10.0	-	V
		VCC = 5V	-	3.33	-	V
Threshold Current (Note3)	ITH	-	-	0.1	0.25	µA
Trigger Voltage	VTR	VCC = 5V	1.1	1.67	2.2	V
		VCC = 15V	4.5	5	5.6	V
Trigger Current	ITR	VTR = 0V		0.01	2.0	µA
Reset Voltage	VRST	-	0.4	0.7	1.0	V
Reset Current	IRST	-		0.1	0.4	mA
Low Output Voltage	VOL	VCC = 15V ISINK = 10mA ISINK = 50mA	-	0.06 0.3	0.25 0.75	V V
		VCC = 5V ISINK = 5mA	-	0.05	0.35	V
High Output Voltage	VOH	VCC = 15V ISOURCE = 200mA ISOURCE = 100mA	12.75	12.5 13.3	-	V V
		VCC = 5V ISOURCE = 100mA	2.75	3.3	-	V
Rise Time of Output (Note4)	tR	-	-	100	-	ns
Fall Time of Output (Note4)	tF	-	-	100	-	ns
Discharge Leakage Current	ILKG	-	-	20	100	nA

When the low signal input is applied to the reset terminal, the timer outpu

Threshold Voltage (V_{th})(PIN 6)	Trigger Voltage (V_{tr})(PIN 2)	Reset(PIN 4)	Output(PIN 3)	Discharging Tr. (PIN 7)
Don't care	Don't care	Low	Low	ON
V_{th} > 2Vcc / 3	V_{th} > 2Vcc / 3	High	Low	ON
Vcc / 3 < V_{th} < 2 Vcc / 3	Vcc / 3 < V_{th} < 2 Vcc / 3	High	-	-
V_{th} < Vcc / 3	V_{th} < Vcc / 3	High	High	OFF

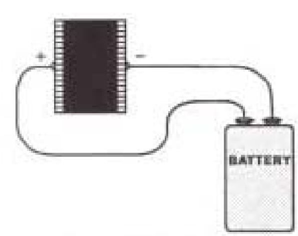
t remains low regardless of the threshold voltage or the trigger voltage. Only when the high signal is applied to the reset terminal, the timer's output changes according to threshold voltage and trigger voltage. When the threshold voltage exceeds 2/3 of the supply voltage while the timer output is high, the timer's internal discharge Tr. turns on, lowering the threshold voltage to below 1/3 of the supply voltage. During this time, the timer output is maintained low. Later, if a low signal is applied to the trigger voltage so that it becomes 1/3 of the supply voltage, the timer's internal discharge Tr. turns off, increasing the threshold voltage and driving the timer output again at high.A device used in electrical current conduction to control the direction of the current flowing to a circuit by applying resistance. Resistors may be fixed or variable, both controlling the flow of current differently.



COLOR	1st BAND	2nd BAND	3rd BAND	MULTIPLIER	TOLERANCE
Black	0	0	0	1Ω	
Brown	1	1	1	10Ω	± 1% (F)
Red	2	2	2	100Ω	± 2% (G)
Orange	3	3	3	1KΩ	
Yellow	4	4	4	10KΩ	
Green	5	5	5	100KΩ	±0.5% (D)
Blue	6	6	6	1MΩ	±0.25% (C)
Violet	7	7	7	10MΩ	±0.10% (B)
Grey	8	8	8		±0.05%
White	9	9	9		
Gold				0.1	± 5% (J)
Silver				0.01	± 10% (K)

Fig: with resistor band code

Resistors can be fabricated in a variety of ways. The most common type in electronic devices and systems is the carbon-composition resistor. Fine granulated carbon (graphite) is mixed with clay and hardened. The resistance depends on the proportion of carbon to clay; the higher this ratio, the lower the resistance. Another type of resistor is made from winding In-home or similar wire on an insulating form. This component, called a wire wound resistor, is able to handle higher currents than a carbon-composition resistor of the same physical size. However, because the wire is wound into a coil, the component acts as an inductors as well as exhibiting resistance. This does not affect performance in DC circuits. A device used to store charge in an electrical circuit. A capacitor functions much like a battery, but charges and discharges much more efficiently (batteries, though, can store much more charge). A basic capacitor is made up of two conductors separated by an insulator, or dielectric. The dielectric can be made of paper, plastic, mica, ceramic, glass, a vacuum or nearly any other nonconductive material. Some capacitors are called electrolytics, meaning that their dielectric is made up of a thin layer of oxide formed on a aluminum or tantalum foil conductor. Capacitor electron storing ability (called capacitance) is measured in Farads. One Farad is actually a huge amount of charge (6,280,000,000,000,000,000 electrons to be exact), so we usually rate capacitors in microfarads (uF = 0.000,001F) and picofarads (pF = 0.000,000,000,001F). Capacitors are also graded by their breakdown (i.e., smoke) voltage. Capacitors rated for lower voltages are generally smaller in size and weight; you don't want to use **too** low a voltage rating, though, unless you enjoy replacing burnt-out capacitors in your creation. For BEAM bots, you'll need to know about 2 main types of capacitors. A polarized ("polar") capacitor is a type of capacitor that has implicit polarity -- it can only be connected one way in a circuit. The positive lead is shown on the schematic (and often on the capacitor) with a little "+" symbol. Polarized capacitors are generally electrolytic. Note that you really need to pay attention to correctly hooking a polarized capacitor up (both with respect to polarity, as well as not pushing a capacitor past its rated voltage). If you "push" a polarized capacitor hard enough, it is possible to begin "electrolyzing" the moist electrolyte. Modern electrolytic capacitors usually have a pressure relief vent to prevent catastrophic failure of the aluminum can (but don't bet your eyesight on this). This bulletin describes the basic characteristics of KEMET capacitors. Before examining all the details relating to KEMET products, here are some of the basics of all capacitors and then of the major types sold under the KEMET brands: solid tantalum and monolithic ceramic.For all practical purposes, consider only the parallel-plate capacitor: two conductors or electrodes separated by a dielectric material of uniform thickness. The conductors can be any material which will conduct electricity easily. The dielectric material must be a poor conductor – an insulator. The symbol for a capacitor used in schematic diagrams of electronic circuits looks very much like a parallel-plate model. Here is a sample circuit which contains all the components normally called “passive,” plus a battery. The battery is an “active” component because it can add energy to the circuit. Passive components may store energy momentarily, but cannot add energy on a continuous basis. The three main passive devices are resistors, capacitors, and inductors.



Charged Capacitor

Material	K at 25°C
Vacuum	1
Glass	5 to 10
Mica	3 to 6
Plastics, general	2 to 4
Aluminum Oxide, Al_2O_3	10
Tantalum Oxide TA_2O_5	26
Barium Titanate, $BATiO_3$	1,000 to 30,000

Values of Dielectric Constant K

When the diagram of the capacitor is magnified, it can be seen that the presence of electrical charges on the electrodes induces charges in the dielectric. These induced charges determine something called permittivity. Each different dielectric material has its own value of permittivity. A more practical and better known measurement tool is called “K,” or dielectric constant. “K” is the *ratio* of the permittivity of the dielectric in use to the permittivity of free space – a vacuum. Therefore, all the capacitance values are related to the permittivity of vacuum. In a vacuum, K = 1, while “K” in every material has some value greater than 1. The higher the “K,” the more capacitance can be realized, with all other things being equal. The expression of capacitance is seen here, and note the presence of the constant, 8.85 X 10–12 (permittivity of vacuum). The only trick involved in using this equation is to keep the units consistent. Capacitance is in farads, the area “A” is in square meters and the distance between electrodes “D” is in meters. “K” is a ratio and a pure number without dimensions. Sometimes different constants are used in the equation. This comes about when units other than farads and meters are used. Microfarads and inches might be used, for example. To get an idea of what a farad is, calculate the area which would be necessary in a capacitor built to have one farad, to operate in a vacuum, and to have spacing between electrodes of one millimeter. First, turn the equation around to solve for the area and then plug in the values known. This calculates to 113 million square meters, which would be a field about 6.5 miles on a side. It’s not hard to see why one farad capacitors aren’t made very often and when they are, they are never made with a vacuum dielectric and one millimeter spacing. Vacuum capacitors are made, but the market is pretty well limited to laboratory standards. All commercial capacitors use some different dielectric material with a higher value of K. Materials used today are in the table below. There is a tendency toward the higher values of K. (With a K of 10, there would be a reduction of one farad capacitor area to a mere 11.3 million square meters!) The wide range in values for barium titanate, which is the capacitors, is an unfortunate fact of nature which will be discussed more completely later on. Why make commercial capacitors with any of the materials having low values of K? The answer generally less with other capacitor characteristics such as stability with respect to temperature, voltage ratings, etc. These will all be explored through investigation of other dielectric systems later. Relays are simple switches which are operated both electrically and mechanically. Relays consist of a n electromagnet and also a set of contacts. The switching mechanism is carried out with the help of the electromagnet. There are also other operating principles for its working. But they differ according to their applications. Most of the devices have the application of relays. A simple electromagnetic relay consists of a coil of wire surrounding a soft iron core, an iron yoke which provides a low reluctance path for magnetic flux, a movable iron armature, and one or more sets of contacts (there are two in the relay pictured). The armature is hinged to the yoke and mechanically linked to one or more sets of moving contacts. It is held in place by a spring so that when the relay is de-energized there is an air gap in the magnetic circuit. In this condition, one of the two sets of contacts in the relay pictured is closed, and the other set is open. Other relays may have more or fewer sets of contacts depending on their function. The relay in the picture also has a wire connecting the armature to the yoke. This ensures continuity of the circuit between the moving contacts on the armature, and the circuit track on the printed circuit board (PCB) via the yoke, which is soldered to the PCB. When an electric current is passed through the coil it generates a magnetic field that attracts the armature, and the consequent movement of the movable contact(s) either makes or breaks (depending upon construction) a connection with a fixed contact. If the set of contacts was closed when the relay was de-energized, then the movement opens the contacts and breaks the connection, and vice versa if the contacts were open. When the current to the coil is switched off, the armature is returned by a force, approximately half as strong as the magnetic force, to its relaxed position. Usually this force is provided by a spring, but gravity is also used commonly in industrial motor starters. Most relays are manufactured to operate quickly. In a low-voltage application this reduces noise; in a high voltage or current application it reduces arcing. When the coil is energized with direct current, a diode is often placed across the coil to dissipate the energy from the collapsing magnetic field at deactivation, which would otherwise generate a voltage spike dangerous to semiconductor circuit components. Some automotive relays include a diode inside the relay case. Alternatively, a contact protection network consisting of a capacitor and resistor in series (snubber circuit) may absorb the surge. If the coil is designed to be energized with alternating current (AC), a small copper "shading ring" can be crimped to the end of the solenoid, creating a small out-of-phase current which increases the minimum pull on the armature during the AC cycle.[1] A solid-state relay uses a thyristor or other solid-state switching device, activated by the control signal, to switch the controlled load, instead of a solenoid. An optocoupler (a light-emitting diode (LED) coupled with a photo transistor) can be used to isolate control and controlled circuits.

2.14.0. Result & Discussion:

Beam coincidence. It can be seen from the energy contained in any part of the signal beam that does not overlap the oscillator beam is lost as far as conversion is concerned. Moreover, any part of the local-oscillator beam that falls outside the signal beam contributes to the receiver noise but not to useful signal. Beam direction two plane waves propagating in slightly different directions, as indicated by the angle θ. Consider the differential beat-frequency current di generated on an area da at the center of the beams, and take the phase of this current as the reference phase. At some distance a from the center the wave-fronts will be separated by a distance $\delta 1 = a \tan\theta$ and the phase will be different by an amount $\delta\varphi = 2\pi \tan\theta\ a/\lambda$. We are interested only in very small values of θ. For such values, tan θ can be taken equal to θ and $\delta\Phi=2\pi\theta a/\lambda$. When $\theta a = \lambda/2$, $\delta/2 = \pi$ and the differ-ential current from this area is exactly out of phase with the reference current. The maximum value the distance a can have is the radius R of the beam, and $\delta\varphi_{max}=2\pi\theta R/\lambda$. The curves show beat-frequency current as a function of $\theta R/\lambda$. The dashed curve represents the function when the light intensity is uniformly distributed over the beam. The quantity $\theta R/\lambda$ represents the distance expressed in wavelengths, and the current goes to zero whenever this distance is an exact multiple of a half wavelength. The solid curve is for the more usual case, where the light intensity has a Gaussian distribution. The current never goes completely to zero but approaches this value as $\theta R/\lambda$ is made large. As a practical example, consider a receiver operating at the common visible-red wavelength of 0.63 Aum and with a beam diameter of 1 mm. The data of now be plotted in terms of 0 alone. The scale at the top of the represents this angle in minutes of arc. Employing this scale we find, for example, that for a detection efficiency greater than 90 percent the angle θ must be less than 0.3 minute or 18 seconds of arc. Wave front curvature the situation when a plane wave and a curved wave front are superimposed. As in the case for the tilted beams, the phase of the signal recovered from the center of the beam differs from that derived from other areas, and thus the con version efficiency is decreased. Polarization. Heterodyne conversion results from the effect of squaring the instantaneous sum of two electric fields by the nonlinear detector. Only the component of the signal field that is spatially aligned with the local-oscillator field can add to it and thereby be effective in producing signals. This implies that the beams must be of the same polarization for maximum conversion. The heterodyne receiver may be considered disadvantageous in that, for optimum performance, it must meet all of the requirements we have set forth, some of which are very severe. However, these critical requirements aid in discriminating against background light, which is usually incoherent, exists in many modes, comes from a wide angle, is randomly polarized, and covers a frequency spectrum very wide in comparison with the required bandwidth of the receiver. we can determine that the angular discrimination of the 0.63-Am receiver described there is the same as that of an antenna with a half-power beam width of ± 0.54 minute or 32 seconds of arc-an extremely sharp an tenna. Another problem encountered in heterodyne reception is that of providing a local oscillator maintained at the proper frequency. By employing an IF discriminator in an automatic-frequency-control circuit, the local-oscillator frequency can be made to track the incoming signal frequency; for most applications, this problem is readily solved. For some space communication systems, Doppler shifts of the optical-signal frequency may become large enough to make frequency tracking difficult. Transmission medium as indicated in the preceding section, efficient heterodyne reception depends upon providing an accurate match between the wave fronts of the signal and local oscillator. If the wave front of the signal beam is altered to any extent by transmission through some medium, it may not be possible to obtain such a match. The transmission medium involved may, therefore, determine whether or not heterodyne reception is feasible. Enclosed transmission path [5]. The most likely method of reliable light transmission over long terrestrial routes would involve an enclosed path, to preclude contamination and reduce turbulence. It is therefore important to determine whether heterodyne reception will be advantageous at the end of such a path. Since light beams travel only in straight lines and tend to diverge, this path would need to be equipped with some means for directing and refocusing the beam. Lenses, or pairs of mirrors, placed at intervals along the line as shown in can perform the functions of directing and refocusing. Since most of the losses in such a line are produced by the directing elements, the total loss depends upon the number of these elements. Total loss should not 0.3 to 0.6 dB/km.5 If the line is placed some distance underground, or is well insulated, turbulence can be reduced to a negligible level. This is borne out by some experiments performed by D. Gloge[6] and by one that will be described in the next section. The enclosed line is not without problems. Changes of the mechanical position of the directing elements or temperature gradients in the line can cause displacements of the beam. In view of the critical requirements on a heterodyne receiver, as stated earlier, one might expect beam shifts caused by temperature changes or vibrations of the guiding elements to be very serious. It has been found that the beam position can be accurately controlled by means of a simple servo control system applied to some of the directing elements and that the vibrations of these elements are not serious. To design a laser security system electronic circuit was designed using Proteus software. Although this project was carried out for security system, it was so designed that it can be used to any security system**.** When power switch of LASER is on the input of LASER is 3V from source. When LASER input is 3V the LASER out put is a LASER ray. At switch off there is no light from LASER. When any obstacle comes between LASER transmitter and Receiver there is no light on sensor. When the obstacle removed sensor again get light from transmitter. When sensor get disturbance of receiving light it power on the alarm circuit. So alarm is ringing and it continuing until the timer (built-in) response or manually off by push switch. When unauthorized person crossover the laser line then alarm begins to ring and also focus light will be on. This alarm and focus light will be automatically stop a fixed period of time. To make a security boundary for coverage a large area of single laser light using some mirror at every corner for laser light reflection.

Conclusion:

In the end, we made the laser security in low budget. It had been protect in full security. Laser security systems are a high tech technology that used to be a part of home security only available to the wealthy. It is manually switch dependent sensors and a basic alarm unit. Laser security system a person moves in front of the motion sensor, that person's body heat triggers the system's alarm. And the alarm signals the security monitoring company and local law enforcement. The basic alarm unit will also sound a loud alarm.

Both analysis and experiment indicate that rather stringent requirements must be met in order to obtain efficient optical heterodyne detection. There is con-siderable experimental evidence that these requirements can be met by employing an enclosed transmission path, the so-called optical pipeline, and that from a practical standpoint the difficulties are not much greater than for other types of detection. Such a line with servo control of beam position should provide a very satisfactory transmission medium for any type of receiver. The heterodyne receiver appears to be more satisfactory than the direct detector for the reception of phase- or frequency-modulated light or multiplexed optical signals. At some wavelengths it may provide the only means of overcoming thermal-noise and detector-noise problems. The operation of Doppler radars depends upon the heterodyning process. For most applications, supplying a properly tuned local oscillator presents no great difficulty. The coherent receiver provides high discrimination against background light. It also provides efficient detection in the infrared region, in which other detectors are deficient. For these reasons and since free space is an ideal transmission medium, the optical heterodyne receiver may have considerable advantage over others for space communication applications. Because of in homogeneities in its index of refraction, the atmosphere is a very unsatisfactory transmission medium if heterodyne reception is employed. For such transmissions other methods of detection are usually preferable.In the system we will be made by microcontroller base, When any authorized person crossover the laser line the security alarm will not ringing. The preceding discussion has been limited to pure modes. In actual transmission the beam will most likely be launched in the fundamental mode but may have some of its energy converted to higher-order modes by wave front distortions during transmission. As a result, the received beam will consist of a mixture of fundamental and higher-order modes and be more complicated than any situation shown. This is illustrated in which shows a beam with all of its energy concentrated in the fundamental mode, in addition to a beam that has additional modes resulting from transmission through 2.6 km of clear but turbulent atmosphere. For transmission systems employing optical components of limited size, losses are greater for the higher-order modes than for the dominant mode. For a more complete discussion of optical modes, The heterodyne receiver currently has another advantage for space communications. The most efficient, and at the same time high-power, source of continuous coherent light is the CO2 laser, which operates at 10.6 μm. However, at the present time there is no satisfactory direct detector for this wavelength range; the diode detectors that have been devised are very noisy. As pointed out previously, for the heterodyne receiver the only noise of consequence is the shot noise resulting from the local-oscillator power, provided this power is large enough. Employing the heterodyne principle should make possible an efficient receiver at this wavelength, where an efficient, high-power transmitter also exists.

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