套件製作注意事項：

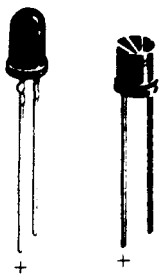
套件完成銲接後，試機時發現不能工作，往往是以下的問題：

(A)銲接不良

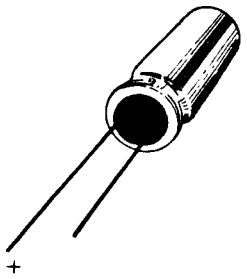
銲接時，不要急於完成製作，而忽略銲接工藝，常見銲接毛病是假銲及虛銲。

(B)弄錯元件極性

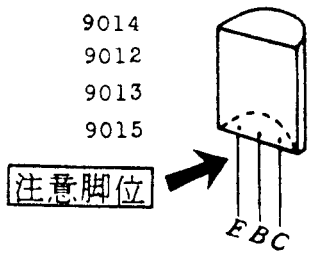
以下元件是有極性之分，見下圖。



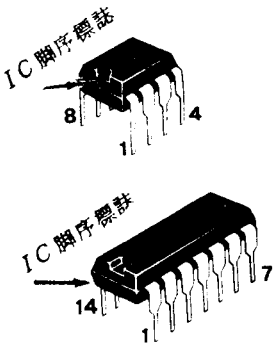
(a)LED



(b)電解質電容器



(c)晶體管



(d)集成電路(IC)

元件極性之分辨方法是相當容易，一般可用電極脚的長短或標誌來找出電極的極性，祇是晶體管較為困難分辨其極性。

由於有些元件是有極性之分，所以銲接前，要核對或檢查元件插在電路板上的位置是否正確，無誤後，才銲接。

(C)銲接元件次序

銲接元件次序，基本原則是先銲接體積較小的元件，如電阻器，陶瓷電容器，最後才銲IC座(IC座上如果插上IC，先除下IC才銲接)。

(D)IC脚序

把IC插至IC座上試機時，不要弄錯脚序，各IC脚要對應IC座脚位，即IC①脚要對應IC座①脚位，②脚對應IC座②脚位，不可逆插，錯誤插上IC，往往會燒燬IC，切記！切記！

(E)電源電壓

如果採用由直流供電器(SUPPLY ADAPTOR)作為製作試機電源，要檢查其電壓是否電路要求的電壓。

FAX: 23987414　　TEL: 23907894

九龍荔枝角道781號宏昌工廠大廈6樓601A室

經銷處：南豐機械工具有限公司 FAX: 2390 4095

旺角雞蘭街18號地下 TEL: 2395 5121

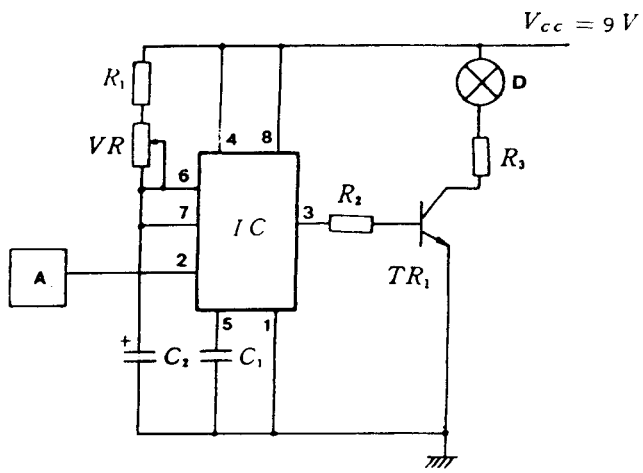
教育電子電路製作套件
EDUCATIONAL ELECTRONIC CIRCUIT PROJECT

D T 202—床頭觸摸定時燈

電路的功能

電路是在手指觸摸時才動作的定時燈，燈點亮一段時間後自動熄滅，可用作夜間看鐘錶或用作一低亮度的照明，燈照明的時間是可以改變。

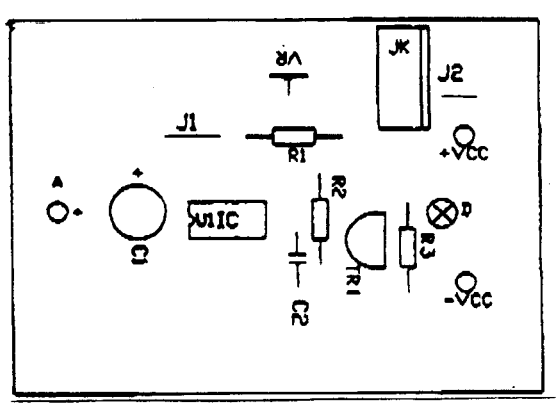
電路圖



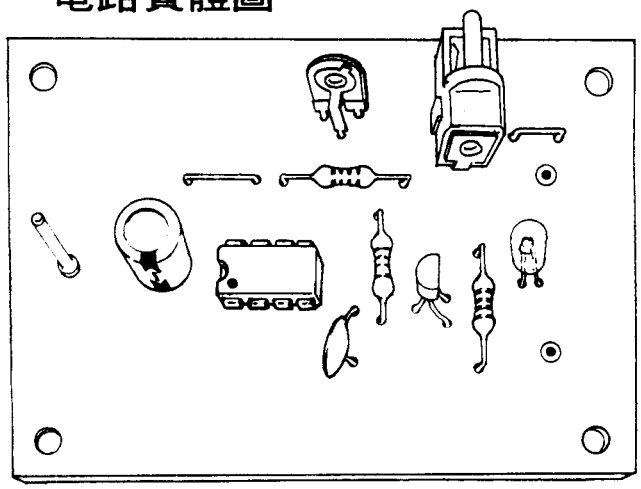
$R_1 = 10K\Omega$ $R_2 = 1\ K\Omega$ $R_3 = 22\ \Omega$ $VR = 500\ K\Omega$ $C_1 = 0.01\ \mu F$

$C_2 = 100\ \mu F$ $TR_1 = 9013$

電路零件位置圖



電路實體圖

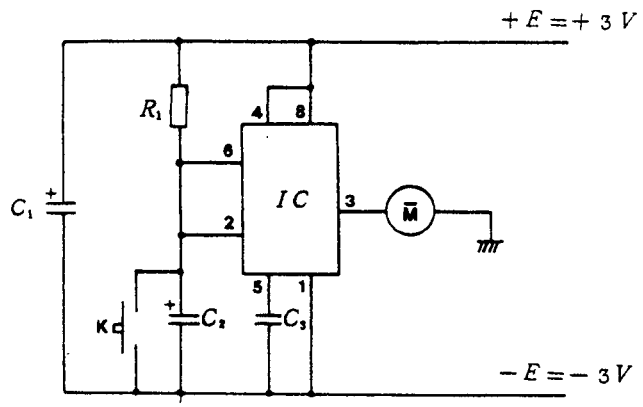


教育電子電路製作套件
EDUCATIONAL ELECTRONIC CIRCUIT PROJECT
D T 301—玩具碰碰車

電路的功能

電路可安裝在模型汽車上（包括電路的小型馬達）。當玩具車碰到障礙物就會改變方向，然後再直線前進。玩具車的改向是用觸動電路微動開關來實現控制。

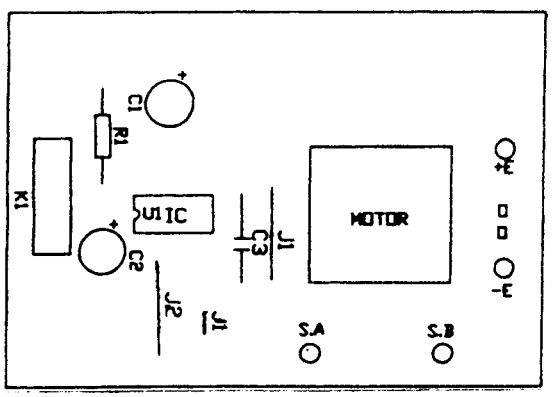
電路圖



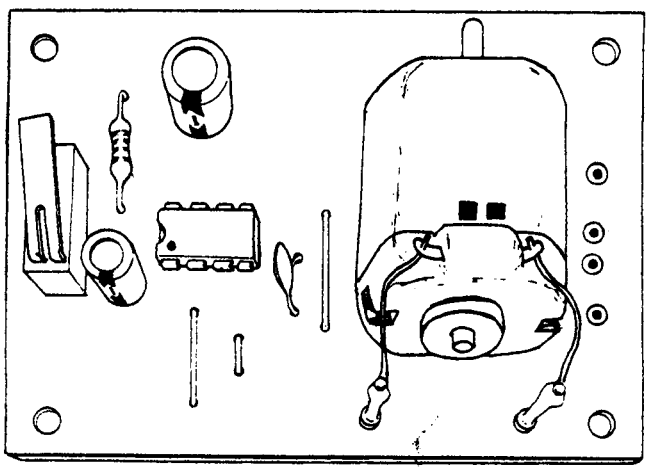
$R_1 = 1\,M\Omega$　$C_1 = 100\,\mu F$　$C_2 = 1\,\mu F$　$C_3 = 0.01\,\mu F$

DT 301

電路零件位置圖



電路實體圖



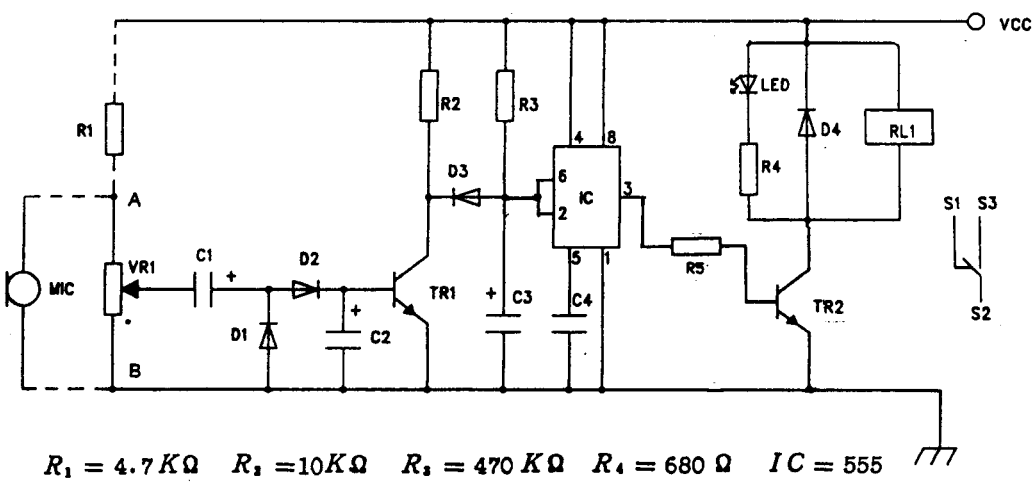
教育電子電路製作套件
EDUCATIONAL ELECTRONIC CIRCUIT PROJECT

DT402 聲控器

電路的功能

聲控(繼電)器有聲音輸入時，電路繼電器的常開(NO)點就接通。電路5秒鐘內沒有聲音電壓輸入，繼電器常開點(NO)就恢復正常而斷開。聲控器可用作自動錄音控制器、聲音檢知器或一些聲控裝置。

電路圖

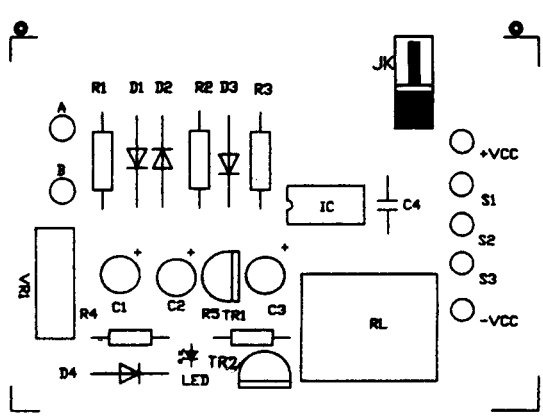


S1 : 繼電器常閉點 (NC)
S2 : 繼電器公共點 (COM)
S3 : 繼電器常開點 (NO)

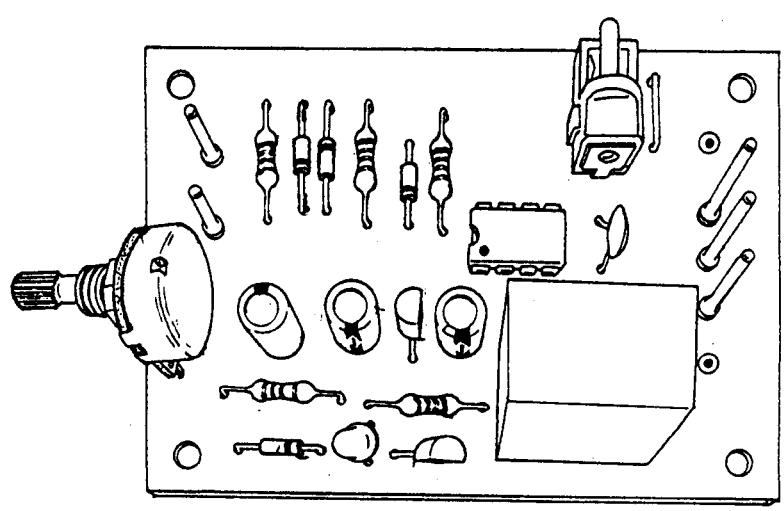
VR1 : 聲控靈敏度調整器
虛線表示使用電容咪時需加的電阻器
AB : 聲控輸入端

$R_1 = 4.7K\Omega$ $R_2 = 10K\Omega$ $R_3 = 470K\Omega$ $R_4 = 680\Omega$ $IC = 555$
$VR_1 = 10K\Omega$ $C_1 = C_2 = C_3 = 10\mu F$ $C_4 = 0.01\mu F$ $R_5 = 1.2K\Omega$
$D_1 = D_2 = IN60$ $D_3 = D_4 = IN4148$ $TR_1 = 9014$ $TR_2 = 9013$

電路零件位置圖



電路實體圖



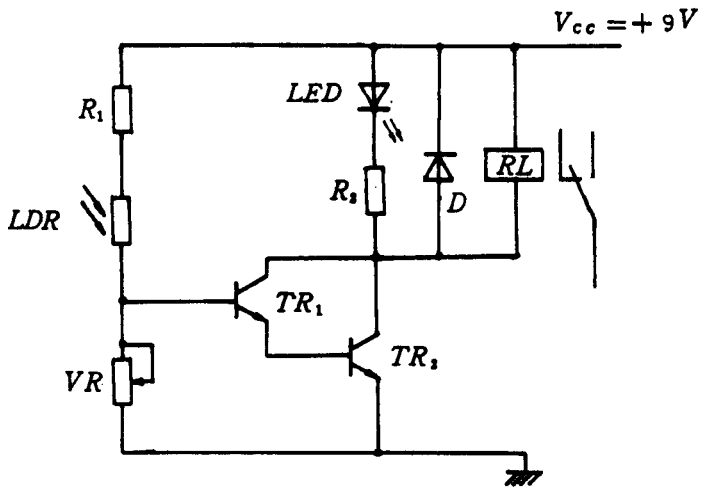
教育電子電路製作套件
EDUCATIONAL ELECTRONIC CIRCUIT PROJECT

ES102—光控開關

電路的功能

電路光敏元件受光照射，電路LED就發光及繼電器吸動。電路可作爲光控裝置。

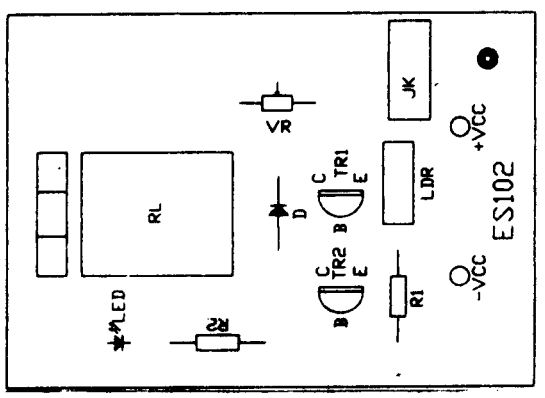
電路圖



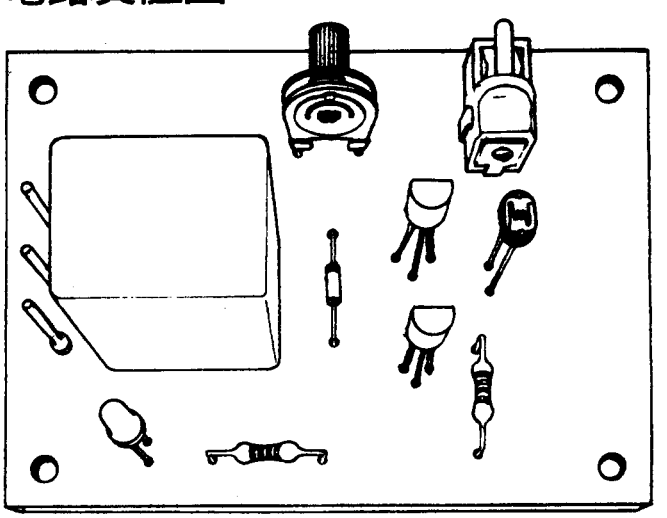
$R_1=470\,\Omega$ $R_2=560\,\Omega$ $VR=10K\Omega$ $RL=9V$ $TR_1=9014$ $TR_2=9013$ $D=IN\,4148$

$ES\,102$

電路零件位置圖



電路實體圖



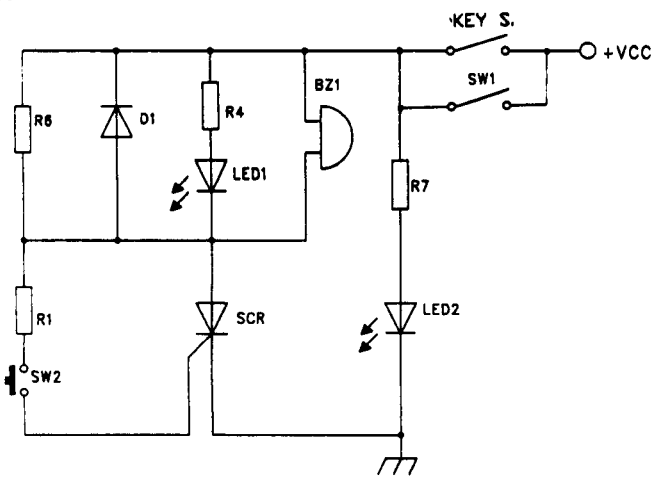
教育電子電路製作套件
EDUCATIONAL ELECTRONIC CIRCUIT PROJECT

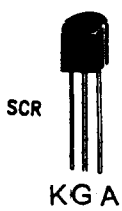
IS101　微動警報器

電路的功能

電路微動開關一經觸動，電蜂鳴器就立即發出聲音，直至電路電源被斷開才可以停止發聲。電路用電子鎖來接通或斷開電源。電路的微動開關安裝在窗户，門框，窗櫥等地方，就可以作為窗户、門、窗櫥等是否被打開或關上的告知器，電路廣泛地應用於一些防盜裝置上。

電路圖





Key S：電子鎖

SW_1：手動開關（作測試用，代替電子鎖。

SW_2：微動開關。

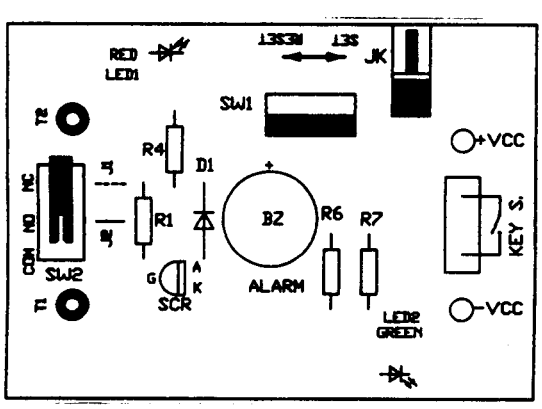
微動開關SW_2作警告"門"被打開，連跳綫J_1；作警告"門"未關上，連接跳綫J_2。

$R_1 = 33\,K\Omega$　$R_4 = 330\,\Omega$　$R_6 = 1\,K\Omega$　$R_7 = 330\,\Omega$　$D_1 = IN\,4148$

$BZ_1 = \phi 8$ 蜂鳴器　LED_1 =紅色 LED　LED_2 =綠色 LED

$SCR = MCR\,100-6$

電路零件位置圖



接通微動開關的NO或NC點
視乎電路的應用，一般接通NO點
SET：接通電源
RESET：斷開電源
綠色 LED 亮起，電路處於工作狀態。
綠色，紅色LED都亮起，微動開關被觸動。

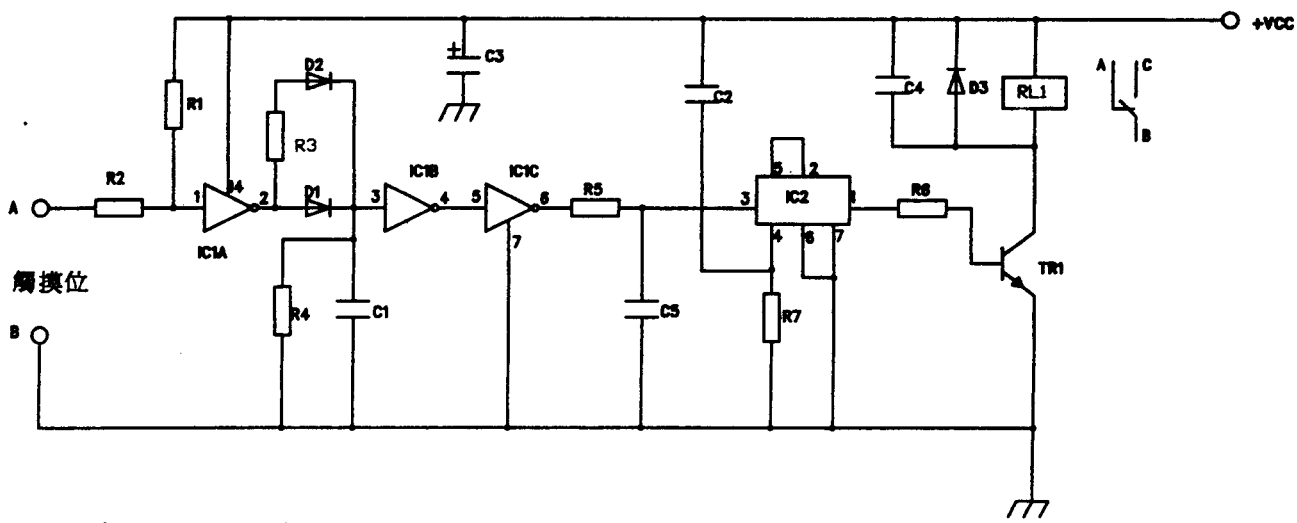
教育電子電路製作套件
EDUCATIONAL ELECTRONIC CIRCUIT PROJECT

IS108 觸摸繼電器

電路的功能

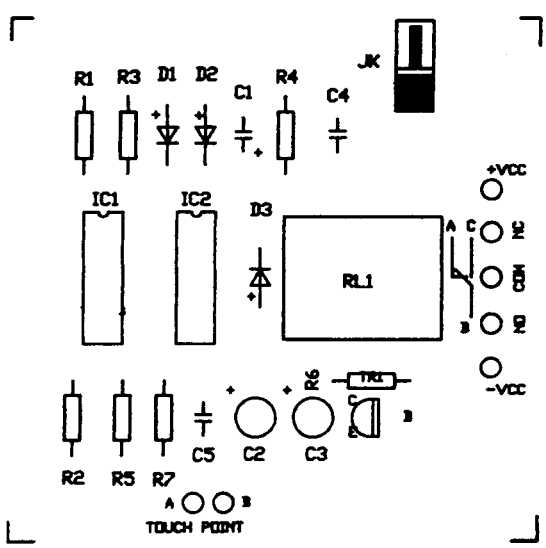
電路接通電源後，人手碰觸電路觸摸極，繼電器就接通電；觸摸極再被碰觸，繼電器就斷開電。製作可作為觸摸開關電器的裝置，如觸摸燈、風扇、家庭電器等。

電路圖



$IC_1 = 4069$ $IC_2 = 4013$ $R_1 = 4.7\,M\Omega$ $R_2 = 100\,\Omega$ $R_3 = 100\,K\Omega$
$R_4 = 150\,K\Omega$ $R_5 = 10K\Omega$ $R_6 = 1\,K\Omega$ $R_7 = 22K\Omega$ $C_1 = 0.33\,\mu F$
$C_2 = 4.7\,\mu F$ $C_3 = 200\,\mu F$ $C_4 = 0.1\,\mu F$ $D_1 = D_2 = D_3 = 4148$

電路零件位置圖

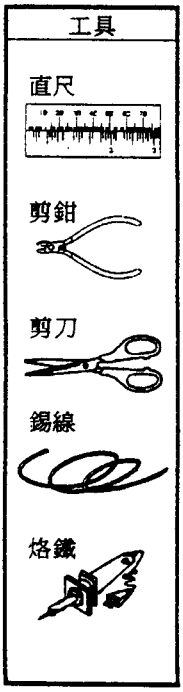


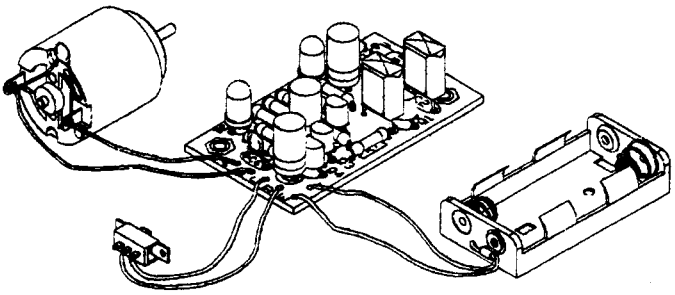
光接收器(有計時器)

EM-107

引　言

利用紅外線接收三極管可將外加的光線轉變成爲電訊號，然後再將信號放大控制馬達，燈光等的啓動，接收器在收到信號時(例如：家電用紅外線遙控器或手電筒的照射等)，受控件便會導通 10 至 30 秒。模板尺寸爲 40.5X 30.5 X12.7mm，適合各類型 3 至 6V 及 0.5A 馬達或燈泡使用。電路可用 DC-30 或 2 顆 AA 電池操作。





注意事項

1. 裝配前須細讀說明書。
2. 裝配工具包含烙鐵、剪鉗、剪刀等利器，使用時小心以免受傷。
3. 勿讓孩童玩弄套件，以免誤吞部件；用後的廢件應立即處理掉。
4. 用剪刀剪割含 PVC 膠片或咭紙的元件。
5. 使用烙鐵時需在乾燥的環境下工作，不要讓烙鐵與周遭物品接觸，以免觸電或發生火警。

電路工作原理

在正常無光照射的情況下，紅外線接收三極管 D1 輕微導通，偏壓電阻 R2 的大電阻值使 Q1 使爲 A 類放大器，其頻率響應是由 C3 限制的。

電阻R5給Q2提供正偏壓，使Q2集電極飽和接近低電平，因而使Q3及Q4截止馬達不轉動。

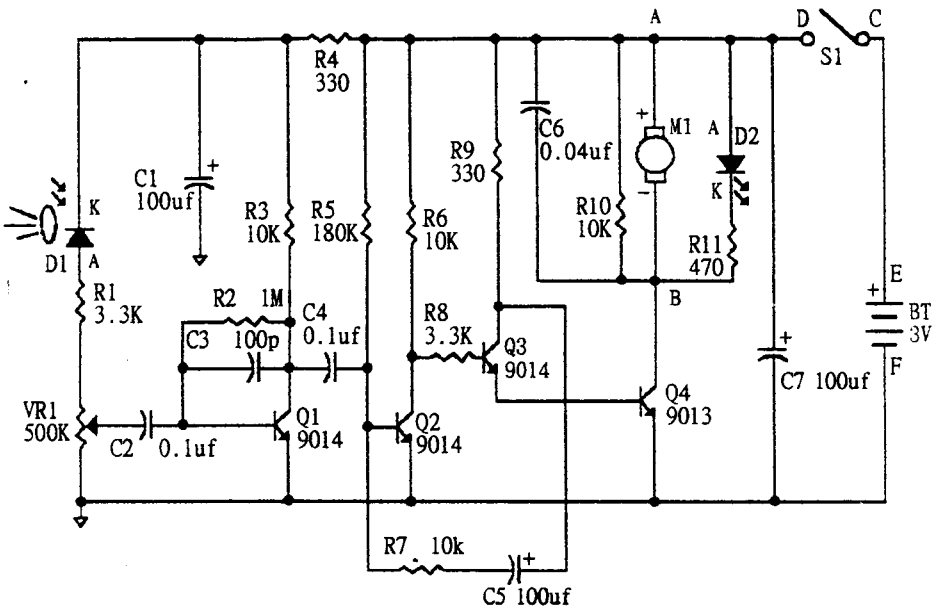
但當有光線照射到紅外線接收三極管D1時，D1導通，電流增加使在VR1的電降壓增加形成一小脈沖，脈沖經C2交連到Q1放大器的基極，經放大後使Q1集電極接近飽和，當Q1集電極飽和時，在C4的電荷即時提供Q2基極一個負偏壓使Q2截止，因而Q2集電極變爲高電平使到Q3及Q4導通，馬達便會轉動。

而Q3的集電極是接有R7及C5的串聯電路，分別連接在Q3集電極及Q2基極兩端，在無光照射情況下C5的電壓接近電源，所以當有光照射時，Q3集電極是飽和時，在C5的電荷就會給Q2提供反向偏壓，使 Q2 截止更深。當訊號的正脈衝消失後，因爲 C5 帶有的反向電壓仍

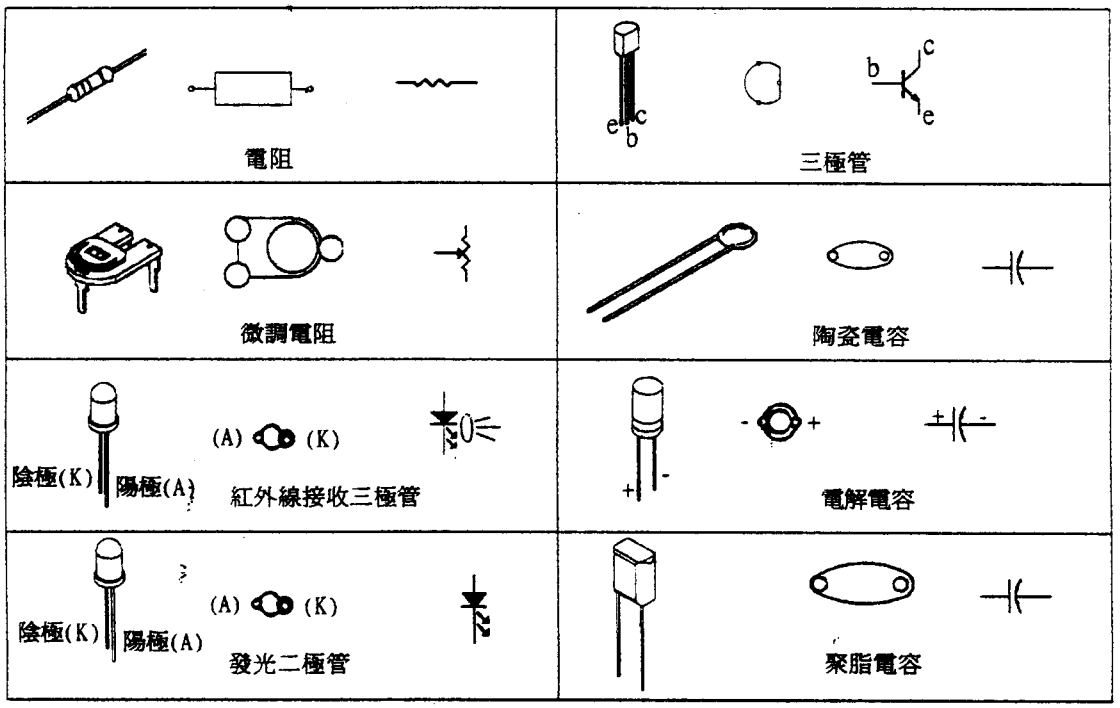
然使 Q2 維持截止，直至 C5 經 R5 充電至+0.7 時，才重新導通，而這延遲導通的時間是由 R5 及 C5 決定的，當 Q2 重新導電時，集電極電壓接近飽和，所以 Q3 及 Q4 截止，馬達停轉，直至 D1 重接到光照射爲止。只要改變 R5 及 C5 的數值，即可更改延遲時間的長短。

電容器 C1 及 C7 是作爲電路的退交連用，當電路導通時，D2 即發亮作爲顯示。

圖一：電路工作原理圖



圖二　：元件的識別(元件的原理圖符號及 PCB 板上圖形符號的說明)



製　作

焊接方法:

要有一個操作良好的成品，基本重點是要有良好的焊接點。以下的秘訣能幫助您掌握更好的焊接技巧。

1. 建議使用 25-30 瓦特的烙鐵。烙鐵瓦數不能太高，瓦數太高，烙鐵過熱，容易損壞元件。
2. 烙鐵頭保持清潔。需經常清理烙鐵頭上的氧化層，然後重新塗上焊油，並上錫，從而延長烙鐵的使用壽命。
3. 使用松香芯的焊條。酸芯焊條容易腐蝕元件腳，從而進一步影響到線路板連線的質量，應避免使用。
4. 在焊接時，焊錫量適中。讓溶化的焊錫流入連接處，使焊接點形成光滑的焊點。焊接時間不能過長，一般控制在 3-4 秒之內。
5. 焊接時要確保焊點之間沒有短路，否則通電時會出現故障，甚至徹底損壞元件。

注意：在剪切元件腳時，請拿穩被剪元件腳，以免剪斷時彈出傷及眼睛。

線路板元件安裝：

按照印刷線路板(PCB)上的指示及元件表，安裝所有的元件。元件全部放在線路板的正面，就是未敷銅箔面(如圖三、如圖五)。把元件腳插入正確的孔內，並壓平在線路板面上，稍稍彎曲露出底部的元件腳，使之不易脫落。焊錫後，剪去元件腳的多餘部分(如圖六)。

按照下列次序安裝元件和根據安裝圖用彩筆劃去已安裝的元件：

(1)電阻。
(2)電容(請注意電容有正負極性之分)。
(3)三極管(請注意管腳排列方向)。
(4)500K 微調電阻。
(5)發光二極管、　紅外線接收三極管(請注意極性)
(6)其它電器元件的連接線的連接(請注意電源的正極、負極)。

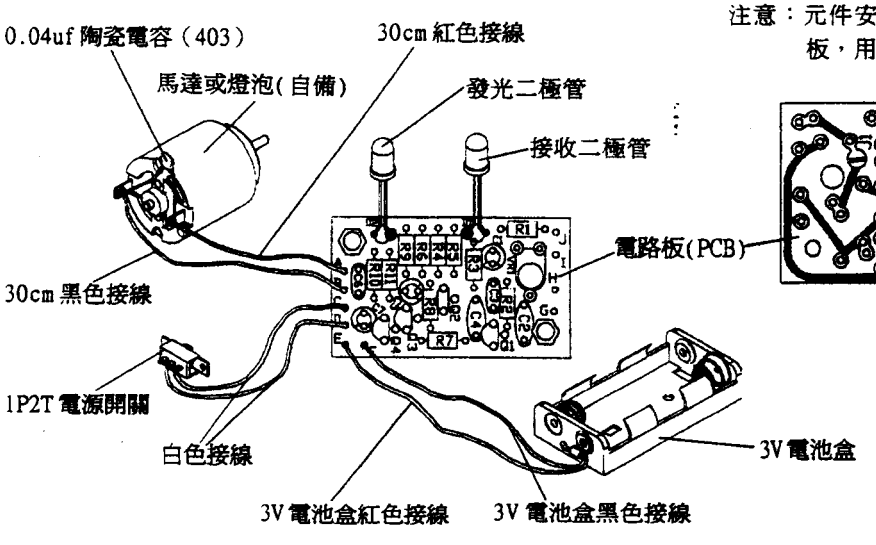
完成所有元件的插入和焊接時，從頭到尾檢查元件的位置，數值和元件表的數值是否一致。

安裝

發光二極管D2可以裝在電路板上或用軟導線定位在玩具裡面。用雙面膠貼把1P2T滑動開關、3V電池盒、貼在玩具裡面，所以無需鑽孔。

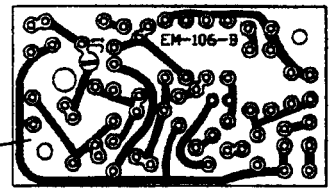
根據下列各圖示可幫助你完成電路板的連線。

圖三　：電路板(PCB)正面(插件面)



圖四　：電路板(PCB)反面(焊接面)

注意：元件安裝時要盡量貼近電路板，用剪出元件腳作跳線。



圖五　：元件的插裝事項

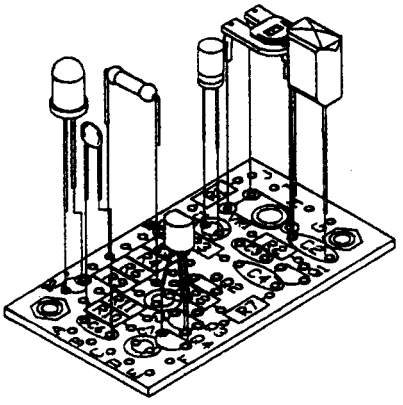
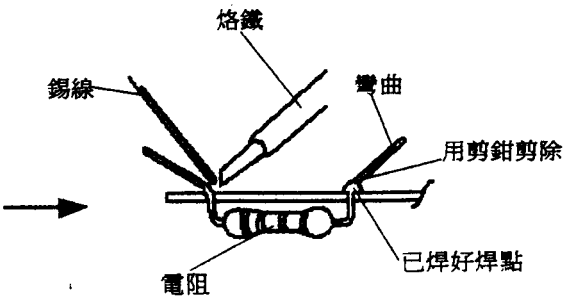


圖　六：元件的焊接事項



操作

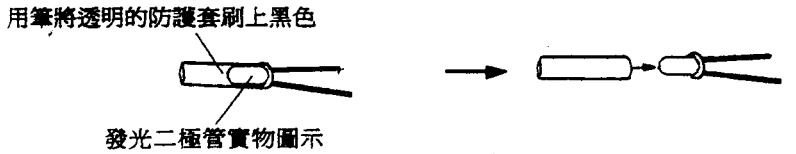
1. 如果你要用模塊來控制馬達，應在馬達接到模塊之前用 AA 電池先測定馬達轉動正常後，方才接到模塊上。
2. 要特別注意核對電源接線接到電路板上時的極性。
3. 將開關推到 "OFF" 位置，然後裝上兩顆新的電池到電池盒(最好用鹼性電池)，並將 VR1 作順時針方向旋轉 3/4 的位置。
4. 當開關推到 "ON" 位置時馬達即轉動數秒鐘，使用時避免強光直射入紅外線接收三極管(可使用光罩)，直射光線因飽和三極管可引至對輕微光線變動的靈度減低，距離紅外線接收三極管約3米左右，用手電筒照射三極管時馬達立即轉動，馬達約轉數秒鐘後即停止，到光線再照射時才重新轉動，調較 R5 到 330K，可延長轉動時間。
5. 如果需要更高靈敏度時可將VR1作順時針方向轉到最大位置，如靈敏度太高產生錯誤動作時可反向調 VR1 至適當位置。
6. 如果你要用這模塊作光電打靶用途，除了你可在輸出端接上馬達或燈泡，你亦可連接一個3V 聲音模塊，來顯示被擊中時發聲用。

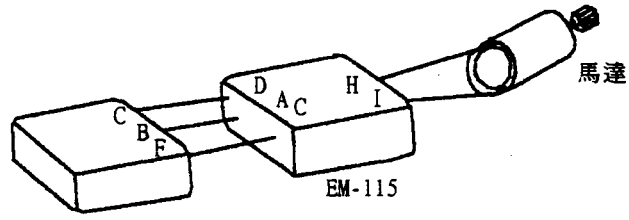
電路不工作時

如接收器操作有問題，應先核對元件方向及數值是否正確，焊點是否有虛焊、短路、缺錫等現象。

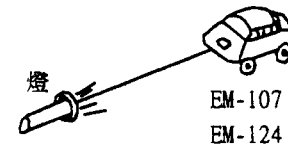
以下是應用部份圖示：

紅外線接收三極管實物應用圖示



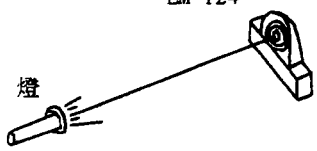


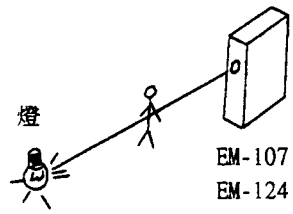
EM-106
EM-107
EM-108
EM-112
接收模塊



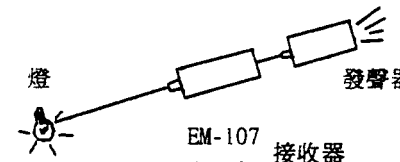
EM-107
EM-124
接收器

EM-107
EM-124
接收器



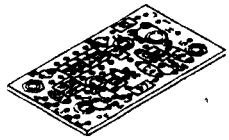


EM-107
EM-124
接收器



EM-107
EM-124
接收器

主要元件



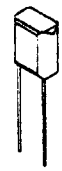
電路板(PCB)

電阻

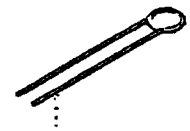
500K 微調電阻

9013 三極管(NPN)
9014 三極管(NPN)

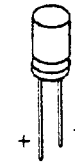
發光二極管
紅外線接收三極管



聚脂電容

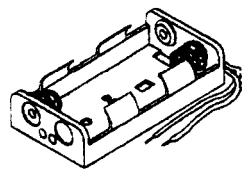


陶瓷電容



電解電容

1P2T 電源開關



3V 電池盒

30cm 紅色接線
30cm 黑色電線
30cm 白色接線

2x6KM 螺絲

2x10mmPM 螺絲

2mm 六角螺母

膠介子(EM)

EM-107 光接收器(有計時器)元件表

序號	數量	名稱	說明
1	1塊	EM-106-B	電路板(PCB)
2	2個	R4、R9	330Ω電阻 1/4W 5%(橙、橙、棕)
3	1個	R11	470Ω電阻 1/4W 5%(黃、紫、棕)
4	2個	R1、R8	3.3K電阻 1/4W 5%(橙、橙、紅)
5	4個	R3、R6、R7、R10	10K電阻 1/4W 5%(棕、黑、橙)
6	1個	R5	180K電阻 1/4W 5%(棕、灰、黃)
7	1個	R2	1M電阻 1/4W 5%(棕、黑、綠)
8	1個	VR1	500K微調電阻
9	3個	Q1、Q2、Q3	9014三極管(NPN)
10	2個	Q4	9013三極管(NPN)
11	1個	D1	紅外線接收三極管
12	1個	D2	發光二極管
13	2個	C2、C4	0.1uf聚脂電容（104）
14	1個	C3	0.001uf陶瓷電容（102）
15	1個	C6	0.04uf陶瓷電容（403）
16	3個	C1、C5、C7	100uf電解電容（16V）
17	1個	S1	1P2T電源開關
18	1個	BT	3V電池盒
19	1條		30cm紅色電線
20	1條		30cm黑色電線
21	1條		30cm白色電線
22	2個		2x6KM螺絲
23	2個		2x10PM螺絲
24	2個		2mm六角螺母
25	2個		膠介子(EM)
26	1個		說明書

德利發科普小精靈

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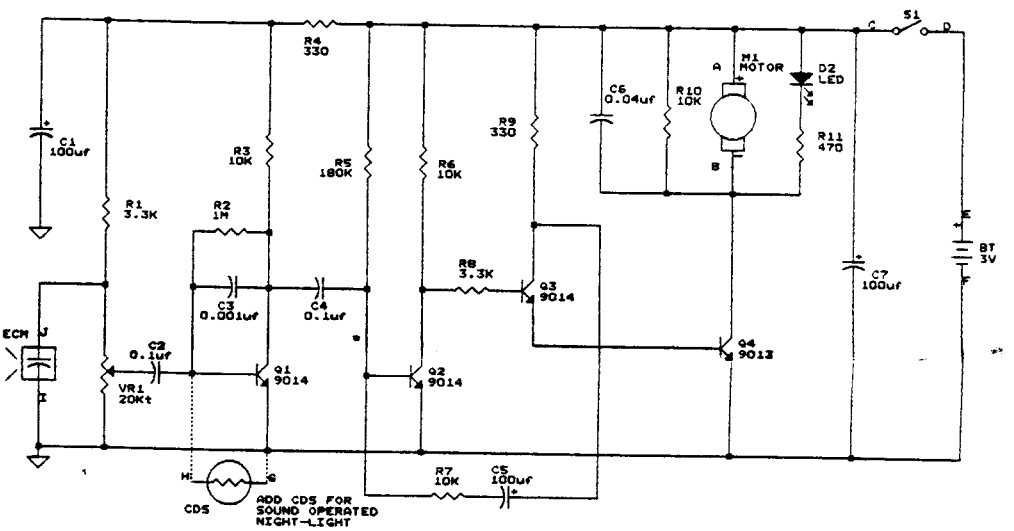
德利發科普教育活動中心電話 / 電傳：(0765) 7832612　郵政編碼：528308
網址：http://www.telefact.com.cn/　Email:support@telefact.com.cn

Introduction

Applying sound waves for remote control of electronic toys are quite common to-day.

Sound waves of clapping hands are picked up by a microphone and amplified by electronic circuits. Its output will turn on a toy motor, a lamp or sound maker, etc., for 15 to 30 sec and then shut off and wait for another command. When install this module in your electric toy, it can make your toy runs more lively and fun to play with.

Module measures only 2.1" x 1.2" x 0.5", easy to be installed in any toy. Its output can drive a 3V, 0.5A lamp or toy motor up to 0.5A. It uses two AA cells (3V) (not included). All parts included.



Circuit Description

In the normal state while no sound is detected, transistor Q1 is slightly forward biased by R2 to form a class A amplifier. Its frequency response is limited by C3.

Transistor Q2 is forward biased by R5 and so its collector is at low voltage (saturation), cutting off Q3 and Q4, so the motor is not running.

When any sound come from clapping hands or voice command picks up by the electret microphone (ECM). Its level is selected by VR1 and is fed to Q1 via. C2 for amplification. The positive cycle of input signal at Q1 base will further turn on Q1 driving Q1 collector to saturation. While Q1 collector is at saturation, charge on C4 reverse biases Q2 base turning Q2 off. Now Q2 collector is switched to high voltage (cutoff) which turns on Q3 and Q4, so the motor starts to run.

At the collector of Q3 a positive feedback network consists of R7 and C5, connects between Q3 collector and Q2 base. Normally, C5 is charged close to the supply voltage. When the Q3 collector is at low voltage, the charge in C5 reverse biases the base of Q2, cutting it off further. As the incoming positive cycle

signal disappears Q2 is still held off by the charge C5 (reverse bias). As C5 charges up by the current through R5 (with time constant C5 x R5), when its voltage reaches the base turn on voltage (approx. +0.6V), Q2 is turned on. Now with transistor Q2 collector goes low again it turns off Q3 and Q4, and so the motor stops. The circuit will return to its normal state and is ready to detect further sounds.

If longer or shorter turn on time is required, resistor R5 can be changed to 68Kohm for shorter time and 330 Kohm for longer time.

Capacitor C1 and C7 are used to filter out the supply line noises so that the circuit can work properly. The turn on of the controller is also indicated visually by a light emitting diode (Led) D2.

This controller can also be used to turn on a 3V, 0.5A lamp as well as a motor when sound is detected.

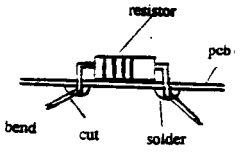
Building the E.M. Module

Soldering tips

Good solder joints are essential for the success of building a working Kit. The following simple rules can help you make good solder joints.

* Use soldering iron of 25 to 30 watt ratings are recommended. Soldering iron of to high a wattage can over heat and damage components easily.
* Keep the tip of the soldering iron clean by wiping off oxide and flux built around the tip by using a damp sponge or cloth.
* Use (60:40 Tin-Lead alloy) rosin core solder only, acid core solder will corrode component leads and circuit traces later.
* When soldering, apply just enough solder. When melt, it will flow around the connections to form a smooth, neat joint. Do not over heat the component by limiting the soldering time to less than 3 to 4 seconds.
* When soldering, make sure there is no bridging of solder from one point to the other which forms a short circuit that may cause **malfunction or permanent damage to the Kit.**

CAUTION: Hold the component leads while cutting them, free flying leads may cause eye injury.



Circuit Board Components Installations

Place components at locations as screened on the PCB use Parts List for values and insert components leads in the correct holes. Install the components on the side of the board with no circuit traces. Press it against the board, and bend the leads outward slightly so it cannot come off. Solder the component in place and cutoff the excess lead length.

Insert the component in the following sequences and mark off the component shown on drawing with a color pen after being inserted.

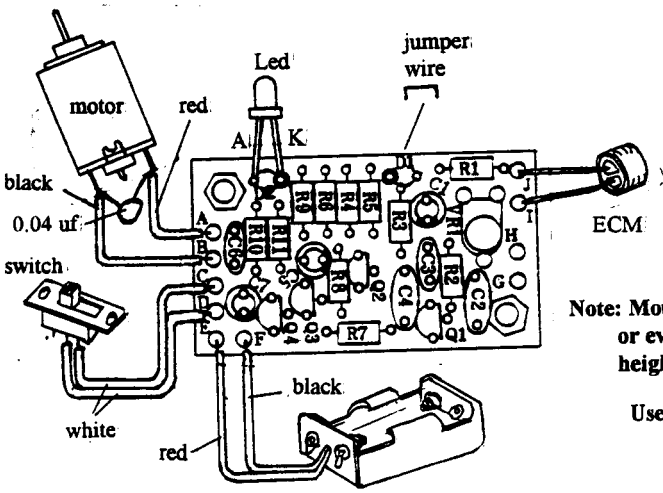
1. All Resistors.
2. All Capacitors. (Some capacitors have + or - polarity indications, so watch out.)
3. All Semiconductors. (Watch for polarities, or orientations.)
4. Inductors and Coils. (Watch for orientations.)
5. Misc. Components and Hardwares (Watch for orientations.)

After finishing all component insertions and soldering, check over the component number for its value one by one in the Part List for correctness.

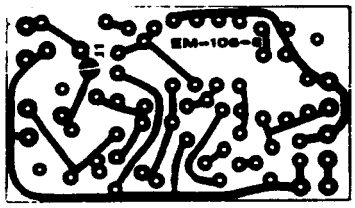
Installation

Led D2 and ECM can be board mounted or soft wired to a particular location in a toy. Switch S1 and battery holder can be replaced by the existing units installed in the toys or models. Try to use double sided tapes for mounting PCB to a toy so drilling of holes is not required.

Wiring up the board to the outside world with the help of the following diagram.



* Note.
D1 replaced by bare jumper wire.



Note: Mount all components as close to pcb as possible, or even lie down the taller components, to reduce height.

Use cutoff leads as bare jumper wires.

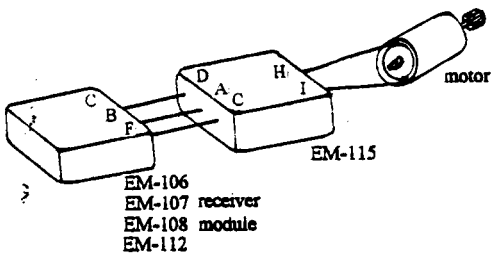
Operation

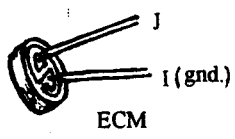
1. If a motor is used in the control module, first make sure that the motor runs properly with 1.5 volt supply (single cell) before connecting it to the module.
2. Check for correct wirings, especially the polarities of battery leads to the PCB.
3. Slide switch to "off" position, install two fresh alkaline AA batteries in the holder and set VR1 to 3/4 of its fully clockwise rotation.
4. Slide switch to "on" position and the motor will run for a while and then stops. Now clapping your hands and the motor should immediately start to run. The motor runs for about 15 seconds and then stops until another command is received. This running time can be extended by increases the resistance value of R5 to 330 Kohm.
5. If more sensitivity is needed adjust VR1 to its fully clockwise rotation. If sensitivity is set too high erratic operations may take place, it can be cured by turning down VR1 to reduce sensitivity.

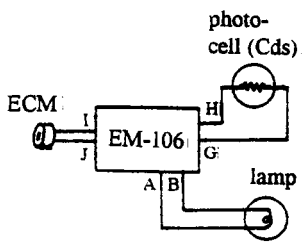
In Case of Trouble

Always check for joints with missing solder, cold solder, bridging solder, the correct orientations of multi-leaded components, correct parts and values, etc.

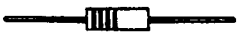
Applications







Night-light



resistor

semi-fixed resistor

led

Cathode (K)

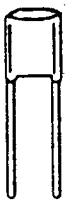
anode (A)

transistor

NPN
9013
9014

PNP
9012
9015

e b c

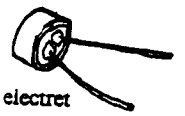


mylar capacitor

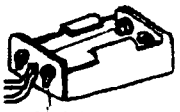
ceramic capacitor

electrolytic capacitor

switch



electret mic.



2 (AA) cells battery holder

screw

nut

plastic spacer

wire

SOUND OPERATED CONTROL ELECTRONIC FOR MODELLING 106
Bill Of Materials

Revised: October 27, 1994
Revision: 1.0
May 13, 1994 16:33:51

Item	Quantity	Reference	Part Description
1	2	R4,R9	330 ohm resistor 1/4 watt 5% (orange-orange-brown)
2	1	R11	470 ohm resistor 1/4 watt 5% (yellow-violet-brown)
3	2	R1,R8	3.3K ohm resistor 1/4 watt 5% (orange-orange-red)
4	4	R3,R6,R7,R10	10K ohm resistor 1/4 watt 5% (brown-blk-orange)
5	1	R5	180K ohm resistor 1/4 watt 5% (brown-grey-yellow)
6	1	R2	1M ohm resistor 1/4 watt 5% (brown-blk-green)
7	1	VR1	20K ohm semi-fixed resistor 10mm
8	1	D2	led lamp 3mm
9	1	Q4	9013 transistor (NPN)
10	3	Q1,Q2,Q3	9014 transistor (NPN)
11	2	C2,C4	0.1 (104) uf mylar capacitor 50V +/-10%
12	1	C3	0.001 (102) uf ceramic capacitor 25V
13	1	C6	0.04 (403) uf ceramic capacitor 25V
14	3	C1,C5,C7	100uf electrolytic capacitor 16V
15	1	S1	SS1204RG6 slide switch 1P2T(M)
16	1	ECM	electret microphone
17	1	BT	3V battery case
18	2		2x6 KM screw
19	2		2x10 PM screw
20	2		2mm hex. nut
21	1		12" insulated wire (red)
22	1		12" insulated wire (black)
23	1		12" insulated wire (white)
24	1		printed circuit board
25	2		plastic spacer (for EM)
26	1		user manual

Enterprises, Inc. San Diego, California.