QUASAR KIT No 1026

RUNNING LIGHTS

General Description

This is a very interesting light effect with 12 LED's. It lights the LED's in sequence so that they give the impression that they are chasing each other. The circuit has also been designed in such a way that by simply adding 3 TRIAC's to the P.C. board it is possible to drive 220 V filament lamps which reproduce the effect of the LED's in a larger scale. The speed of rotation and its direction can be changed. The power handling capability of the circuit when it is used with lamps is 800 Watts per channel, 2400 Watts in total which is more than enough for most professional applications.

Technical Specifications - Characteristics

Working voltage: 9-15V DC
Max. current: 100 mA
Max. output power:3 X 800Watts

How it Works

The circuit consists of six PNP transistors. Three of them operate as switches (TR2,4 and 6) and the other three are used as DRIVERS for the LED's. The three transistors TR2,4 and 6 form the circuit which creates the effect of rotation. They are connected in three identical circuits and the base of each one of them is connected to the collector of the next through an electrolytic capacitor. The bases of the last transistor in the chain (TR6) is connected through C4 to the collector of TR2. The result of this connection is that as the capacitor which connects two transistors together becomes charged it turns the next transistor ON which in turn drives its corresponding driver which lights its respective LED's.
The LED's will stay ON for as long as the capacitor which connects the collector of the transistor which drives their respective driver is charging. When this capacitor becomes fully charged the balance of the circuit is tipped towards the next transistor pair, the first LED's extinguish and the next ones light up for the cycle to repeat itself.
It is quite obvious that replacing the capacitors C2,3 and 4 with others of higher values will make the LED's to stay on for a longer time every time their turn comes, because the charging times will be longer for larger capacitors.
The speed of rotation is controlled by means of the trimmer VR1 which controls the bias of the three switching transistors TR2,4 and 6 together with the resistors R1,3 and 5 and at the same time controls the negative bias of the bases of the driver transistors TR1,3 and 5 together with the resistors R2,4 and 6 which also double as bleeding resistors for the capacitors C2,3 and 4 while the corresponding transistor is ON.
The electrolytic C1 helps in starting the circuit by keeping correctly biased the base of the first transistor in order to start the process.

Construction

First of all let us consider a few basics in building electronic circuits on a printed circuit board. The board is made of a thin insulating material clad with a thin layer of conductive copper that is shaped in such a way as to form the necessary conductors between the various components of the circuit. The use of a properly designed printed circuit board is very desirable as it speeds construction up considerably and reduces the possibility of making errors. Quasar Kit boards also come pre-drilled and with the outline of the components and their identification printed on the component side to make construction easier. To protect the board during storage from oxidation and assure it gets to you in perfect condition the copper is tinned during manufacturing and covered with a special varnish that protects it from getting oxidised and also makes soldering easier.

Soldering the components to the board is the only way to build your circuit and from the way you do it depends greatly your success or failure. This work is not very difficult and if you stick to a few rules you should have no problems. The soldering iron that you use must be light and its power should not exceed the 25 Watts. The tip should be fine and must be kept clean at all times. For this purpose come very handy specially made sponges that are kept wet and from time to time you can wipe the hot tip on them to remove all the residues that tend to accumulate on it.

DO NOT file or sandpaper a dirty or worn out tip. If the tip cannot be cleaned, replace it.

There are many different types of solder in the market and you should choose a good quality one that contains the necessary flux in its core, to assure a perfect joint every time.

DO NOT use soldering flux apart from that which is already included in your solder. Too much flux can cause many problems and is one of the main causes of circuit malfunction. If nevertheless you have to use extra flux, as it is the case when you have to tin copper wires, clean it very thoroughly after you finish your work.

In order to solder a component correctly you should do the following:

- Clean the component leads with a small piece of emery paper.
- Bend them at the correct distance from the component's body and insert the component in its place on the board.
- You may find sometimes a component with heavier gauge leads than usual, that are too thick to enter in the holes of the p.c. board. In this case use a mini drill to enlarge the holes slightly. Do not make the holes too large as this is going to make soldering difficult afterwards.
- Take the hot iron and place its tip on the component lead while holding he end of the solder wire at the point where the lead emerges from the board. The iron tip must touch the lead slightly above the p.c. board.
- When the solder starts to melt and flow wait till it covers evenly the area around the hole and the flux boils and gets out from underneath the solder. The whole operation should not take more than 5 seconds. Remove the iron and allow the solder to cool naturally without blowing on it or moving the component. If everything was done properly the surface of the joint must have a bright metallic finish and its edges should be smoothly ended on the component lead and the board track. If the solder looks dull, cracked, or has the shape of a blob then you have made a dry joint and you should remove the solder (with a pump, or a solder wick) and redo it.
- Take care not to overheat the tracks as it is very easy to lift them from the board and break them.
- When you are soldering a sensitive component it is good practice to hold the lead from the

component side of the board with a pair of long-nose pliers to divert any heat that could possibly damage the component.
- Make sure that you do not use more solder than it is necessary as you are running the risk of short-circuiting adjacent tracks on the board, especially if they are very close together.
- When you finish your work cut off the excess of the component leads and clean the board thoroughly with a suitable solvent to remove all flux residues that may still remain on it.

The construction of this project is very simple, as all the components are clearly marked on the printed circuit board and they are not placed very close together which should make construction a child's play even for the most inexperienced. Solder first of all the pins which will be used for all the external connections to and from the circuit, make the three jumper connections unless you wish to use the change-over switch S1 to change the direction of rotation of the lights. In that case use pins at points A,B,E and F and only make the connection between points C and D. (The switch can be connected later as you will most probably wish to place it somewhere in the front panel of the case that will eventually house your project.
Solder in place the resistors, the trimmer, the capacitors making sure that they are inserted correctly with respect to their polarity and finally solder in their places the transistors and the LED's making sure that you insert them correctly and that they are not overheated during soldering. Connect the switch with the rest of the circuit with wires sufficiently long to allow proper placing of the switch in its selected place on the front panel of the case. For the wiring of the switch follow the diagram provided next to the main circuit diagram of the light chaser.
The power supply which can be anything between 7 and 15 VDC is connected across points 1 (+) and 10 (-) of the circuit.
Inspect the board carefully and connect the battery or the DC supply to the circuit. The LED's should start flashing in a pattern that gives the impression that the lights are rotating. Turning the trimmer VR1 should change the speed of rotation of the lights. (For more resistance slower rotation).
If you are not going to use the 220 V option the resistors which are used to drive the TRIAC's (R7,8 & 9) are not necessary.
Please note that the TRIAC's are not included in the KIT and if you wish to include them you should ask your retailer for three BT136-600(4A, 600V) or equivalent TRIAC's which should be soldered in their assigned places on the printed circuit. In this case the loads are connected across points 4-5, 6-7, and 8-9 and the mains is connected at points 2 and 3 of the printed circuit. These TRIAC's are capable of driving loads of up to 800 Watts each which means that the circuit can handle up to 2,400 W in total when it is fully loaded. Please do not forget to use suitable heatsinks on the TRIAC's if you are planning to use the circuit with such heavy loads for prolonged periods. Make all the testing with battery power and only if you are satisfied with the results connect the circuit to the mains. (The battery or a suitable DC supply will still be necessary as there is no provision on the P.C. board for drawing power directly from the mains for the low voltage section.
Please consider the whole circuit as if it were at mains potential while it is connected to 220 V to avoid any serious and possibly fatal accidents.

Adjustments

This kit does not need any adjustments, if you follow the building instructions.

Warning

Quasar kits are sold as stand alone training kits.
If they are used as part of a larger assembly and any damage is caused, our company bears no responsibility.

While using electrical parts, handle power supply and equipment with great care, following safety standards as described by international specs and regulations.

CAUTION
This circuit works from the mains and there are 220 VAC present in some of its parts.
Voltages above 50 V are DANGEROUS and could even be LETHAL.
In order to avoid accidents that could be fatal to you or members of your family please observe the following rules:
- DO NOT work if you are tired or in a hurry, double check everything before connecting your circuit to the mains and be ready to disconnect it if something looks wrong.
- DO NOT touch any part of the circuit when it is under power.
- DO NOT leave mains leads exposed. All mains leads should be well insulated.
- DO NOT change the fuses with others of higher rating or replace them with wire or aluminium foil.
- DO NOT work with wet hands.
- If you are wearing a chain, necklace or anything that may be hanging and touch an exposed part of the circuit BE CAREFUL.
- ALWAYS USE a proper mains lead with the correct plug and earth your circuit properly.
- If the case of your project is made of metal make sure that it is properly earthed.
- If it is possible use a mains transformer with a 1:1 ratio to isolate your circuit from the mains.
- When you are testing a circuit that works off the mains wear shoes with rubber soles, stand on dry non conductive floor and keep one hand in your pocket or behind your back.

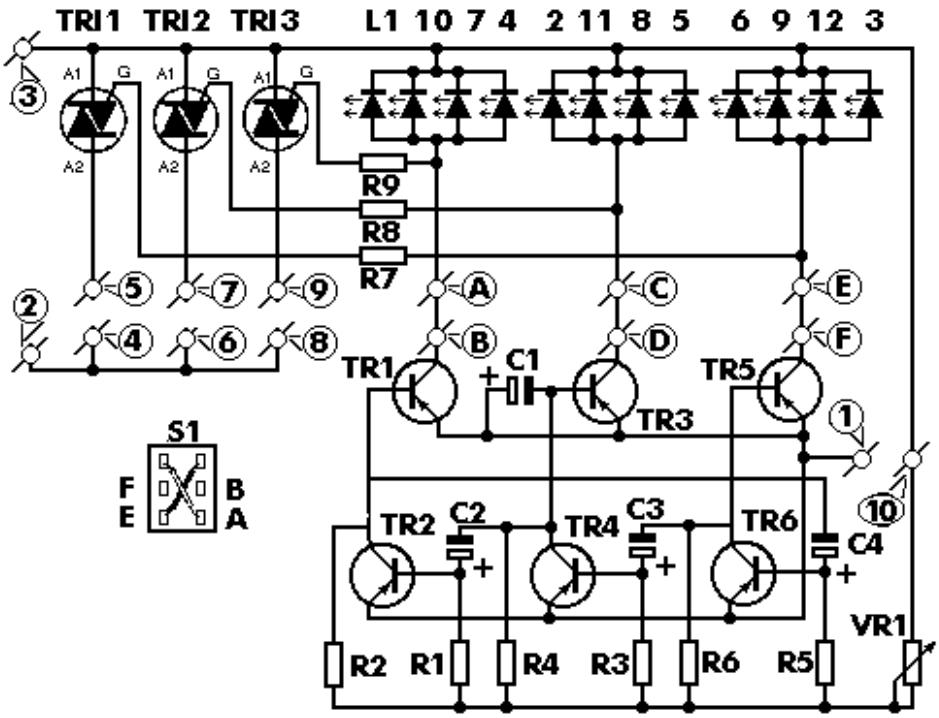
- If you take all the above precautions you are reducing the risks you are taking to a minimum and this way you are protecting yourself and those around you.
- A carefully built and well insulated device does not constitute any danger for its user.
BEWARE: ELECTRICITY CAN KILL IF YOU ARE NOT CAREFUL.

If it does not work

- Check your work for possible dry joints, bridges across adjacent tracks or soldering flux residues that usually cause problems.
- Check again all the external connections to and from the circuit to see if there is a mistake there.
- See that there are no components missing or inserted in the wrong places.
- Make sure that all the polarised components have been soldered the right way round.
- Make sure that the supply has the correct voltage and is connected the right way round to your circuit.
- Check your project for faulty or damaged components.
If your project still fails to work, please contact us for information about our Get-You-Going

service.

Schematic Diagram



Parts List

All components including printed circuit board, assembly instructions including schematics and detailed parts list are supplied when you purchase the kit.

Ordering

For pricing info and online ordering please visit:

http://www.quasarelectronics.com/1026.htm

For further info please contact us by e-mail:

mailto: sales@QuasarElectronics.com