QUASAR KIT No. 1117

TV PATTERN GENERATOR

General Description

A pattern generator is a very useful instrument for the correct alignment of the timing circuits of a television set. The circuit we propose you to build, is a «bar generator» that will produce horizontal and vertical stripes (bars) on the TV screen, that will help you align the vertical and horizontal scanning synchronisation circuits of the receiver.

Technical Specifications - Characteristics

Working voltage: ..... 9 VDC
Current drawn: ..... 2 mA
Operating Frequency: ..... 170 - 250 MHz (VHF)
Horizontal scan frequency: ... 16525 Hz
Vertical scan frequency: ..... 50 Hz
Output impedance: ..... 75 ohm

How it Works

The circuit can be divided in five different stages. Four astable multivibrators and the output stage which is built around the VHF oscillator.
The first astable consists of two NOR gates in U2 and the components R9, R15, D4, C8, and C10. The two NOR gates are used as inverters and together they form an astable multivibrator which oscillates at a frequency of 16525 Hz, which is the horizontal scan frequency of the TV, and can be fine-tuned by means of R15. The capacitor C10 is there to provide the necessary feedback to maintain the oscillations. The signal from the output of the oscillator is taken through C8 and R6 to the output stage and modulates it.
The other multivibrator built around the other two NOR gates in U2, together with R12, R14, D6 and C12 produces the necessary pulses for the vertical scanning frequency which is 50 Hz. This frequency is fed to the input of one of the AND gates in U1 (pin 1).
The multivibrator built around two of the NOR gates in U3 and the components R13, R17, C9 and D7 produces the pauses between pulses, which after being fed to the AND gates in U1 (pins 8, 9 and 10) which are connected as inverters are then also used to modulate the oscillator and appear on the TV screen as vertical stripes (bars).
Finally the last multivibrator which consists of the remaining two NOR gates in U3 together with the components R1, R11, R16, C7 and D5 produces the pulses which appear on the screen as horizontal lines.
All four multivibrators are based on the same operating principle. They are elementary oscillators using NOR gates and a feed back element which is either a capacitor or a resistor (depending on the operating frequency) and all of them incorporate a trimmer to permit slight adjustments to their operating frequency.
The output signals from the three inverters in U1 are taken through D3, R7 and D2 to the VHF oscillator. This is a common base circuit which has a low input resistance and

relatively high voltage amplification. The output frequency of the oscillator is determined by the coil which is formed by the copper track on the PCB and the variable capacitor L1. This frequency is between 170 and 250 MHz and can be adjusted by the trimmer L1.
The resistors R1 and R2 form a potential divider which controls the modulation level of the output oscillator and the trimmer R3 controls the contrast of the pattern against the back ground.
Finally the transistor Q2 and its associated circuit (R2 and D1) form a voltage stabiliser for the circuit. The trimmers R14, and R15 control the vertical and horizontal scan frequencies respectively so that the image becomes steady and the squares on the screen appear perfect. The trimmers R16 and R17 set the number of the horizontal and vertical bars respectively.

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 the 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 leave 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.

To build the pattern generator solder first of all the IC sockets on the P.C. board taking care to insert them correctly and then make the jumper connections and solder the pins for the external connections. Continue with the resistors and the capacitors, again making sure that the electrolytic are inserted the right way round, and finally solder in place the diodes and the transistors, taking care to avoid overheating them with the soldering iron. Place the trimmers and the variable capacitor in their places and solder the battery clip's leads across the points marked (+) and (-), pins 4 and 1 respectively.
At this point make a very careful inspection of your work and if you are sure that everything is OK take the IC's from their aluminium wrap, which is there to protect their delicate circuits from static discharges and insert them very carefully in their sockets. Be especially careful in the process, to avoid touching the pins with your hands and also to avoid bending them between the IC's and the sockets.
To get the best performance from your generator it is highly recommended to enclose it in a metal case which will shield all stray radiation that could possibly cause trouble in use. (If you use a metal case the shielding of the output cable should be connected to the case by means of a 5 or 10 pF ceramic capacitor). The generator can be connected to the TV set under test either directly using a piece of coaxial cable connected between the points 3 (signal) and 2 (earth) of the circuit and the VHF antenna input of the receiver, or if the receiver is sensitive enough and the instrument is not very far the connection by cable may not be necessary because the transmitter section of the generator is quite powerful.

Adjustments

- Connect the output of the generator by means of a coaxial cable with the input of your TV receiver.
- Turn the receiver on and select a VHF channel (say ch. 5).
- Set R3 in the middle of its travel.
- Using a plastic tuning screwdriver adjust L1 till you get an image on the TV screen even if it is distorted.
- Adjust R14 till the vertical stripes become more defined.
- Adjust R15 so that the horizontal stripes appear on the screen.
- By adjusting R16 and R17 select the number of horizontal and vertical stripes that will be

displayed on the screen.
- Re-adjust R14 to make the horizontal stripes completely steady.
- Finally touch again R14, R15, R16, and R17 to get the best possible image definition and set the image contrast by means of the trimmer R3.

Warning

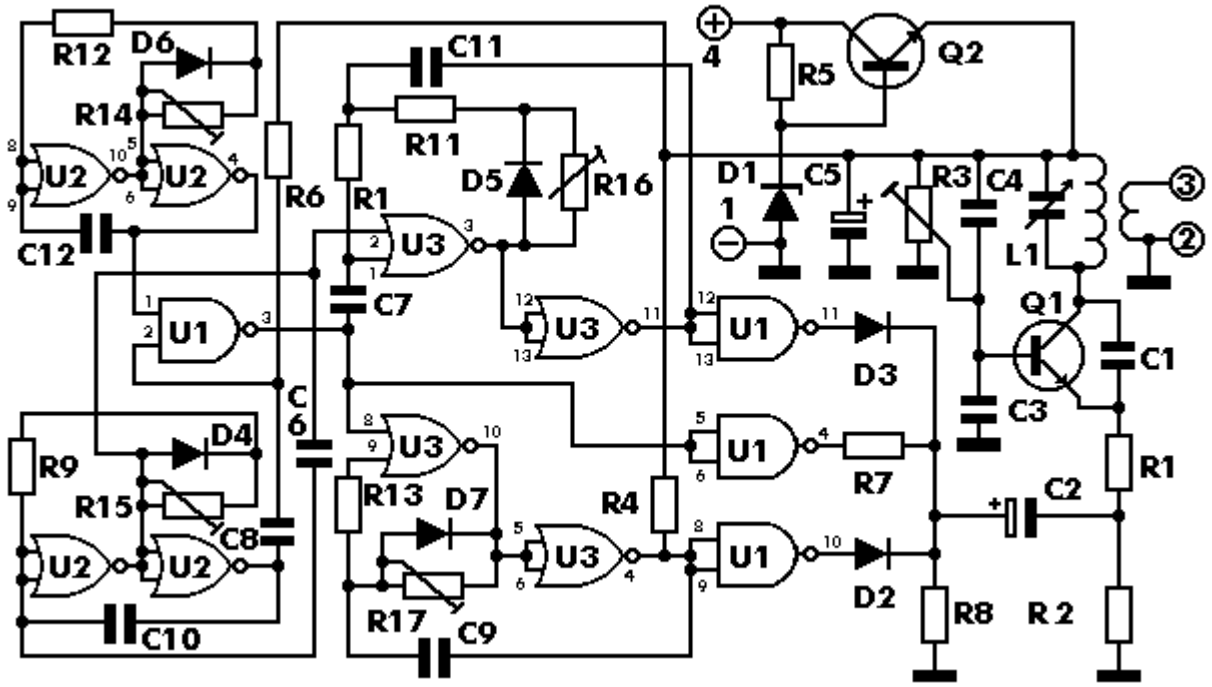
QUASAR kits are sold as stand alone training kits.
If they are used as part of a larger assembly and any damage is caused, our company bears no responsibility.

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

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 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/1117.htm

For further info please contact us by e-mail:

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