

## QUASAR KIT No. 1013 VHF-FM-TV RECEIVER

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### General Description

This project is a relatively easy to build regenerative receiver. This type of receiver is very well known for its very high sensitivity. This particular design can cover the frequency range from 50 to 150 MHz by simply changing the tuning coil used. It is a very interesting project as it will let you hear apart from the commercial FM and TV broadcasts, aircraft to base conversations and also other special services (MARINE, COAST GUARD, POLICE etc.) that use the bands covered by the receiver as well as the radio amateurs in 144 MHz.

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### Technical Specifications - Characteristics

Working voltage: 12V DC  
Max. current: 500 mA  
Max. output power: 5 Watts  
Receiving frequency: 50-160MHz

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### How it Works

The circuit is very straightforward. Transistor TR1 is used as a simple regenerative receiver the receiving frequency of which is determined by the coil L1 and the internal capacitance of the VARICAP diodes D1 & D2. The VARICAP diode is a special diode which has a variable internal capacitance that varies according to the voltage across the device. The voltage across D1,2 is determined by the setting of the potentiometer R2 which is used therefore for tuning the receiver into the desired frequencies. The amount of feedback is adjustable by means of the trimmer VR1 which should be set for maximum sound clarity. The coil used in each occasion determines the frequency range that the receiver will be capable of tuning into and it must be wound of 1 mm enamelled copper wire with a former diameter of 1 cm and having 1 to 8 turns according to the frequency range you wish to receive. If for example you are interest in the 144 MHz amateur band the coil should have only one turn, for 115 MHz 2 turns, 3 turns for the 88-108 MHz FM band and 8 turns for the 60 MHz for TV1. The turn spacing of the coil should be 2 mm between turns. The other two coils used in the kit are there to block unwanted RF from getting into the power supply lines and the audio stages of the receiver.

From the output of receiver (emitter of TR1) the received signals are taken to the audio amplifier which consists of two transistors and an IC power amplifier. TR2 is used as a first amplification stage and through C9 the signal is taken to the volume potentiometer R10 and to the base of TR2 which further amplifies it to a level that will be sufficiently high to drive the output IC which is the TBA810S and can deliver up to 5 Watts in its output. The power supply should be capable of delivering 500 mA at least and its voltage should be between 9 and 15 VDC. If you wish to increase the sensitivity of the receiver you should use an external aerial

for the frequency range selected. For stronger signals a common telescopic antenna will be sufficient.

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## 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.

After you had finished 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 still remain on it.

The receiver has quite a few components and this calls for careful construction if you are to avoid frustrating mistakes. First of all solder the pins, the coils L2,3 and the socket for L1, (a crystal socket will do) if you are going to use one, in their places on the p.c. board. The use of a socket for L1 is advisable as it will facilitate coil changes during use. Identify the resistors and solder them one by one in their places on the board and when you finish do the same with the capacitors. Take care not to reverse any electrolytic as this will inevitably destroy them and the circuit will not work. Solder then very care fully the diodes and the transistors in their places and finally insert and solder very carefully the IC. The semiconductors are very sensitive to heat and should be soldered as quickly as possible to avoid overheating them with the soldering iron. The coils should be wound using the wire supplied in the kit using a cylinder having a diameter of 1 cm as a former and leaving a 2 mm space between adjacent turns. Form the ends of the coils in such a way that they fit in the socket easily without deforming the coil. The power supply should be connected at points 1 (+) and 2 (-) of the p.c. board and the loudspeaker at points 3 and 4. The antenna should be connected at points 5 (ant.) and 6 (ground) of the circuit. The two potentiometers can be either mounted on the PCB or if the case you are going to use does not permit it, you can use short, shielded cables to connect them to the board.

The first potentiometer R2 is used for tuning and R10 is the volume control. Make a very careful visual inspection of the circuit and if everything seems to be OK insert a coil in the L1 socket and connect the receiver to the power supply. Turn the volume control up and with R2 try to tune into a station. When you pick something up, tune the receiver for the best reception possible and then adjust VR1 for the best sound quality.

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## **Adjustments**

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

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## **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.

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## **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.

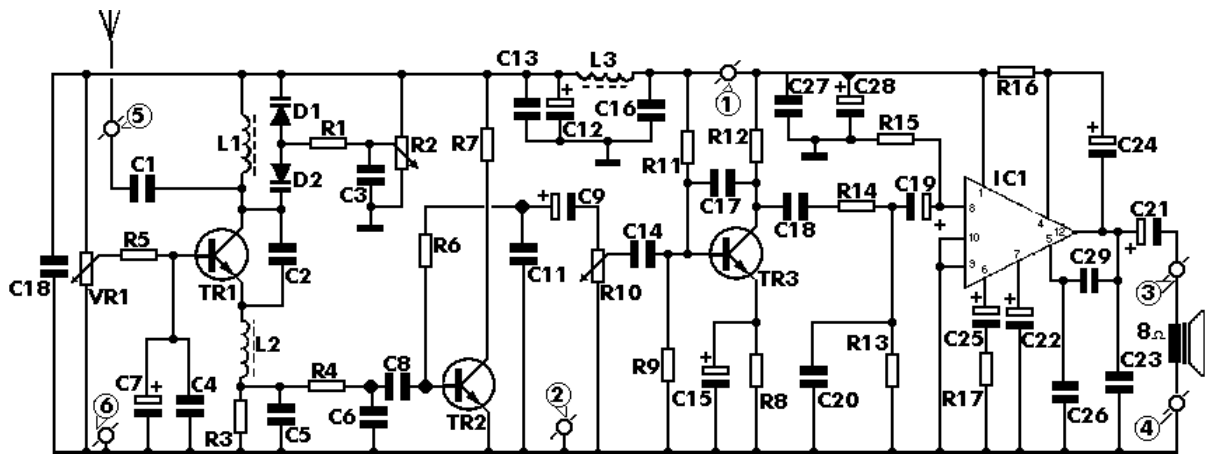
Make sure that the supply has the correct voltage and is connected the right way round to your circuit.

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.

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## Electronic Diagram



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## 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/1013.htm>

For further info please contact us by e-mail:

[mailto: sales@QuasarElectronics.com](mailto:sales@QuasarElectronics.com)

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