MEETINGS, NETS and SERVICES

Club Station: VK4WIS

Club Repeaters:

Maleny: VK4RSC on 146.850 MHz & 438.075 MHz.
Peregian Beach: VK4RMB on 146.825 MHz & 438.175 MHz.
Gympie: VK4RGY on 146.625 MHz & 438.825 MHz.
Bli Bli: VK4RSN on 53.700 MHz

General Meeting: Monthly on the first Tuesday at 7:30 pm in the Club House, old Toll Plaza building, 85 Godfreys Road, Bli Bli.
Visitors are welcome to attend.

Weekday Meeting: Weekly at 10:00 am on Wednesday.

Good Morning Net: Daily at 8.15 am at VK4RSC on 146.850 MHz.
Conducted by various club members.

Tech Net: Weekly at 8:30 pm Sunday at VK4RSC on 146.850 MHz.
Check in, raise topics and ask your technical questions.

80 m Net: Weekly at 7:30 pm Thursday on 3660 kHz.

10 m Net: Weekly at 8:15 pm Wednesday on 28.470 MHz.

6 m Net: Weekly at 7.30 pm Friday at VK4RSN on 53.700 MHz.

2 m Net: Weekly at 7:30 pm Sunday on 144.300 MHz SSB.
Conducted by club station VK4WIS.

QNEWS: Relayed Sunday at 9:00 am at VK4RSC on 146.850 MHz.
After the broadcast a callback is conducted by VK4WIS.

Internet: www.vk4wis.org
This website provides previous issues of Pelican Droppings in full colour in pdf format which can be downloaded.
The current issue can be had by subscribing to the email edition in pdf format. Apply to SCARC.

EchoLink: Available on VK4RSC 146.850 MHz.
The Internet station is VK4AKA-R and the node is #195107.

NEXT ISSUE

The travellers to the USA for the Dayton, Ohio hamfest will be back with stories on this major annual event in the amateur radio calendar.

SCARC Inc. Office Bearers AGM March 2007

President	Noel Des Jardins VK4NL
Vice-President	Harvey Wickes VK4AHW
Secretary	Gordon Taylor VK4VP
Treasurer	Keith Noll VK4AKA
Committee	Ray Stuart VK4YRS; Frank Winter VK4BLF; Mike Little VK4YFL; Richard Philp VK4YRP

Copy deadline: 3rd Tuesday of the month preceding GM issue.
Email editor: gcombes6@bigpond.com

Pelican Droppings

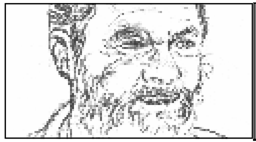
Newsletter of the Sunshine Coast Amateur Radio Club Inc.

Issue No.89 June-July 2007

Noel Des Jardins VK4NL President

INSIDE

Address: The Secretary, Sunshine Coast Amateur Radio Club Inc.
PO Box 7551, Sippy Downs, Qld. 4556



Presidential Preamble

At the outset I would like to say a big "thank you" to Ray VK4YRS, our immediate Past President. Ray did a great job in the hot seat for the last two years and I am sure I can call on him for help whenever I may it. I would also like to thank the members for their support and confidence and for voting me into the position of club President.

At my first business meeting I was very pleased to see such a good roll up, and to receive so many congratulations and offers of help from many members.

When I rocked up at the gate on my first Wednesday as President, I was overwhelmed to find Graham Milliken, Maroochy's Disaster Management Coordinator, there to welcome me to the team. It was good of him to make me feel so welcome. I look forward to continuing the close relationship our club has with Graham and his team.

The John Moyle Field day Contest loomed over the horizon, with initially Harvey VK4AHW and Gordon VK4VP lined up to get things organised. Then Murphy stepped in, and I ended up having to get things underway. I breathed a sigh of relief when Harvey was able to help out at the last minute. I also received lots of help from several other members, and I thank all those who helped make the weekend such a success. I owe a big thanks to Vin VK4FVCW and his team for getting the van in place up at Dulong and the antennas set up and operational. Our team of operators did well in setting up all bands over the full 24 hours. Well done to all those concerned. The logs have been written up and submitted. Many thanks to Geoff VK4KEL for his help on the computer. Now we wait for the results to be published.

Recently our willing workers removed the old Gympie repeater network for maintenance. Our thanks go to Jason VK4MIH for his tremendous effort in keeping communications flowing for those in the northern region with his privately-funded Mt. Corella 2 metre repeater on 147.975.

Our Noosa site is going ahead in leaps and bounds, thanks to Warwick VK4NW for all his ground work.

The Kirklea Campout weekend was, from all reports, a great time had by all. The weather was great, and so were the outdoor movies and the fellowship with other hams and their families.

Rally Queensland was well supported by our club members and my thanks go out to them for flying the flag on behalf of the club.

At our April general meeting it was my pleasure to welcome Ken and Pat Fuller to the meeting as our WIA President. Also new members Tony

ognised the huge importance of Newton's work and encouraged him to publish his work. He did this in "The Mathematical Principles of Natural Philosophy", now considered the most important scientific book ever written and without question the most important single work in physics.

Following publication of his book, he was totally worn out and he temporarily lost interest in science. In 1696 he was appointed Warden of the Mint in London, later becoming Master of the Mint where he made important financial reforms. In 1703 he was elected President of the Royal Society. In 1704 he published a great book on optics entitled "Opticks: a Treatise on the Reflexions, Refractions, Inflexions and Colours of Light". He was knighted in 1705, but continued with his duties at the Mint as well as doing much experimenting in the fields of chemistry and alchemy until his death in 1727.

Newton's discoveries were so important that they continued to guide physics for the next two centuries. They were essential in developing the understanding of electricity, magnetism and electrodynamics by Faraday, Maxwell and subsequent scientists. It was only Einstein who was able to advance thinking beyond the principles discovered by the great man over 300 years ago. End

---

Op amps (continued from page 13)

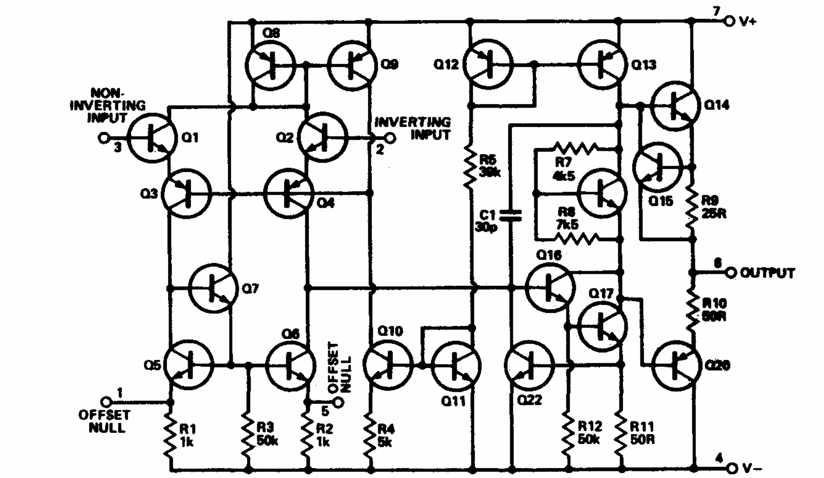


Fig. 2 Full circuit diagram of a 741 operational amplifier IC

Famous Personalities: Sir Isaac Newton

"The most prodigious human intellect in the history of mankind". Isaac Newton was born on Christmas Day, 1642 in a small stone farmhouse in the tiny hamlet of Woolsthorpe, Lincolnshire, England. He went to school in the nearby town of Grantham and later attended Cambridge University where his professors encouraged him to study mathematics and optics. He received his degree in 1665 and soon afterwards the university closed because of the bubonic plague sweeping through England.

Newton returned to the farm in Woolsthorpe and during the following 18 months there he developed his theories which were to revolutionise the world. While pondering on how the moon revolved around the earth, he was sitting near the apple tree in his garden and saw an apple drop to the ground. At that instant he realised that the force which pulled the apple downwards also pulled on the moon and it is the earth's pull which stops the moon from flying off into space. In order to study the subject, he had to invent a new branch of mathematics known as the differential and integral calculus. He then worked out the mathematical inverse square law which governs gravity and went on to develop the three laws of motion which govern how objects move:

1. A body at rest will remain at rest and a body in motion will remain in motion unless a force acts on it.
2. The acceleration of a body is directly proportional to the force producing the acceleration.
3. Every action has an equal and opposite reaction.

These principles seem obvious to us today, but in 1666 they provided a gigantic and revolutionary leap in understanding. It is indeed fortunate that Newton lived in England where free thinking was encouraged – only a few years earlier in Italy, Giordano Bruno had been burned at the stake by the Roman Catholic Church for showing that the earth was not the centre of the universe.

Newton returned to Cambridge in 1667 when it reopened and at the young age of 25 he was appointed to the most prestigious position of Lucasian Professor of Mathematics, the same post as is at present filled by Stephen Hawking. In 1684 he explained his discoveries on the motions of the planets to his friend Edmond Halley who rec-

Antenna erection at Lugana Lookout
From the left are Bernard VK4KAC, Richard VK4YRP and Keith VK4MBH

Technical stuff:

Antenna: Dual 2 m /70 cm co-linear vertical
Frequencies: 146.825/438.175 MHz latter with 93.5 Hz tone
Height ASL: 192 metres

VK4TFP and grandson Kyle. After the meeting Frank VK4BLF gave an interesting & informative talk on spectrum analysers and their function in detecting signals. Thanks to Geoff VK4KEL for standing in as secretary for the night.

Our thoughts were with Angus VK4KMC & wife Liz when their daughter and grand-daughter were involved in a serious car accident.

Our repeater sub-committee got the Lugana Lookout site ready on the day. Warwick VK4NW tackled all the paperwork, Richard VK4YRP displayed steeple-jacking skills in erecting antennas at pole top, Dave VK4UN manipulated his machinery and flagmen Keith VK4MBH and Bernie VK4KAC kept everyone safe. Keith VK4AKA spent many hours getting the technical matters up and running.

Cheers for now, Noel VK4NL

Filters

by Tony Thorrold VK4KKY

A filter is a circuit that will allow a certain range of frequencies to pass through it with little attenuation while greatly attenuating any other frequency. Traditional methods of construction used capacitors, inductors and/or resistors and many filters of this passive type are still found in modern equipment. (A passive circuit is one that does not need a source of power, as opposed to an active circuit which needs a power supply to work.) Modern circuits often use op amps and resistors to simulate inductors because, especially at lower frequencies, inductors can be very large. Other advantages of active filters are variable Q, variable centre or cutoff frequencies, easy tuning and lower cost while their disadvantages include limited dynamic range and, of course, the need for a power supply. Other types of filter are also available, e.g. crystal filters, surface acoustic wave filters, mechanical filters, etc, but these will not be dealt with in this article.

Filters can be divided into four types: low-pass, high-pass, band-pass and band-stop. The names accurately describe what each filter does, for instance a low-pass filter will allow frequencies below a certain figure, the “cutoff frequency”, to pass freely while attenuating frequencies above the cutoff frequency. The low frequencies can pass the filter.

Low-pass Filter

A well-known low-pass filter is that used in a traditional power supply. This often comprises a choke and a capacitor in an L-section as shown in Fig 1. The reactance of the inductor increases with frequency, while that of a capacitor decreases. Thus the higher frequencies are conducted to ground while low frequencies are conducted to

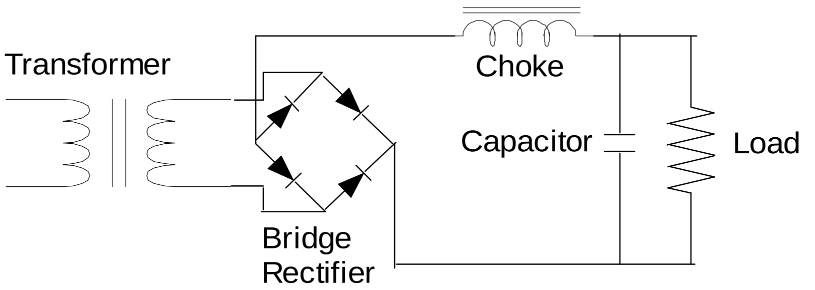


Fig 1 Low-pass passive filter

0V. The null offset terminals are used to correct this discrepancy if it is important to the circuit.

If the value of the feedback resistor is made to be 0 ohms, i.e. a piece of wire is used instead of a resistor, and no input resistor is used then the gain of the op amp will be 1. The voltage at the output will equal the voltage at the input and this circuit is called a voltage follower. It may seem odd to have an integrated circuit which appears to do the same job as a piece of wire could do, but remember that an op amp has a very high input resistance, so the current drawn from the input circuit will be very small. The op amp also has a low output resistance, so it can supply quite a high current to the following circuit. Here it has been used to stop the output circuit from influencing the input circuit and in this configuration it is called a buffer amplifier.

If two different signals are fed to the two inputs, the op amp will amplify the difference between the two signals. This is called a differential amplifier (see Fig.2 on page 15)

In summary, an op amp is a versatile general purpose amplifier with an extremely high gain, high input resistance and low output resistance and can be configured in many useful ways. End

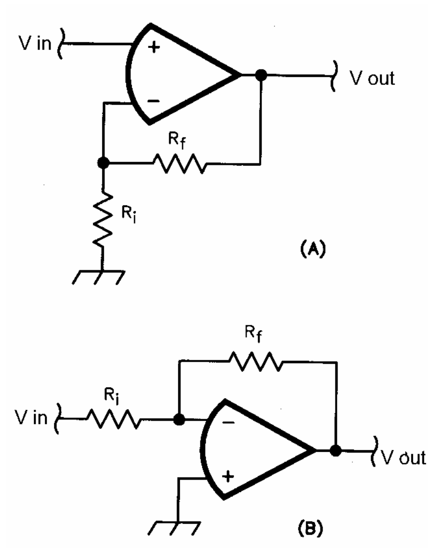


Fig.1 Non-inverting and inverting operational amplifiers

Operational Amplifiers

A Pe;lican Droppings Tech Review by Tony Thorrold VK4KKY

An operational amplifier, or op amp, is a very useful circuit building block, usually manufactured as a small integrated circuit. Instead of constructing your own amplifier using discrete transistors, resistors and capacitors, an op amp gives it to you ready-made in a convenient and inexpensive little IC.

An ideal op amp has infinite input impedance, zero output impedance and an infinite open loop voltage gain. Practical op amps come surprisingly close to these ideal parameters with input impedances in the millions of ohms and gains of 100 dB.

A typical op amp has three signal terminals – a non-inverting input (shown by a + sign on a drawing), an inverting input (shown by a – sign) and an output. For an AC signal, inversion means a 180° phase shift. In practical applications the gain of the amplifier is limited by using negative feedback from the output terminal back to the inverting input terminal.

Op amps can be used either as non-inverting amplifiers (Fig 1A) or inverting amplifiers (Fig 1B). The input resistor is R_i and the feedback resistor is R_f. The gain of each circuit is given by the expressions:

$$\frac{Vout}{Vin} = \frac{(Rf + Ri)}{Ri} \text{............Fig.1A}$$

$$\frac{Vout}{Vin} = \frac{Rf}{Ri} \text{................Fig.1B}$$

Where V_{in} is the input voltage to the non-inverting terminal
V_{out} is the output voltage

A widely used general-purpose op amp is type 741 and it is usually housed in an 8-pin DIL package – a tiny square box with two rows of four legs. In addition to the two inputs and the output, the 741 uses two pins for the power supply +ve and –ve and two other pins for null offset. The circuit of a 741 is shown in Fig 2 on page 15.

When the input voltage is 0V, the output should be 0V, but sometimes because of manufacturing tolerances the output is not exactly

the output. DC is allowed to pass while the 50 Hz or 100 Hz ripple from the rectifier is stopped. The capacitor provides most of the filtering action at low load currents and the choke will contribute more and more to the smoothing as the current increases.

Figs 2a and 2b show circuits for typical passive and active low-pass filters. All characteristics of the active filter (e.g. cutoff frequency, gain, etc.) can easily be changed merely by selecting appropriate values of resistors and capacitors. An ideal low-pass filter would allow all frequencies up to the cutoff frequency to pass unimpeded and would completely stop all frequencies above this. See Fig 3a. Unfortunately this ideal cannot be attained and in practice we get a roll off curve as seen in Fig 3b. The cutoff frequency is normally taken as the point where the strength of the signal is halved (-3dB).

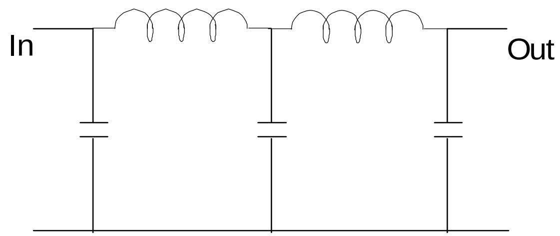


Fig 2a Passive low-pass filter

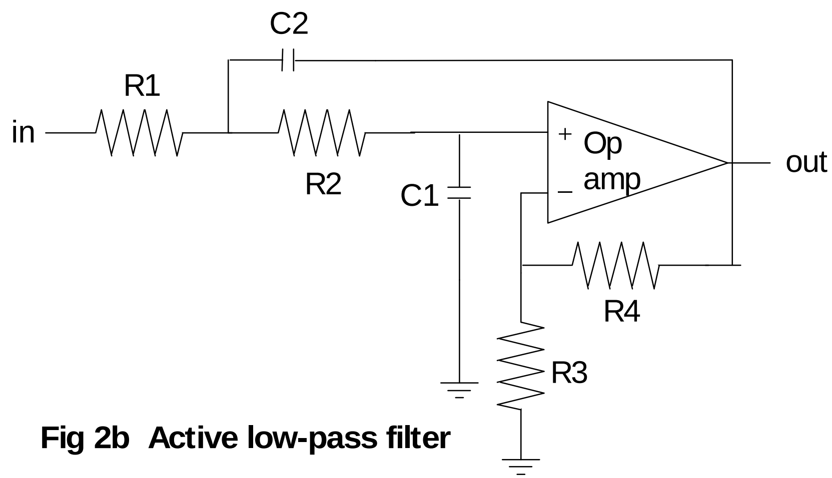


Fig 2b Active low-pass filter

The frequency at which the roll off begins and the steepness of roll off depends on the value of the components and the number of stages used. Up to a point, the more stages a filter has, the more effective it is.

Low-pass filters are used in transmitters to prevent radiation of harmonics (frequencies which are multiples of the desired fundamental). Values for the filter are chosen so that the wanted frequency is within the range that the filter will pass, while the harmonics are strongly attenuated.

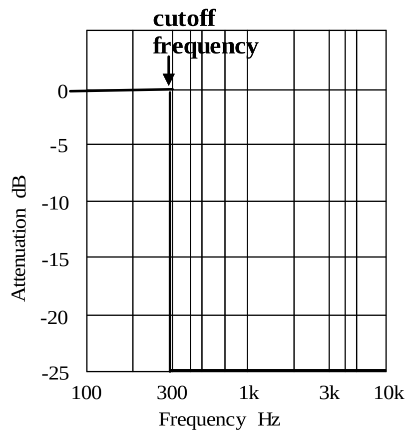


Fig 3a

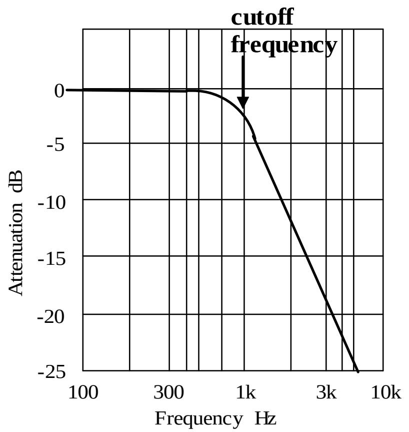


Fig 3b

High-pass Filter

The behaviour of a high-pass filter is opposite to a low-pass filter. Frequencies above the cutoff frequency are allowed to pass to the output while those below are attenuated. Figs 4a and 4b show circuits for typical passive and active high-pass filters. As you will notice, the circuits are very similar to the low-pass filter - they just have some inductors / resistors and capacitors changed over.

Band-pass Filter

A band-pass filter allows only a selected band of frequencies to pass, while attenuating any higher or lower frequency. It is really a combination of high-pass and low-pass filters as can be seen in Figs 5a and 5b. A useful application of an audio frequency band-pass filter is for CW reception. If the band is made very narrow, interfering signals just above or below the signal you are reading will not be audible.

Once you have identified the common base lead by trial and error, you have completed the easy part. Correctly identifying the collector and emitter leads is a little trickier, but can be worked out by using a wet finger as a forward biasing leakage path from collector to base. With the meter connected between the collector and the emitter, attempting to read high resistance, this reading will remain very high until some forward bias is leaked via the wet finger, from collector to base. The same wet finger test from emitter to base has no effect on the very high resistance measured between collector and emitter.

Dynamic testing of silicon BJTs in an analogue circuit is a simple matter of measuring the base-to-emitter voltage. If the stage is turned on and working correctly, close to 0.6 volts should be measured between the base and emitter junction (see Fig.3). Much less than this indicates the stage is not turned on, whereas any voltage above a volt or so usually means the junction is open circuit. Have fun testing your BJTs. End

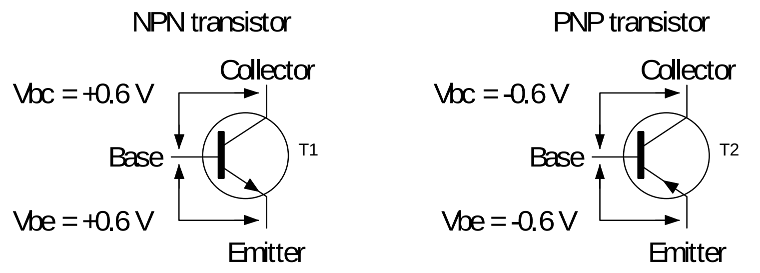


Fig. 3 PN and NP junction voltages

FETs; some may be SCRs; some may be voltage regulators, whilst some may be a pair of switching diodes, back-to-back. The list of possibilities is surprisingly long and apart from the identifying numbers, they often all look much the same.

Then there is the issue of polarity: NPN or PNP? What about those four-legged things? Is it a dual gate MOSFET? Is it perhaps a device employing a 4th lead as a shield to its metal case? Does the device incorporate internal protection diodes, from collector to emitter or perhaps internal biasing resistors?

If you have read so far, you may now be thinking, “Gosh, this is hard!” Actually, if you have a clearly identified transistor, like a BC107, and a garden variety analogue multi-meter, a static test is really quite simple. The meter can be used to tell you if the transistor is open circuit, short circuit, or “leaky”. It can also identify the three leads, and differentiate between PNP and NPN types.

Before testing, you need to know what to expect of a “good” transistor. Basic solid-state theory suggests that, as a 3-layered silicone sandwich, the average BJT should test like a pair of back-to-back diodes, with the junction of the two diodes always being the base (see Fig.2). Ohm measurements should reveal one lead that measures two low resistance paths to the other two leads using one polarity, and two high resistance paths using the other polarity. These other two leads (collector and emitter) will always measure a very high resistance in both directions, because one of the two junctions under test must always be reverse biased.

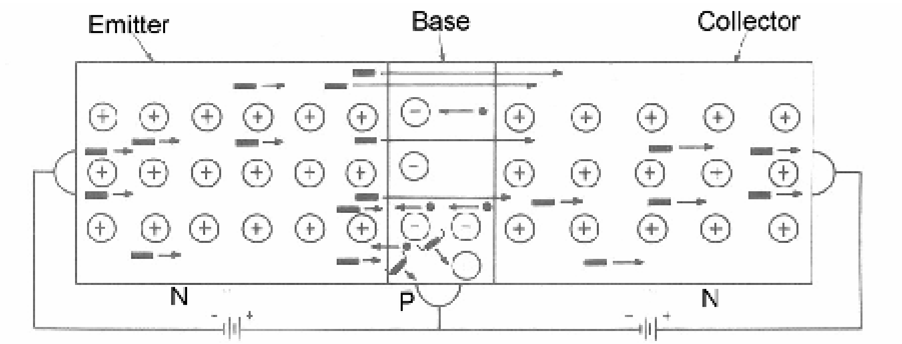


Fig. 2 Forward bias between emitter and base and reverse bias between base and collector of an NPN transistor

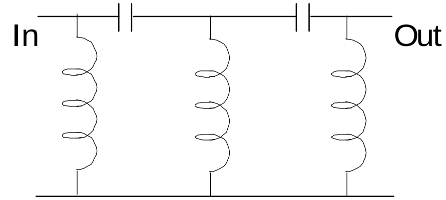


Fig 4a Passive high-pass filter

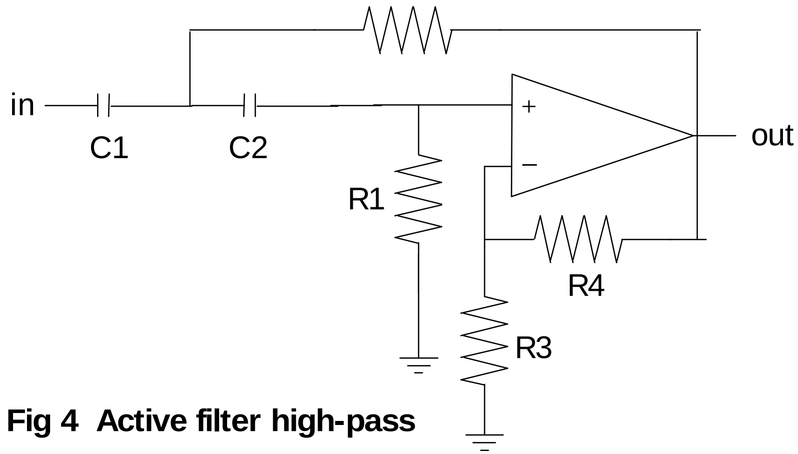


Fig 4 Active filter high-pass

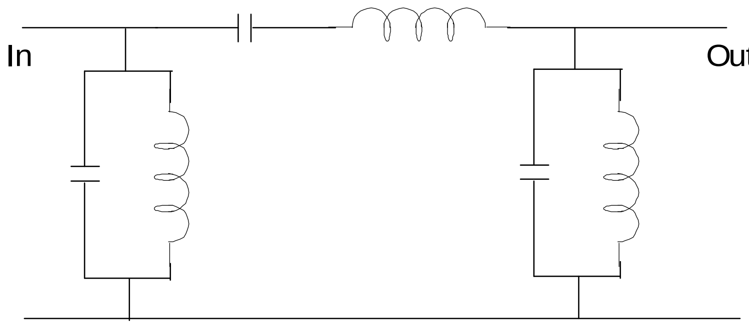


Fig 5a Passive band-pass filter

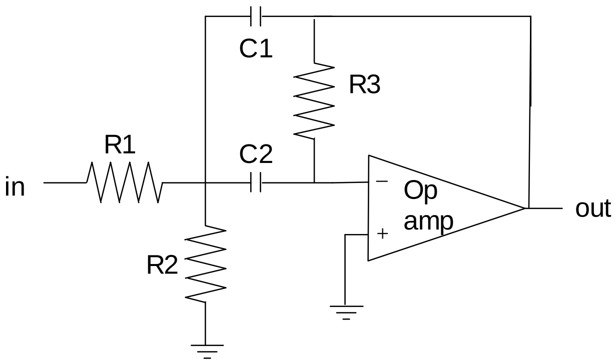


Fig 5b Active band-pass filter

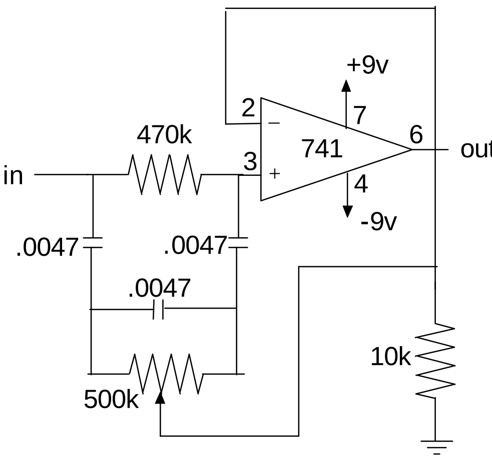


Fig 6 Notch filter

Band-stop Filter

A band-stop filter, also called a notch filter, attenuates a band of frequencies while allowing all other frequencies to pass - just the opposite of a band-pass filter. A practical application of a narrow notch filter is to attenuate an annoying whistling heterodyne near to an ssb signal. A circuit diagram of a notch filter with a tunable range of 300 Hz to 1500 Hz is shown in Fig 6.

References:
ARRL Handbook for Radio Amateurs
Converter and Filter Circuits by Rudolf F. Graf
Amateur Radio by Gordon Stokes and Peter Bubb End

Testing Bi-polar Transistors using an Analogue Multi-Meter
By Harvey Wickes VK4AHW

Strangely enough, what should be a simple test procedure, when it comes to a go / no-go static test of a transistor, can be an exercise with a few traps for the unwary. Read on, and I will explain a few of the more common pitfalls as we go

Firstly, there is the analogue (moving coil) multi-meter to be used. Nearly all analogue multi-meters, when used on the Ohms x 1 range will be using an internal 1.5 volt dc battery as a power source. As it only takes around 0.6 Volts to forward bias a silicon junction, the internal meter battery is quite adequate for the task, unless it has gone flat. Generally, if the zero ohms set adjustment works, the battery should be OK. But what if the device being tested is in fact a Darlington transistor, with two base/emitter junctions in series? Beware! Fig.1 illustrates a few different BJTs and two FETs

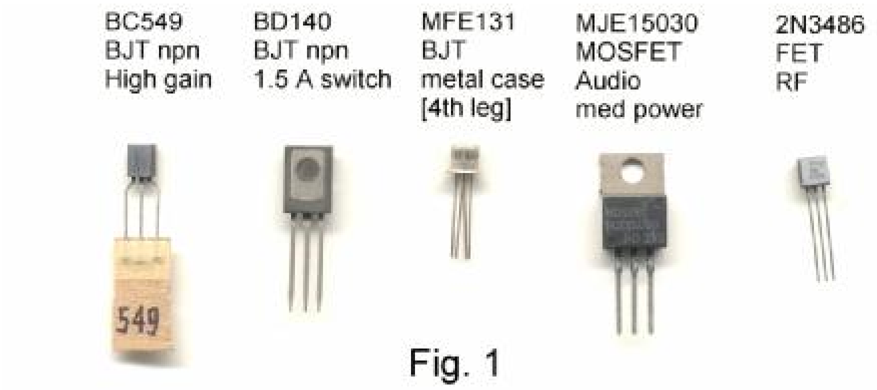


Fig. 1

The next important thing to check is the actual DC polarity that is available from the Meter test leads, which are of course, red and black. In most analogue Ohm meters, the black lead actually connects to the positive of the internal battery, and the red lead connects to negative. If you are using a digital multi-meter on Ohm test ranges, the opposite applies, so there is a trap for young players. If in doubt, use a second meter on low DC range to test the polarity of the first meter.

Another pitfall relates to the fact that not all three-legged solid state devices are Bi-polar Junction Transistors (BJTs). Some may be