STARLITE

THE NEWSLETTER FOR THE STOURBRIDGE AND DISTRICT A.R.S.

G6OI
G6SRS

G4CVK

ISSUE: NOVEMBER 2018

STOURBRIDGE & DISTRICT AMATEUR RADIO SOCIETY
INCORPORATING
OLD SWINFORD HOSPITAL SCHOOL RADIO CLUB

MEETINGS HELD AT

OLDSWINFORD HOSPITAL SCHOOL
HEATH LANE
STOURBRIDGE
[8:00 TO 10:00 PM]

VISITORS ALWAYS WELCOME

THE SOCIETY HOLDS ITS FULL MEETINGS
ON THE 1ST AND 3RD MONDAYS EACH MONTH

80TH ANNIVERSARY YEAR

[MARCH 2018 - MARCH 2019]

RSGB AFFILIATED SOCIETY

The views expressed in STARLITE may not be those of the Committee – Stourbridge and District Amateur Radio Society

STARLITE

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http://g6oi.ross-lewis.co.uk/index.html

StARS Facebook Page:-
https://www.facebook.com/groups/stourbridge.ars/

Forthcoming Meetings

November 5th	On Air. Informal. Digi Modes Group.
November 12th	On Air. Informal. Digi Modes Group.
November 19th	Main Meeting – **Annual Surplus Sale**
November 26th	On Air. Informal. Digi Modes Group.
December 3rd	On Air. Informal. Digi Modes Group.
December 10th	**StARS Annual Dinner @ Dilshad Balti, Oldswinford**
December 17th	Main Meeting – Subject tba.
December 24th	On Air. Informal. Digi Modes Group.
January 7th 2019	On Air. Informal. Digi Modes Group.
January 14th 2019	On Air. Informal. Digi Modes Group.
January 21st 2019	Main Meeting – Subject tba.
January 28th 2019	On Air. Informal. Digi Modes Group.
February 4th 2019	On Air. Informal. Digi Modes Group.
February 11th 2019	On Air. Informal. Digi Modes Group.

Editor's Comment

John G8UAE advised me that the SSB FD results have been announced. We are 15th out of 23. Final score is 181 contacts and 27,634 points with an error rate of 6.06%, mainly due to incorrectly received serial numbers.

We had a lively meeting on October 15th, a good proportion of which was discussing the Society's annual dinner. This will be held on Monday, December 10th at the Dilshad Indian Restaurant, Oldswinford. **Wayne M5LLT** has the menu, which includes English dishes, and he will, most likely (or maybe has by the time you read this), forward a copy to the members for their perusal. He will be taking names and their menu choices in due course.

I was thinking, recently, about the *2m Tape Measure Yagi* club project, which was begun earlier this year. Is it still a viable project? Has it been shelved? Or is it being held over as a Winter project? I'm sure those interested would like to know the current state of affairs.

We are, now, 8 months into our ***80th Anniversary Year*** and, so far, have done nothing to commemorate it. Perhaps someone on the Committee could let us all know if anything is being arranged for this event. I well remember taking part in a number of Special Event Stations arranged by StARS, resulting in numerous QSOs. Some of these SESs were GB6OI, GB2AAS, GB8SL, GB2HRS (for JOTA), GB2OSH & GB4CVK (with OSH), amongst others. All were very well represented by our members, but, of course, we had a much healthier membership at the time.

Just in case you don't look at the calendar, here is a reminder that …

The Annual Surplus Sale

Will Take Place On

Monday, November 19th 2018

To Begin At 8pm Prompt

So Bring Your Sale Items A Little Earlier Than This

JOTA Happiness ……

JOTA/JOTI took place at Norton Scouts with help from a number of our members. It appears that conditions on HF were not so good, the main problem being electrical interference making the bands unusable. On Sunday, **Tony M6AHW** brought along his Tilly with a HF vertical and managed a couple of QSOs. Having said that, **Wayne M5LLT** was having plenty of traffic on 2m/70cms using his DMR setup. Here are some photos from **Nick G6DQN** …

…… and Tragedy

On the Friday, whilst preparing to set up the Scout station, **Dr Bob G4VPE** had an unfortunate accident. Whilst making a movement, I understand that his hip dislocated. Consequently, an ambulance arrived to take him to hospital. I was informed that an operation was performed to repair the damage. I'm sure you will all join me to wish him a speedy recovery. Adrian GØNLA sent these photos …

An Introduction To The Smith Chart

In this tutorial, we will introduce and explain **Smith Charts**, and then given an introduction to impedance matching. We will then use the Smith Chart to perform impedance matching with transmission lines and lumped components (capacitors and inductors).

Introduction to Smith Charts

The **Smith Chart** is a fantastic tool for visualizing the impedance of a transmission line and antenna system as a function of frequency. Smith Charts can be used to increase understanding of transmission lines and how they behave from an impedance viewpoint. Smith Charts are also extremely helpful for **impedance matching**, as we will see. The Smith Chart is used to display an actual (physical) antenna's impedance when measured on a Vector Network Analyser (VNA).

Smith Charts were originally developed around 1940 by Phillip Smith as a useful tool for making the equations involved in transmission lines easier to manipulate. See, for instance, the input impedance equation for a load attached to a transmission line of length *L* and characteristic impedance Z0. With modern computers, the Smith Chart is no longer used to the simplify the calculation of transmission line equations; however, their value in visualizing the impedance of an antenna or a transmission line has not decreased.

The Smith Chart is shown in Figure 1. A larger version is shown .

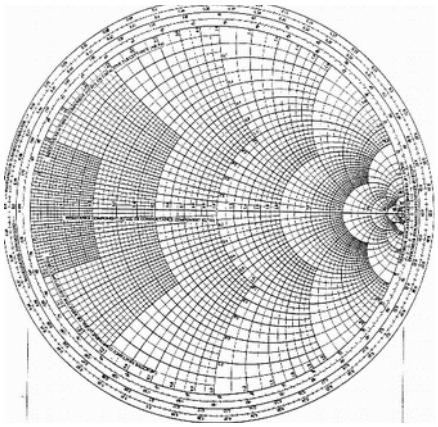

Figure 1 should look a little intimidating, as it appears to be lines going everywhere. There is nothing to fear though. **We will build up the Smith Chart from scratch, so that you can understand exactly what all of the lines mean.** In fact, we are going to learn an even more complicated version of the Smith Chart known as the emittance *Smith Chart*, which is twice as complicated, but also twice as useful. But for now, just admire the Smith Chart and its curvy elegance.

This section of the antenna theory site will present an introduction to Smith Chart basics.

Smith Chart Tutorial

We'll now begin to explain the fundamentals of the Smith Chart. The Smith Chart displays the complex reflection coefficient [Equation 1, below], in polar form, for an arbitrary impedance (we'll call the impedance ZL or the load impedance). The reflection coefficient is completely determined by the impedance *ZL* and the "reference" impedance *Z0*. Note that Z0 can be viewed as the impedance of the transmitter, or what is trying to deliver power to the antenna. Hence, the Smith Chart is a graphical method of displaying the impedance of an antenna, which can be a single point or a range of points to display the impedance as a function of frequency. For a primer on complex math, click here.

Recall that the complex reflection coefficient (Γ) for an impedance ZL attached to a transmission line with characteristic impedance Z0 is given by:

$$\Gamma = \frac{Z_L - Z_0}{Z_L + Z_0} \qquad \textbf{[Equation 1]}$$

For this Smith Chart tutorial, we will assume Z0 is 50 Ohms, which is often, but not always the case. Note that the Smith Chart can be used with any value of Z0.

The complex reflection coefficient, or Γ, must have a magnitude between 0 and 1. As such, the set of all possible values for Γ must lie within the unit circle:

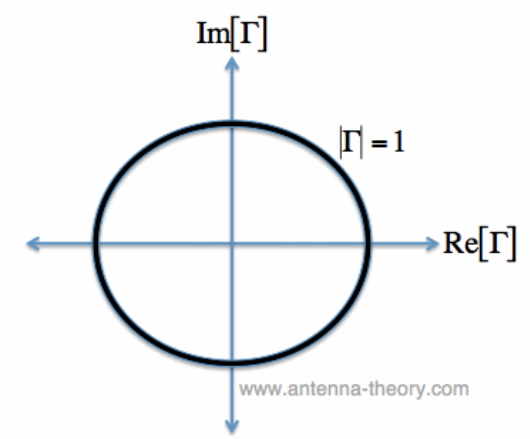

Figure 2. The Complex Reflection Coefficient must lie somewhere within the unit circle.

In Figure 2, we are plotting the set of all values for the complex reflection coefficient, along the real and imaginary axis. The centre of the Smith Chart is the point where the reflection coefficient is zero. That is, this is the only point on the Smith Chart where no power is reflected by the load impedance.

The outer ring of the Smith Chart is where the magnitude of Γ is equal to 1. This is the black circle in Figure 1. Along this curve, all of the power is reflected by the load impedance.

Let's look at a few examples.

Smith Chart Example 1.

Suppose Γ_1=0.5. From equation [1], we can solve for ZL to be:

$$Z_L = Z_0 \frac{1+\Gamma}{1-\Gamma} \qquad \textbf{[Equation 2]}$$

From equation [2], with Z0=50 Ohms, a reflection coefficient of 0.5 corresponds to a load impedance ZL=150 Ohms. We can plot gamma_1 on the smith chart:

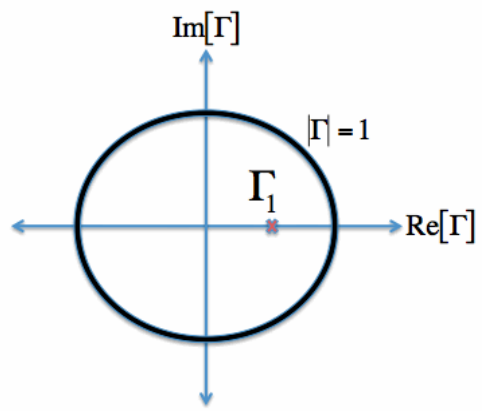

Figure 3. Γ_1 plotted on the Smith Chart.

Since Γ_1 is entirely real, the point lies along the real gamma axis (x-axis) in Figure 3, and the imaginary axis value (y-axis) location is 0.

Smith Chart Example 2. Suppose Γ_2 = -0.3 + i0.4

Γ_2 is plotted on the Smith Chart in Figure 4:

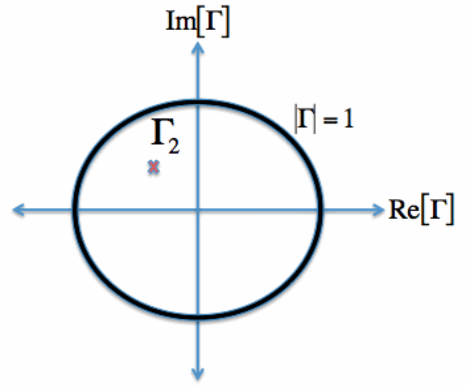

Figure 4. Γ_2 plotted on the Smith Chart.

From Equation [2] and using Z0=50, we note that Γ_2 corresponds to a load impedance ZL = 20.27 + i*21.62 [Ohms].

Smith Chart Example 3. Γ_3 = -i.

Γ_3 is plotted on the Smith Chart in Figure 5:

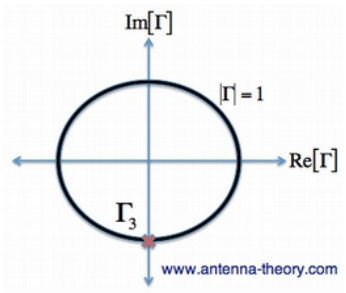

Figure 5. Γ_3=-i plotted on the Smith Chart.

From Equation [2] and with Z0=50, Γ_3 corresponds to a load impedance ZL = -i*50 Ohms. That is, the load impedance here is purely imaginary and negative, which indicates a purely capacitive load.

VSWR on the Smith Chart

Since VSWR is only a function of the absolute value of Γ, we can get the VSWR for a load from the Smith Chart as well. That is, a VSWR = 1 would be the centre of the Smith Chart, and VSWR=3 would be a circle centred around the centre of the Smith Chart, with magnitude Γ=0.5. Circles centred at the origin of the Smith Chart are constant-VSWR circles. Note that the outer boundary of the Smith Chart (where Γ=1) corresponds to a VSWR of infinity.

To sum up this page so far, the Smith Chart is a plot of the reflection coefficient. Since the reflection coefficient corresponds directly to an impedance, we are actually plotting the impedance of a device on the Smith Chart.

This is just a taster, as I am no expert on this subject. To learn more about this complex subject, follow this link

http://www.antenna-theory.com/tutorial/smith/chart.php#smithchart

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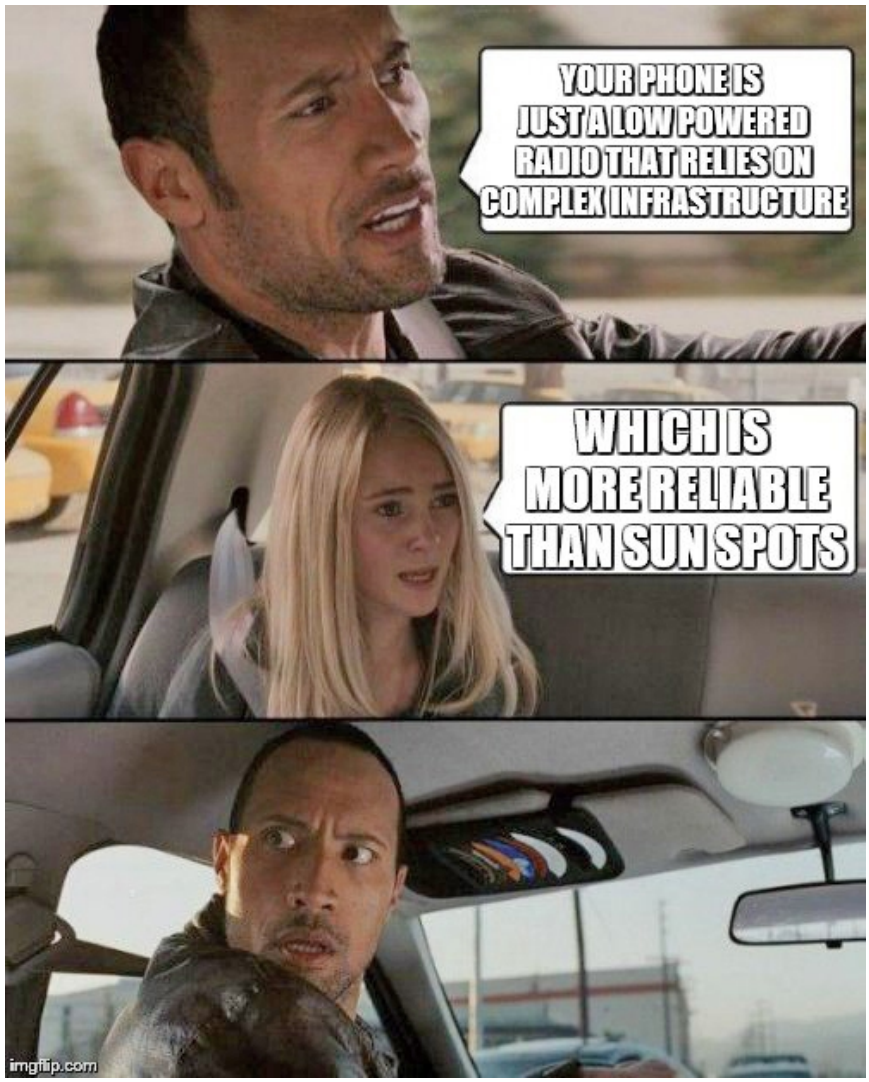
JOTA in Oz

Jim G4WAO tells me that HF propagation was pretty rough down under, too.

Perhaps this picture goes part way to commenting on propagation.



Marconi Day 2018

Here is an item from **Jim G4WAO**, which you may find interesting. It is a cutting from an Australian newspaper about the annual Marconi Day event.

WAHROONGA

Long line of radio progress

Colin Christie and John Bishop with a 1920s radio receiver. Picture: Troy Snook

100 years of words across water

Gary Hamilton-Irvine

WAHROONGA took a leap back in time on Saturday to celebrate an important piece of Australian history — the first wireless radio transmission between Australia and the outside world.

A strong crowd gathered for the centenary celebration at the weekend, which included a re-enactment of the historic moment to the delight of onlookers.

On September 22 1918 prime minister Billy Hughes sent a message in morse code from Wales to the home of Ernest Fisk in Wahroonga, after visiting troops in France.

"It was the very first direct wireless radio message to Australia. Previously to that everything had to go through cable," Ku-ring-gai Historical Society vice-president Jo Harris said.

"But the Germans would cut the cable (during WWI) and Australia would have no communication with the outside world."

That day also marked the start of what would become the golden era of radio in Australia.

The re-enactment of the message, which spoke about the valour of Australian troops, was staged at 1.15pm, 100 years to the dot since the first transmission.

There were speeches and the singing of the national anthems on Saturday, staged next to the Wireless Monument, near the roundabout of Stuart and Cleveland streets. The monument was erected in 1935 on the same block as the Fisk home.

Mrs Harris, who also organised the 75th anniversary, said it was special to have 14 relatives from the Fisk family present. Displays were also held inside the St Andrew's Anglican Church hall.

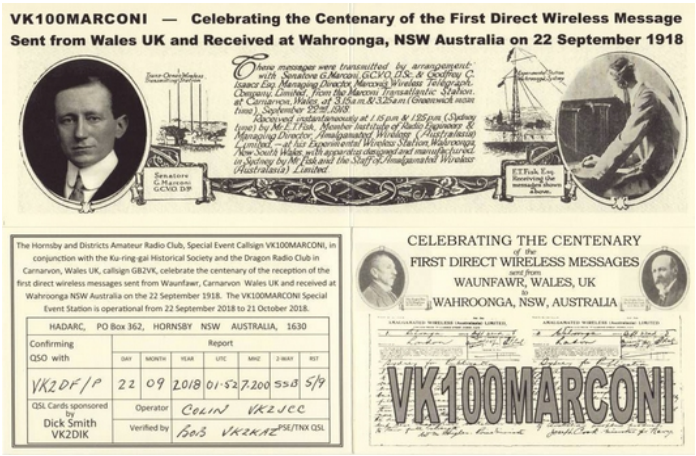
"Everyone was just so happy and cheerful to learn so much," she said. "There were a lot of people who had no idea about the event and the history around it."

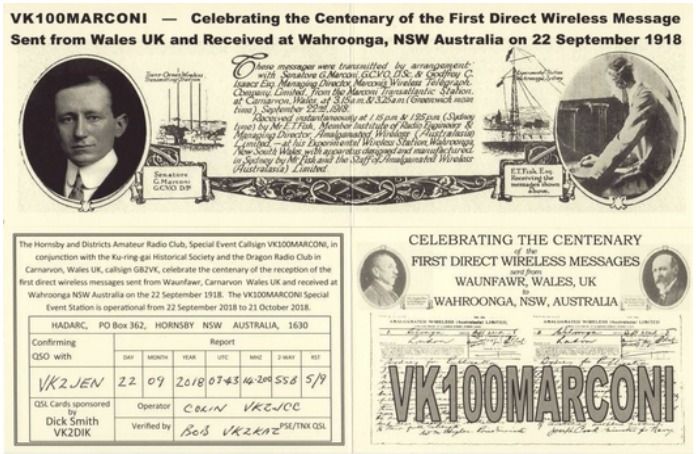
Mrs Harris thanked those who put in hard work and all those who attended. She also thanked the council and the church for their support.

And here is a link to the You Tube recording of the event:

https://youtu.be/Lb5r4qp3v0M

And a couple of QSL cards from the event.





Centenary Celebration: 1918-2018

Jim G4WAO sent these photos, from **VK2MB**, commenting "*This has been a very big amateur radio celebration in Australia, but don't remember there being anything about it here.*"

Have you any ideas or comments as to why this is not an event in the UK? *Editor.*







NASA sending helicopter to Mars

Is it a bird, is it a plane? No, it's a Marscopter!

The Mars Helicopter www.jpl.nasa.gov/news/news.php?feature=4457, a small, autonomous rotorcraft, will travel with the agency's 2020 www.nasa.gov/mars2020 rover mission, currently scheduled to launch in July 2020, to demonstrate the viability and potential of heavier-than-air vehicles on the Red Planet.

“NASA has a proud history of firsts,” said NASA Administrator Jim Bridenstine. “The idea of a helicopter flying the skies of another planet is thrilling. The Mars Helicopter holds much promise for our future science, discovery and exploration missions to Mars.”

US Rep. John Culberson of Texas echoed Bridenstine’s appreciation of the impact of American firsts on the future of exploration and discovery. “It’s fitting that the United States of America is the first nation in history to fly the first heavier-than-air craft on another world,” Culberson said. “This exciting and visionary achievement will inspire young people all over the United States to become scientists and engineers, paving the way for even greater discoveries in the future.”

Started in August 2013 as a technology development project at NASA’s Jet Propulsion Laboratory (JPL), the Mars Helicopter had to prove that big things could come in small packages. The result of the team’s four years of design, testing and redesign weighs in at little under 1,8 kilograms. Its fuselage is about the size of a softball and its twin, counter-rotating blades will bite into the thin Martian atmosphere at almost 3 000 rpm – about 10 times the rate of a helicopter on Earth.

“Exploring the Red planet with NASA’s Mars Helicopter exemplifies a successful marriage of science and technology innovation and is a unique opportunity to advance Mars exploration for the future,” said Thomas Zurbuchen, Associate Administrator for NASA's Science Mission Directorate at the agency headquarters in Washington. “After the Wright Brothers proved 117 years ago that powered, sustained and controlled flight was possible here on Earth, another group of American pioneers may prove the same can be done on another world.”

Watch the video https://youtu.be/oOMQOqKRWjU - *the Mars Helicopter is a technology demonstration that will travel to the Red Planet with the Mars 2020 rover. It will attempt controlled flight in Mars' thin atmosphere, which may enable more ambitious missions in the future. Credits: NASA/JPL-Caltech*

The helicopter also contains built-in capabilities needed for operation at Mars, including solar cells to charge its lithium-ion batteries and a heating mechanism to keep it warm

through the cold Martian nights. But before the helicopter can fly at Mars it has to get there. It will do so attached to the belly pan of the Mars 2020 rover.

“The altitude record for a helicopter flying here on Earth is about 40 000 feet. The atmosphere of Mars is only one percent that of Earth, so when our helicopter is on the Martian surface, it is already at the Earth equivalent of 100 000 feet up,” said Mimi Aung, Mars Helicopter project manager at JPL. “To make it fly at that low atmospheric density, we had to scrutinize everything, make it as light as possible while being as strong and as powerful as it can possibly be.”

Once the rover is on the planet’s surface, a suitable location will be found to deploy the helicopter down from the vehicle and place it onto the ground. The rover then will be driven away from the helicopter to a safe distance from which it will relay commands. After its batteries are charged and a myriad of tests are performed, controllers on Earth will command the Mars Helicopter to take its first autonomous flight into history.

“We don’t have a pilot and Earth will be several light minutes away, so there is no way to joystick this mission in real time,” said Aung. “Instead, we have an autonomous capability that will be able to receive and interpret commands from the ground and then fly the mission on its own.”

The full 30-day flight test campaign will include up to five flights of incrementally farther flight distances, up to a few hundred meters and longer durations as long as 90 seconds, over a period. On its first flight, the helicopter will make a short vertical climb to 3 meters, where it will hover for about 30 seconds.

As a technology demonstration, the Mars Helicopter is considered a high-risk, high-reward project. If it does not work, the Mars 2020 mission will not be impacted. If it does work, helicopters may have a real future as low-flying scouts and aerial vehicles to access locations not reachable by ground travel.

“The ability to see clearly what lies beyond the next hill is crucial for future explorers,” said Zurbuchen. “We already have great views of Mars from the surface as well as from orbit. With the added dimension of a bird’s-eye view from a ‘marscopter,’ we can only imagine what future missions will achieve.”

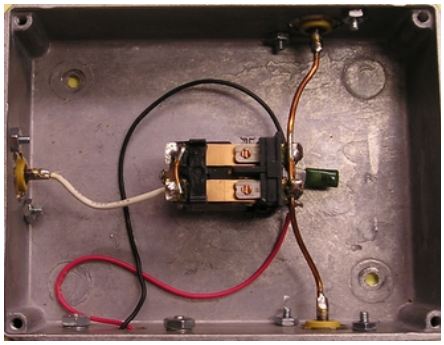
Mars 2020 will launch on a United Launch Alliance (ULA) Atlas V rocket from Space Launch Complex 41 at Cape Canaveral Air Force Station in Florida and is expected to reach Mars in February 2021.

The rover will conduct geological assessments of its landing site on Mars, determine the habitability of the environment, search for signs of ancient Martian life and assess natural resources and hazards for future human explorers. Scientists will use the instruments aboard the rover to identify and collect samples of rock and soil, encase them in sealed tubes and leave them on the planet’s surface for potential return to Earth on a future Mars mission.

The Mars 2020 Project at JPL in Pasadena, California, manages rover development for the Science Mission Directorate at NASA Headquarters in Washington. NASA’s Launch Services Program, based at the agency’s Kennedy Space Centre in Florida, is responsible for launch management. For more information about NASA’s Mars missions, go to www.nasa.gov/mars

Antenna Switch - KØBG

Modern mobile transceivers are often referred to as DC to daylight radios, because they usually cover 160 meters through 70 centimetres. Being as small as they are, there isn't a whole lot of room for antenna connectors. Quite often, the output connections are on dongles; the Kenwood TS-480 is a good example. In most cases, only two connections are provided. One for 160 through 6 meters, the other for V/UHF. If you use separate antennas for VHF and UHF, diplexers are available to split the one port into two. However, if you use a separate antenna for the HF bands, and another for 6 meters as I do, you need an antenna switch. This begs the question, what do you do if you're transceiver is remotely mounted? You can buy 12 volt powered, remote antenna switches like the MFJ-4712 ($80), but you will need to modify it for mobile use. The solution is to make one, and if you're frugal, it'll cost you about $20.



The left photo shows the inside of the switch. It seems simple enough, but there are a few caveats. Knowing how it was made should put you over the hurtle, so to speak.

The box is a cast aluminium one, about 3x4x2, although just about any aluminium or steel box could be used. The relay is a DPDT, removed from its plastic enclosure, and screwed into the bottom of the box. The flexible white wire (the common connection) originally connected to a terminal on the opposite end of the relay. The poles were wired in parallel, and to the output SO239s with short pieces of #14 copper wire. All of this was done to keep the insertion losses low. Even then, the throughput SWR rises slightly (1.2:1 at 54 MHz).

If you look closely at the expanded photo, you'll notice a diode and small cap attached across the coil terminals. These are added to eliminate the back EMF when the switch is turned off, so connection polarity is important. Power is fed to the switch from a front mounted control panel, shown at right.

Note that the leads shown in the photo above left, are a bit too long. About half the length would be better. Overly long leads cause the insertion losses to go up, which increases the SWR on the higher bands.

Coming next month: Top Secret: QRP Tips

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