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In this issue

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Reader contributed articles welcome

Editorial

In this issue, we have Dave G3ZGZ investigating why a splitter does not deliver the results we would all expect from a simple unit and more interestingly, why it's performance varies across different bands. Fortunately Dave does solve the mystery.

Marco Geels PE1BR.NL has some ideas for the Micro Mini OSD board that was actually designed for overlaying text on remote controlled aeroplanes, but Marco has other ideas.

Mike G7GTN is looking at camera illumination for small webcams which really does add some sparkle to their performance and helps with working on small surface mount constructions.

John G3RFL revisits the 100W power meter he designed for CQ-DATV 11, adding improvements and combining the design with the 5W power meter from CQ-DATV 18. So we have a dual design with both 100W or 5W FSD.

Trevor has been looking back at what it was like to be a cameraman in the days of Turret Cameras, with a few well chosen links to the world of YouTube and some of the camera work in television and the movies.

Ken W6HCC reports that Art WA8RMC resolved the power supply extended temperature problem of the DATV-express boards and all units have been reworked. However, a new problem has been seen in a few units.

These are under intense scrutiny.

Armand Hoffstetter KD0PXF looks at setting up a transmission and the world of windows 10 driving his HiDes DVB-T transmitter.

Along with all the news and updates from GB3FB and its 9cms TX being received at 100Kms and GB3FT still awaiting 23cms approval but it will shortly have a slotted wave guide TX and possibly a another 6dBs of gain.

So as we always say:-

Sit back and enjoy CQ-DATV 58 and if you have something to interest our readers in the next issue please contact *editor@cq-datv.mobi*.

CQ-DATV Production team

Index page links

Please Note:- For some unexplained reason, on different PDF viewers, the page links on the index page are jumping to a page either before or after that indicated.

This has just started happenning and we are investigating the problem.

If you experience this problem, we would appreciate a quick note telling us the PDF viewer and operating system you are using.

California, Arizona Students to Speak with Astronauts on Space Station
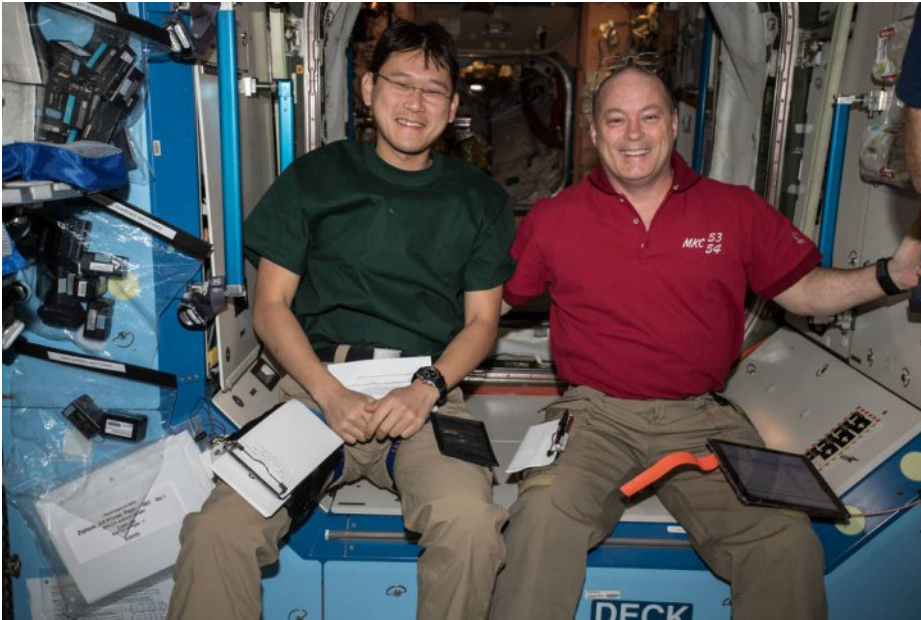
Astronauts Norishige Kanai of the Japan Aerospace Exploration Agency and Scott Tingle of NASA will talk to students in California and Arizona March 2, 2018, about life and work aboard the International Space Station. Credit: NASA

Two astronauts living and working aboard the International Space Station will talk live with students in Arizona and California on Friday, March 2. The separate Earth-to-space calls will air live on NASA Television and the agency's website.

Students from H.L. Suverkrup Elementary School in Yuma, Arizona, will talk to Expedition 55 astronauts Scott Tingle of NASA and Norishige Kanai of the Japan Aerospace Exploration Agency at 10:30 a.m. EST. Media interested in attending the event should contact Trina Seigfried at 928-246-3565 or *tseigfried@craneschools.org*.

The event will take place at 1590 S Ave.

At 12:15 p.m., Tingle and Kanai will get a call from students at Monta Loma Elementary School in Mountain View, California. To attend this event, media should contact Shelly Hausman at *shausman@mvwsd.org* or 650-796-8304. The event will take place at 60 Thompson Ave.

The students will have a unique opportunity to pose questions directly to astronauts about life aboard the space station, NASA's deep space exploration plans, and doing science in space. They're preparing for the event by studying the space station, astronaut biographies, and the current research and activities happening aboard the station. In addition, the Suverkrup students have added their names to NASA's InSight Mars lander Names to Mars program and are preparing for a virtual field trip to the Red Planet.

These in-flight education downlinks are an integral component of NASA's Year of Education on Station, which provides extensive space station-related resources and opportunities to students and educators. Linking students directly to astronauts aboard the space station provides unique, authentic experiences designed to enhance student learning, performance and interest in science, technology, engineering and mathematics (STEM).

Astronauts living on the orbiting laboratory are able to participate in these educational calls, and communicate 24 hours a day with the Mission Control Center at NASA's Johnson Space Center in Houston, through the agency Space Network's Tracking and Data Relay Satellites.
https://www.nasa.gov/directorates/heo/scan/services/networks/sn

Source: *https://www.nasa.gov/press-release/california-arizona-students-to-speak-with-astronauts-on-space-station*

LimeSDR-mini

As a follow-up to the LimeSDR-mini Tx/Rx discussions, I just placed an order for a LimeSDR-mini unit for US$139 (the introductory price). These units have been shipping since February as promised by Crowd Supply at *https://www.crowdsupply.com/lime-micro/limesdr-mini*.

The LimeSDR-mini is a very small Tx/Rx unit with USB-3 capability

A Crowd Supply update e-mail reported that "We've shipped over 300 boards so far and we're happy to report another 900 or so boards will arrive at Crowd Supply's warehouse this week." My unit is expected to ship on March 31.

73...de Ken W6HHC

GB3FT and FB update

Just a quick fyi,

GB3FB is working well on 9cms and being received at 100kms away by Tony G4CBW.

GB3FT on 23cms is still awaiting approval but is available under clause 10 and will shortly have an improved slotted wave guide antenna courtesy of the UK
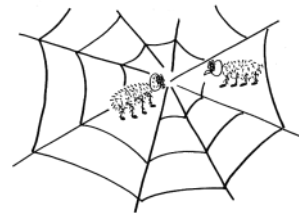
Micro wave group - it should offer an extra 6dB of gain over the current Alford slot and fingers crossed may extend to coverage to the Wirral and Barrow areas.

73 Tim G4WIM

Source: *https://forum.batc.org.uk/viewtopic.php?f=15&t=5409*

New and improved - CQ-DATV website!

The cq-datv.mobi web site has been moved to a new hosting company that provides us with a SSL certificate so that all connections are now secure using the https protocol.

As well as being encrypted, this protocol is much more robust and should improve downloads for people on poor internet connections.

BATC at the Martlesham MRT 14/15 April

The BATC will be represented at the Martlesham Microwave Round Table on the weekend of 14/15 April. There will be a presentation on " ATV on 5.6, 10 and 24GHz" just after lunch on the Sunday, and items from the BATC shop will be available all weekend at normal prices minus the post and packing costs - cash only please. We will also be running a Portsdown Clinic.

Remember that you need to sign up for the Round Table in advance at: *http://mmrt.homedns.org/*. No entry without pre-booking.

Source:
https://forum.batc.org.uk/viewtopic.php?t=5426&p=15213#p15213

Roberto Zech, DG0VE, silent key

Some weeks ago a shocking news arrived: our friend Roberto Zech, DG0VE, died quite suddenly on 20.2.2018.

Roberto was 49 years old, sportive and health-conscious.

Only recently on 17.2. he visited the "GHz-Tagung" in Dorsten, Germany, and other visitors reported good health from him. Many amateur radio and ATV friends knew Roberto since more than 30 years as a developer and producer of high level UHF and GHz devices. He provided them to radio amateurs and commercial users all over Europe.

As a certified textile machinery technician he aquired his knowledge on microwave technology in private studies.

Roberto seemingly had planned new decvices like a 24 GHz prototype group in a milled aluminium housing.

He was an active member in several amateur radio groups like DARC and AGAF and regularly visited meetings like HAM RADIO in Friedrichshafen, UKW-Tagung Weinheim and ATV-Treffen Gloevzin with his stand.

Roberto is leaving a big vacancy especially in the ATV community. We whish his family much strength after this severe loss. Roberto, DG0VE, will always stay in our mind thankfully.

For AGAF e.V. Uwe, DJ8DW President

Translation Klaus, DL4KCK *www.agaf.de*.

Thanks to Armand Hoffstetterr KD0PXF for the above.

Please note that this mailing list is only used to advise interested people about the availability of new issues of CQ-DATV magazine. The list is not, and never will be, shared with any other organisations.

Want to be notified when issues of CQ-DATV are published? Then join our *mailing list*.

CCTV Camera LED Ring Light

**Written by Mike Stevens G7GTN**

Introduction

Wishing to enter the interesting world of surface mount construction, it became quickly apparent that my eyesight would always struggle with this.

Looking around I found plenty of people using the small USB based camera microscopes, with quite mixed results. Knowing these are basically quite cheap webcams with some added illumination I set about to see what I could create using my familiar bargain basement (or value based) approach to matters.

I already had a small CMOS board based camera module, and on powering this I was quite surprised by the video output quality. If it does actually meet the quoted 600 TV lines output PAL specification is really unknown at present, this would be a whole new question for another day. But for the application and proposed system seemed to be quite suited.

Basic Hardware Modules

The LED Ring is based on the WS2812B addressable chips; the smaller size type selected has 8 controllable devices with an outer diameter of approximately 31mm across the PCB module. An ATTiny85 based processor module controls the brightness level (and colour) of all LEDS using a single push button switch. The camera is feed with a +5V supply directly from the processor module. An optional LED can be attached on I/O pin P2 via a 220Ω resistor to show the code is running. I used either a tethered USB cable from a PC or a simple 18650 cell based power bank to power the test project.
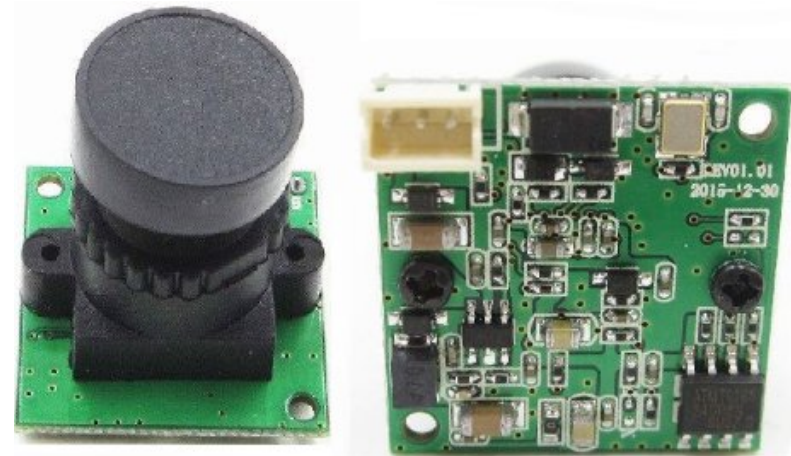
Required modules

Software

The Neopixel LED Ring is controlled via an external Library. This can be downloaded from the link in the article or installed directly using the Manage libraries feature. From the available code LEDRING.ZIP you need to change a constant to let the code know how many LEDs you have in total, in my case 8 were used & sufficient for the task.

The brightness level setting is controlled via a standard push button switch on I/O pin P1, the other end being connected to GND. The switch is debounced via software; you can select the value in ms to adjust for your own particular switch used.

Plug in the ATTiny85 USB cable when the Ardunio IDE notifies you to do so. Once you have uploaded the code the push button will turn the LED Ring on at full brightness, subsequent pushes will change the brightness.

The brightness levels can be easily adjusted within the code to suit your own usage case. If you go past the 4 pre-set levels the next press will turn off the LED illumination ring.

Conclusions

A slight word of caution is probably already in order, it is strongly advised that you do not stare directly at the LEDs when set at the full brightness level. On doing so myself I found that my eyes were slightly strained, after even just a few seconds of viewing.

The illumination provided by the 8 small LEDs is quite impressive, and being a pre made module makes the application of these very easy. You could scale up this idea to use larger LED Rings for other devices such as video cameras.

One consideration to keep in mind is the current required by the devices, this would mean an external +5V power supply circuit as the ATTINY85 on board regulator type 78M05 could run out of steam quickly.

With the camera module I had used the limitation would be in the M16 type lens used, so a more sensible option is to source a different camera using a CS Mount lens.

The LED light idea can still transition in this new direction.

Internet Links

https://digistump.com/wiki/digispark

https://www.arduino.cc/en/Main/Software

https://cdn-shop.adafruit.com/datasheets/WS2812B.pdf

https://learn.adafruit.com/adafruit-neopixel-uberguide/arduino-library-installation

Above and previous page: M16 thread & CS Mount Based Zoom Lenses

Written by Ken W6HHC

During February, testing of the compact MiniTiouner-Express hardware receiver and analyzer production units that use the Serit NIM tuner and uses the MiniTioune software from Jean Pierre F6DZP continued.

In February, Art WA8RMC resolved the power supply extended temperature problem and all units have been reworked. However, a new problem has been seen in a few units.

Out of 29 production units that are under intense scrutiny, 25 units work perfectly. However, consistently 4 units power up with poor modulation constellation and a low MER reading.

Restarting these four units allow them to sometimes work OK…but most times the poor modulation constellation comes on.

A possible issue has been identified with the one of the Serit tuners on the "four poor constellation units" and all "four poor constellation units" are in the same manufacturing date code lot (different from the 25 other good units) . Art is working with the Serit manufacturers to analyze.

Ken W6HHC has completed a MiniTiouner-Express User Guide draft that has been reviewed and updated by the project team, A review copy has been sent to Jean Pierre F6DZP for his inspection and comments.

he project team has decided to delay sales of the MiniTiouner-Express hardware until the poor-constellation-problem on some units is better understood.

MiniTiouner-Express
DVB-S/DVB-S2
Receiver / Analyzer
User Guide
For Windows OS
Draft 10

Cover for Draft 10 of MiniTiouner-Express User Guide

There is good news that the PLUTO SDR Tx/Rx units from Analog Devices are NOW SHIPPING from both DigiKey and Mouser electronic distributors.

The DATV-Express software v1.25p4 software (for windows) will transmit with either a PLUTO modulator or the normal DATV-Express modulator board. Currently, Charles G4GUO has been working to add the Lime-Mini SDR board to the v1.25p4 software.

Mostly working, Charles explains he just needs to add the "raised COSINE" filter to the code for Lime-Mini SDR board software. Charles reports he could have a software build ready to provide alpha testing with Lime-Mini SDR board in a couple of weeks.

Project Speed is set to moderate….de Ken W6HHC

Micro Minim OSD

**Written by Marco Geels PE1BR** *http://pe1br.nl*

Design:

I heard and read a lot about the Micro minim osd board. This is a small and cheap ($6.45) OSD board designed to overlay text on remote control airplanes. Actually it is an SMD Atmel chip on one side and a SMD max7456 chip on the other side.

In **CQ-DATV Magazine 12** and **39** Mike Stevens G7GTN wrote about this board and he made some software to start your own project.
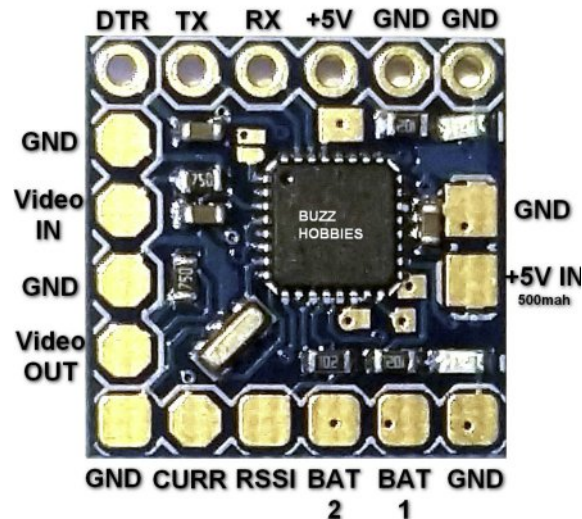

The issue for me with this software is you have to open your case, plug in the USB>>TTL converter, find the latest version of you software, change the text and reprogram the Atmel. I want to build this OSD in every transmitter so I always have my callsign on screen whenever I am transmitting. I also use my transmitters at club events, Jota etc etc so I have to change my callsign a couple of times a year (club call, jota/J call and personal call) and sometimes I want to add text from wherever I'm transmitting.

The OSD pcb has 2 analog inputs so with a couple of resistors and 5 buttons I made a small keypad to control the device. I mounted the OSD PCB under the keypad and connected everything together.
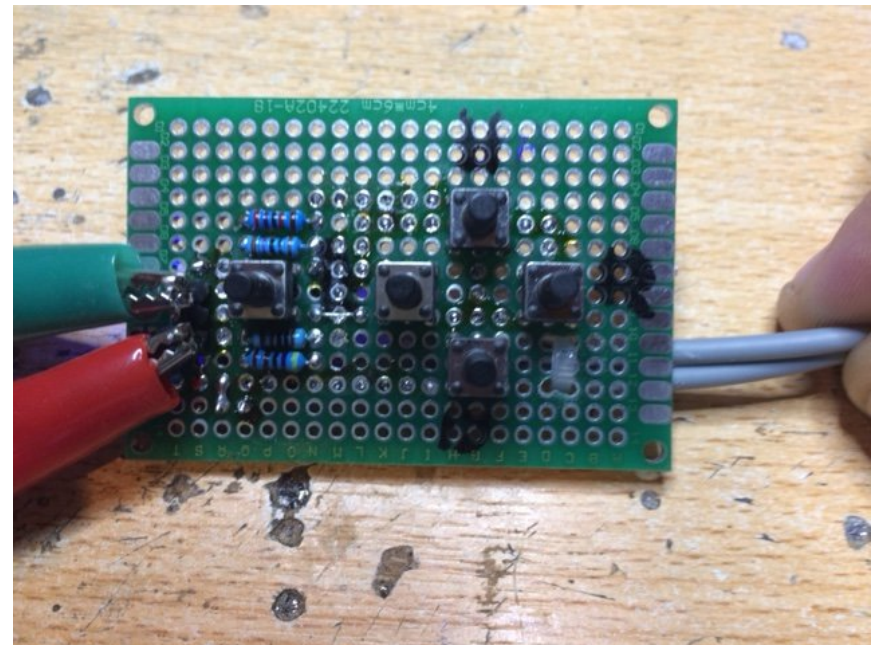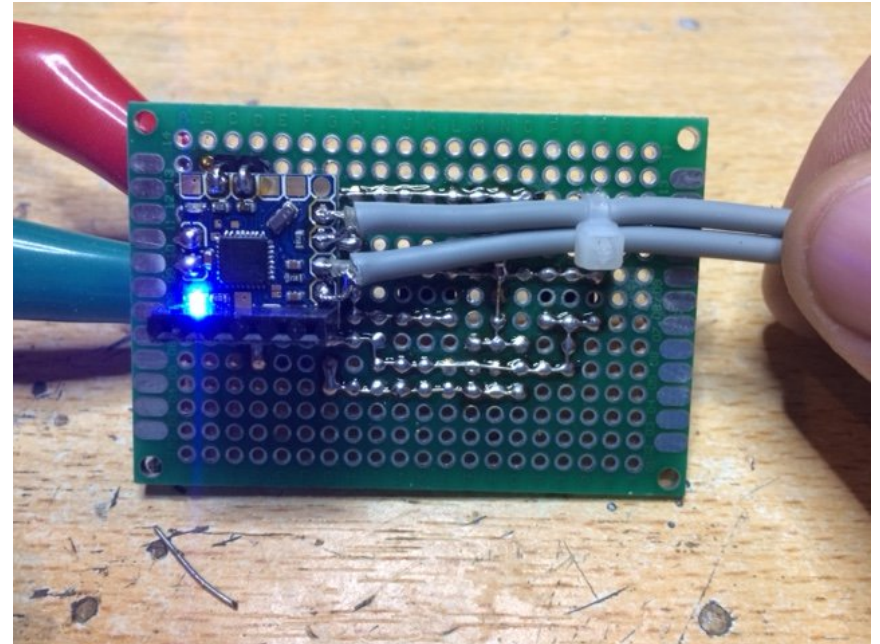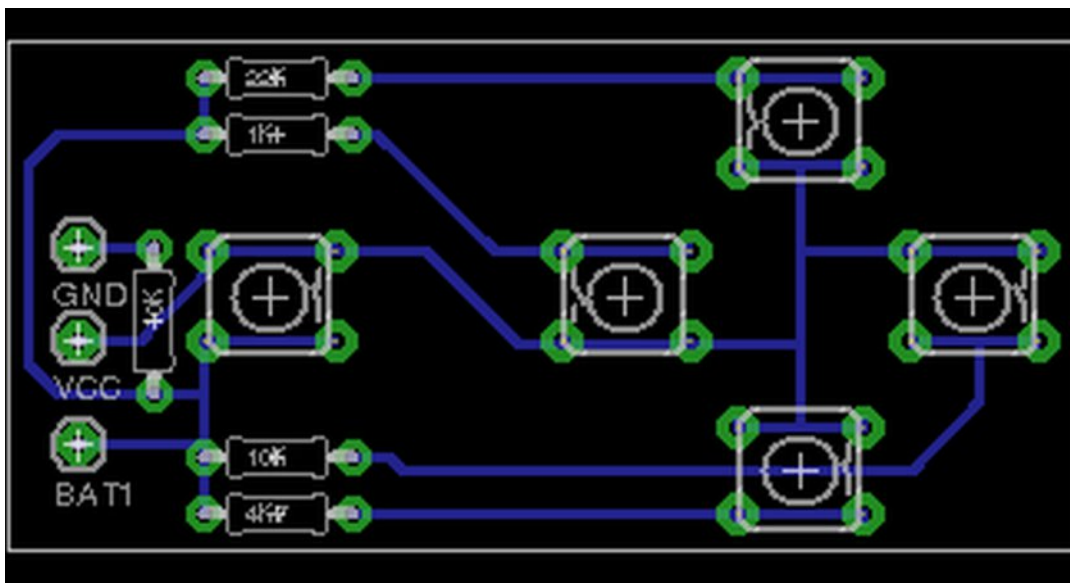
Menu options:

OK that hardware part was easy now do some software: How hard can it be, read some buttons and change the text, erhmm it became a little bit more work to code this: ➡

But the result is there. I can now edit 6 lines of text, turn them on and off, select blinking or steady, black or white letter.

I can move the text to every position on the screen and everything will be stored to EEprom so my text will be remembered when I cold start the device.

You need to upload the character file Mike Stevens G7GTN created and described in **CQ-DATV Magazine 12** before you upload the arduino software.

Continued next page...
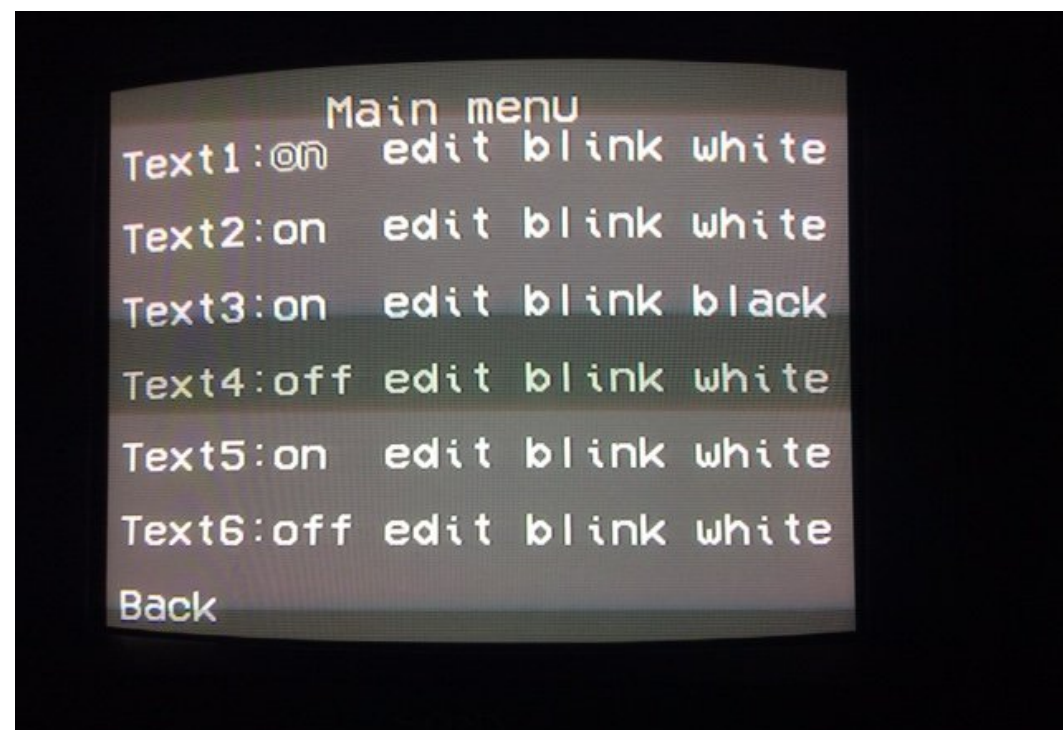
Files:

Please note that these files download from Marco's site and not the cq-datv.mobi site.

PCB board image

http://pe1br.nl/wp-content/uploads/2016/10/pcb-image-e1477184792402.png

eagle schematic

http://pe1br.nl/buttonbord-V1.sch

eagle board

http://pe1br.nl/buttonbord-V1.brd

arduino software

http://pe1br.nl/calgever_PE1BR_V1_0.zip

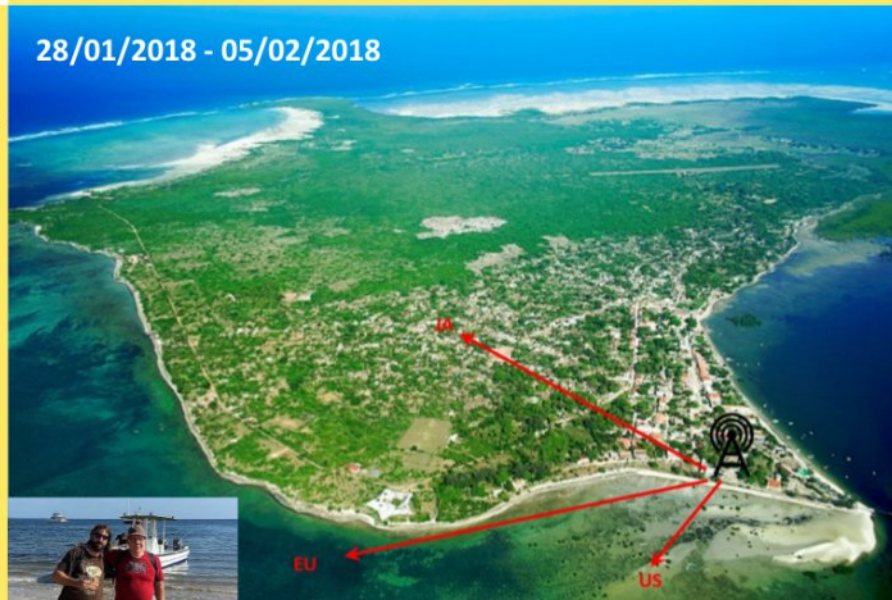### CQ-DATV website

https://www.cq-datv.mobi/

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Check out the DKARS website at:-
http://dkars.nl/

When is a splitter not a splitter but a high pass filter?

Written by Dave Woodhall G3ZGZ

Recently I've been doing some tests on 2m DATV using my BATC receiver with Minitioune (MiniT) software. I have noticed that the RF level meter on the software pulses about once a second and reasoned that as it has a wide bandwidth, the signal my be outside of the 2m band.

I wanted to use my SDR dongle at the same time as the BATC receiver without having to change over antenna leads. I use a preamp on 2m and I figured this would have a high enough output level to drive a splitter.

I rummaged through one of my many junk boxes and found an ideal candidate for the job. It is a satellite 2 way splitter with F connectors and rated 5 to 2250MHz.

I connected it up and first used my SDR receiver to see the incoming signals. This showed an incoming DATV signal on 146.5 MHz as I expected.

When I used the MiniT I expected to be able to receive the picture OK as the incoming DATV signal was strong. I could, but was getting a MER of only 2db where previously the same signal gave >17db MER when only the MiniT RX was used.
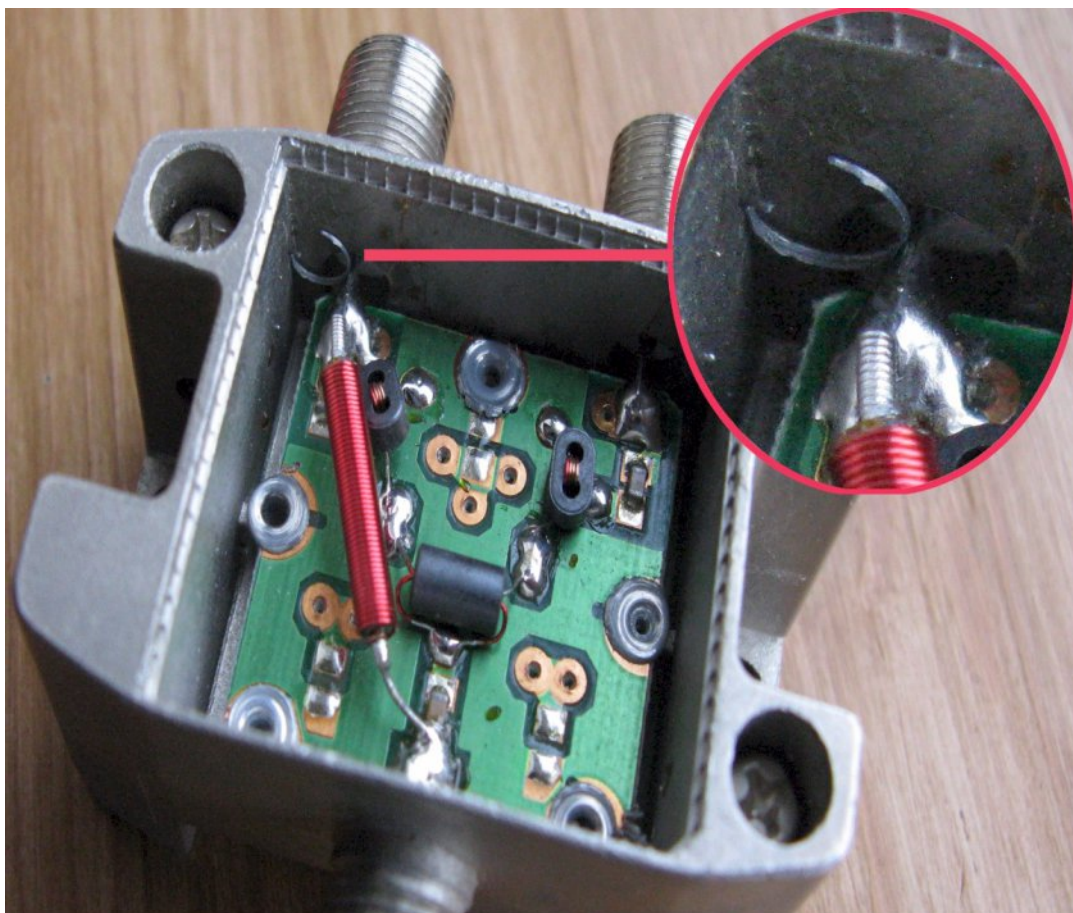
I expected the splitter to have some loss but this was strange.

I changed the SDR and MiniT to 1315MHz, to receive the output of GB3FT, whereby both showed the signal level I expected. This was strange as well! Back to 2m and the results were confirmed.

Decided to change over the SDR and MiniT ports that were used on the splitter. Now the SDR had a very low signal level and the MiniT was fine. Strange! Funny that 23cm passes through OK, but not 2m and it's only one port.

So a splitter is a high pass filter when there's a little extra material on the connector.

After that was sorted out I was able to use the SDR and MiniT together from the same antenna. Luckily I didn't put power up the cable to my preamp as the short happened to be on the connector that has power pass through!

Now to identifying the 1 second pulse that the MiniT RF level meter shows. Funny - this turned out to be TWO sources of "QRM".

The one causing the problem is a data or paging transmitter operating on 153.025MHz that puts a VERY strong signal into my QTH. The bandwidth of the MiniT receiver is such that when on 146.5 MHz the TX is being picked up. When receiving a weak DATV signal this TX does not actually cause any problems, much to my surprise. A bandpass filter on the input reduces this signal to the point where it doesn't show on the MiniT RF meter.

The other source is one I first encountered a couple of years ago.

This QRM is also a 1 second pulse and it covers a really wide band of frequencies either side of 2m. From my QTH it beamed up north, but was not always there. It is of such a low level that it's not a problem, but in searching for the first QRM source I heard it.
I have a DF receiver on 151 MHz and this picks up the signal so I took it for a walk in the streets around my QTH.

I went north and turned into the next street behind my house. The signal got stronger and was DF'd to a car parked in the street.

Then the penny dropped - I had exactly this problem with a 2m mobile rig in my own car a few years ago.

Using a 4lb hammer, and my large chisel I manage to get the press fit lid off the splitter.

Now I know why.

Look at the socket at the top left of the splitter. There is a loop of metal sitting between the case and the centre connection of the socket. At 2m it is a good enough short, at 23cm it must have enough inductance to not effect the signals too much!

I think the circle of metal is swarf from the pop rivet to the left of the red RFC.
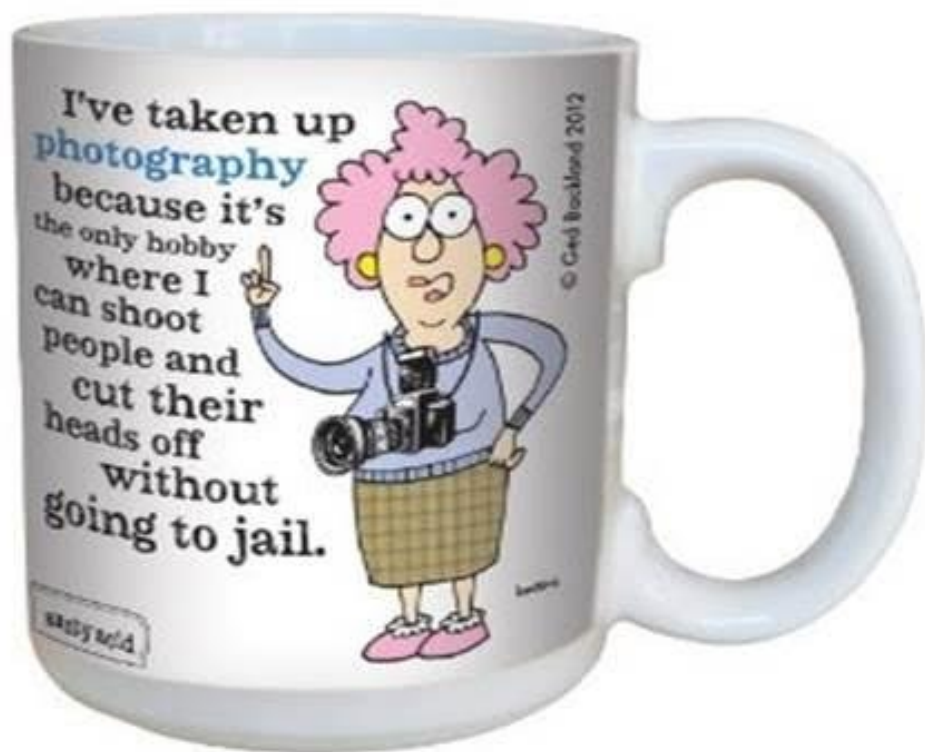
It turned out to be the car's alarm system! That's why this QRM was not present all the time!

Since then I have noticed that a similar pulse is emitted from some electronic clocks that use a solenoid to move the fingers!

This is why amateur radio is such good FUN.

Now back to DATV!

G8GKQ/p sendete mit 2 MS/s auf 10 GHz mit dem Portsdown-DATV-Sender des BATC (siehe Seite 6) und wurde über 130 Kilometer Entfernung von G8GTZ mit dem MiniTiouner (F6DZP) empfangen.

Aus dem Inhalt: EDITORIAL · Einladung zu den AGAF-Mitgliederversammlungen in Glövzin und Friedrichshafen · Eine preisgünstige Antenne für das 13-cm-Band · Testbericht zur Dia-Digitalisierung · SHF-Baken bei DBØKK in Berlin · DBØHEX auf dem Brocken wieder QRV · HAMNET-Ausbau in Deutschland · 50 Jahre AGAF – Die Anfänge

TV Amateur is a German Language ATV Magazine It is published 4 times a year and if you would like to subscribe go to *http://agaf-ev.org/*

In 1970 a job change took me into working in a TV studio, what a different world.

The kit was unfamiliar, but all of it obeyed the rules of electronic engineering, figure out what it did and why it was not performing and threaten it with the service manual. I had a bench, all the usual tools and I was in my safety zone - or was I. The studio was new as were most of the staff, but I was making things work and keeping my head down. Then the Director of Television, returned from leave (what grand titles some people had) and after a staff meeting decided to shake us all up.

I did not know it at the time, but he was ex Navy where apparently the drill is everyone has two jobs EG you are the cook and when they sound general quarters you stop cooking and have an operational post EG number 2 Pom Pom. How does this translate into television?

The following day the studio was brought to life and all the kit I had been fixing was powered up and working. What I had not expected was that I was going to be pressed into work actually operating kit. The philosophy was to team bond everyone by moving them out of their safety zones and into a weeklong exercise of TV production with everyone carrying out unfamiliar tasks.

Well I was certainly well outside my safety zone and assigned to camera operations, lucky we did not have any Pom Poms to man, or depth charges to fire.

It is different mending a camera to, actually pushing one around on the studio floor. The cameras were black and white, and it was back in the days of turret lenses, something I always thought had been copied from the film camera world.

Camera head of an EMI 203 5 lens camera

The lenses were changed by rotating the turret and this was a pure mechanical action from a rotating handle on the side of the camera. This had to be done when your camera was not on air so pay attention to the tally lights and listen to the gallery through the head phones..not too difficult, but you did need to know which lenses were in the turret and which direction to go, or you were in danger of making some very elementary mistakes, that were plainly obvious to everyone in the production gallery.

Most cameras have four lenses in the turret, but the ones we had had five, which might sound like an advantage, but it was not. The lenses all had an Iris that was controlled remotely, so that a racks operator could set the exposure. There was just one common motor and it was connected to all the lenses, so moving the iris on one lens did the same to all the other lenses, but they were not in front of the tube so not a problem, or was it?

Even the BBC blanked out lens positions in the Turret

The lenses had focal lengths given in inches, (pre-decimal days), the widest being 1" then 2" up to either 8" or sometimes 12" (12" is a little long for studio work and the longer the lens the shallower is the depth of field and camera wobble is a problem). The focus is controlled by the camera operator and as we all know is a product of the distance from the lens to the subject, move the camera or if the subject moves then it needs to follow.

The common rookie mistake is to go the wrong way, you need to be aware if the camera and the object are moving nearer or further apart and to be able to keep focus, but do not over or under do it, this takes practice and getting this wrong when, viewed on a small electronic viewfinder on the studio floor under rather bright lights, can be seen by everyone in the gallery looking on much larger monitors and in much better lighting conditions. The gallery wants usable pictures at all times and are unforgiving on somebody that takes too long to get focus or change lenses again you will hear it in your headphones.

I don't know the history of the EMI cameras, but I did wonder if the motor came from a four-turret model as it struggled to move five irises' at once. It just made it with new lenses or lenses that had just been serviced, but if they were due for an expensive service then they needed more power than the motor was capable of delivering.

The solution, was remove a lens and fit a blanking plate and well just one more problem to struggle with when operating a camera, remove a good picture and replace it with a blanked out lens and then go black deprived the gallery of a picture for 5 seconds or more and your headphones delivered a rocket for you and all the other cameras to hear.

Early Studio Gallery

There were other functions to get on top off, the head was mounted on a pan and tilt head and it did allow for some very smooth camera work, perhaps the simplest task.

The final problem was moving the camera, the head weighed probably getting on for a 100lbs (50Kg) and was counter balanced with an equivalent amount of lead weights, so it could be telescoped up and down and the whole assembly wheeled across the studio floor.

The pedestal had three wheels and two modes- one-wheel steering and three-wheel steering. You rotated a large ring which gave the direction of travel and used one-wheel steering as it followed your chosen subject, moving on the floor in a much more desirable arc, but again something you could get wrong. The camera took some pushing particularly as you are trying for a graceful camera move on shot, that will need the pan and tilt head moving and most probably focus all at the same time.

Typical stock shot of a Camera Pedestal, steering gear and the lower section where the lead weights go

Another rookie mistake is to try to track the camera on a long focal length lens, always track on the widest lens only, despite the commands coming from the gallery in your head phones, they are not the experts and may not have ever tried operating a TV camera.

This moving of the camera (tracking) provided some interesting effects, unlike a modern day zoom where the picture just gets bigger and smaller the picture actually changes as the 3D geometry changes.

Imagine looking through an open door at something at the other side as you walk through the door, its door frame will no longer be in shot and the parts of the kitchen that were hidden by the door frame will come into shot. (see link 1)

This is so often seen in the film making industry where Zoom lenses are just not in vogue and camera moves are, TV camera operatives have become lazy and camera moving on shot is in decline and a picture size is controlled by the zoom lens. I think this de-skilling is a shame and the loss of hard won skills is always a pity.

My week on the studio floor came to an end and I left better skilled and much wiser. That was not the end of the shake down exercises they happened about every other month, slowly I got to appreciate how a TV team works together and was better for it. I think even now I can stand on a studio floor and explain what every light does and why it's there.

My life changed in the studio as I honed my skills in what was part of a University just as other opportunities beckoned with fresh challenges. I then went to work in ITV, in a role that did not involve camera work, so they will never know what they were spared. I loved my time in the University studio, but the challenge of better kit, colour and video tape, was calling, but that's another story.

The last time I came near one of these hulking brutes, was a network golf tournament (no I do not play golf). The cameras had evolved and were colour and zoom lens equipped, the reserve cameraman had been bringing me tea on a regular basis when I was working in a VT truck with no relief , my new role in life. When my relief finally turned up, I returned the favour and took him some tea out to one of the far camera outposts (good chance to try out a golf buggy).

The trick on this camera position was to follow the ball from tee off up into the sky and down onto the green or where it eventually landed. This involved a lens we all called the big Schneider.

Outside Broadcasts are always where long lenses come into their own. The lens was later borrowed by ITN to film the Iranian Embassy siege. To my horror the racks operator never changed the exposure so in the burnt-out sky it was impossible to see and follow the ball.

I did comment, and he said yes, it's easier of course for the racks operator as the exposure is the same when the ball lands, but not helpful for the camera operator. It was just the one racks operator, others are more helpful.

Back to my outpost manning a VTR machine, but it does make you think about team work. I know the man with the impressive title and Navy experience would have kept the racks operator well away from the depth charges, safer for everyone on both sides.

• *https://www.youtube.com/watch?v=T91YvMBm3E8* - 7 seconds in see the two vertical post move, a camera move not a zoom

• *https://www.youtube.com/watch?v=ud1zpHW3ito* - probably the longest lens ever used to get all the desert heat shimmer

• *https://www.youtube.com/watch?v=0vLWt2qVPPI* - Large Schneider in operation, needs a good quality mount and steady hands

1999 and a exhibition of 70s kit. A full colour camera with a zoom lens mounted on gas pedestal kit well beyond the University budget, but yes, I could have pushed it higher.

A more up to date TV camera and a Schneider lens

Written by John Hudson - G3RFL

After building the 100W Power Meter for 23cm published in **CQ-DATV 11**, a requirement arose for a lower power meter working in the 3cms band, 10.425MHz and then revising the PCB and display and adapted the code to produce a 5 watt version in **CQ-DATV 18** I decided to take things a step further and see if it was possible to combine the two designs into a single power meter that could be dual range.

I used the same PCB and LCD display that the 23 cm power meter used in CQ-DATV 18, as it worked well on the 100 watt power meter.

I added an additional switch between pins 2 and 4 on the programming socket and this will select either 100 watt FSD or 5 watt FSD. it's all down to the detector you use, which is an RF to voltage converter and +5v will equal either 5 watt or 100 watt depending on the switch position.

The frequency is also down to the detector and can be anything up to 3cms depending on the choice of detector. The work all went into revising the software and adapting the PIC code without a total re-write.

The very nice LCD display produced an attractive white characters on a blue background. The display required an I2C interface, which is provided by a PIC30F4012.

This is a very impressive chip. It has its own internal xtal and uses a X4 PLL to make an even faster clock. The display is two lines and the top line is programmed to show a bar graph in 80 steps. The second line has got some fixed things that never change such has the "W" and "dBm".
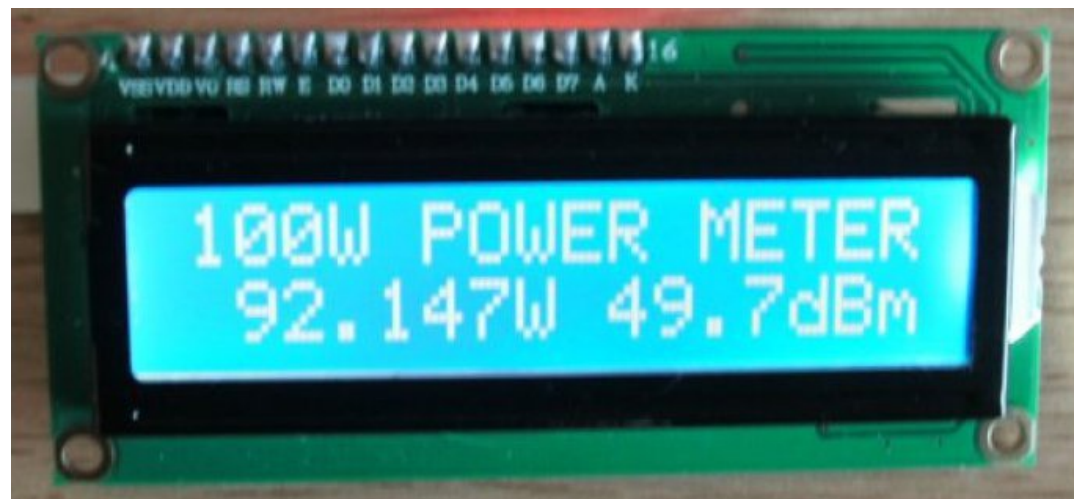
I2C LCD display produced White characters on a Blue background

The unit can be tested without the detector, just supply a variable voltage (not exceeding 5volts) and the power display will change as the voltage changes. With 5watts going through the SMA/SMA 10dB 2W attenuators, you get just 500mW out of the pad and into the waveguide detector. This should produce 7V so if we pad that down to 5V then bingo, the PIC A/D 10 bits can interface to this DC input.

At an A/D value 1024, the display power wants to read 5watts or 100watts depending on the switch position. So we have 6 digits and 3 digits for the dBm scale. The PIC software takes an A/D value, squares it then divides it by 65536 then divided the answer by 10465. Now we have the whole watts, so we save that. Next we multiply by 1000 and divide by 10465. Now we have the milliwatts figure, so we save that.

Next, and this is the harder bit, convert these two values into dBm (0 to 50) with a fraction left over. This took 48 bit maths, real genius how it works. Multiply the watts value by 1000 and add the milliwatts to it. This gives us a big number that is the total value, now in milliwatts. Now divide this by the magic number of 1.258927714 (this is about 1dB).

3cm 5W Power Meter Bar Graph

16 full blocks each with 5 steps total of 80 steps range is 0.001 to 5Watts

FULL block	POWER m/W	dBm
1	20	13.0
2	80	19.0
3	200	23.0
4	325	25.0
5	500	27.0
6	700	28.7
7	1,000	30.0
8	1,300	31.2
9	1,600	32.1
10	2,000	33.0
11	2,400	33.8
12	2,850	34.6
13	3,400	35.4
14	3,850	35.9
15	4,400	36.5
16	5,000	37.0

23cm 100W Power Meter Bar Graph

16 full blocks each with 5 steps total of 80 steps range is 0.5W to 100Watts

FULL block	POWER m/W	dBm
1	500	27.0
2	1,800	32.6
3	4,000	36.0
4	6,500	38.2
5	10,000	40.0
6	14,500	41.6
7	20,000	43.0
8	25,000	44.0
9	32,000	45.1
10	40,000	46.0
11	48,500	46.9
12	57,500	47.6
13	67,250	48.3
14	77,000	48.9
15	88,000	49.5
16	100,000	50.0

5 Watt Power meter bar graph, left. 100 Watt Power meter bar graph, right

The answer is in dBm with a fraction left over. Convert all these 9 digits to ASCII and deliver to the LCD. Job done. Not quite - you have to add leading zero blanking on 3 digits. To correct the values from the 100W values to give 5W readings, we just DIV by 20.

Detector

The last building block is the detector that will rectify the microwave RF and produce the DC required by the power meter. There is a lot of history to RF detectors. The first was a COHERER which was a glass tube full of sharp iron aligned themselves and created a short across the terminals. However on the RF being stopped they still shorted out until the tube was tapped by anything that vibrated, known as a decoherer. Thus CW was born.

A more sensitive detector was required so then a vacuum tube detector was born. The start of the valve (tube), before the days of semiconductors.

Today we do have semiconductors and it's in this field we find the detector used for our meter. The power is the square of the voltage measured times the termination, in our case 50 ohms. The power is mainly terminated in a dummy load and the detector senses the voltage across it. Best to dissipate much of the power by adding an attenuation pad in front of the detector, say 10dB, thus not blowing the socks off the detector diode.

After building several of these to try and see what was required, it finishes up I need a low capacitance diode with low volts drop. So I started out with a HSMS2822 Schottky device with two diodes so we get full wave rectification of the RF. I soon found that I needed lots of values of decoupling caps with short leads. This then led on to using SMD components, as indeed the detector has as well.
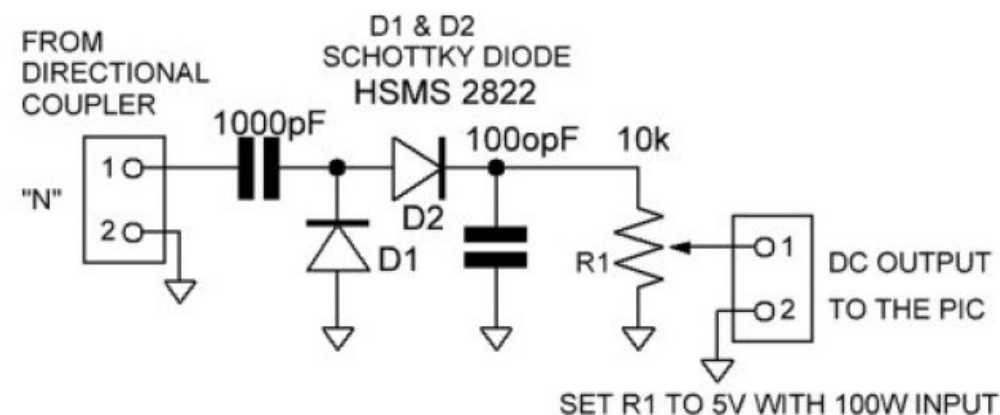
Now on V5 of these and I do not want standing waves on the device so its correct over a wide frequency range. First I tried FR4 D/S PCB and lots and lots of links through the PCB, even at one time I tried nuts and bolts and its input was SMA.

After lots of versions I finished up using a waveguide detector and sender head coupled together with the Full Power 5W going in to it and RAM (Radar Absorbent Material) up the middle of the Waveguide.

This caught fire with the RAM material now turning to graphite dust and epoxy. This was too messy and had other problems. The answer was to buy a 10dB 2 watt attenuator on ebay.

A nice little brass unit, SMA in, SMA out, about 10mm diameter.

To heat sink it, a brass collar was used. So we now have the power down by 90% and I fed this into a microwave SMA Waveguide sender (actually an "N" connector with adapter), then coupled that into a waveguide detector.

This will measure the peak voltage so it needs scaling down by 0.707 to get the mean value. As shown in the photo from the TX I now have 5W of RF and my detector needed to be loaded with a resistor to give 5V output which was equal to+37dBm or 5W.

Note:

At 5W input you will have to restrict the time it's on for otherwise the attenuator will over heat, but you can get 1dB ,2dB, 3dB attenuators to get rid of the heat. I made a brass heat sink to slide over the 2Watt attenuator and it does get warm after 30 mins (about 30 Deg C).

Oh, I had to turn the detector diode around to give a positive voltage output. Not sure about this being 100% linear but it does give a constant level to tune things up to as a reference. You can correct for the bottom end error by adding a resistor of 20K or so from the detector to +5V.

Once I had solved all the problems, the unit started to evolve and take shape. The single sided PCB was drilled and populated and the PCF30F4012 was programmed with the revised code. (This is available for download on the *CQ-DATV* site).

The case was from MAPLINS (N77AL), just gone up in price (about £15), but could be easily adapted to take the LCD display, which was sourced from eBay. The 2watt 10dB attenuator from ebay was mounted externally to the case.

The 100 Watt coupler

The 100W version requires a 20db coupler. Mine came from eBay at a very reasonable price.

If you are not familiar with this sort of technology it has an input and an output so it can be connected in line with your antenna or dummy load. It also has a third port where RF is coupled via a pickup line and delivers a signal which is 20db on the original signal.
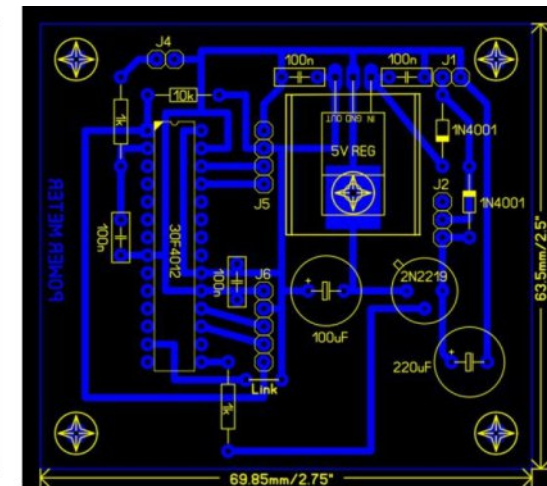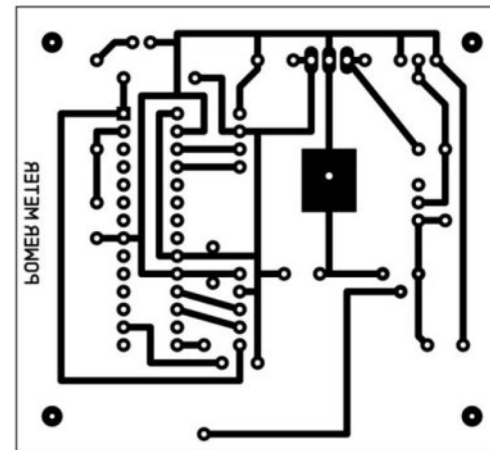
I purchased several of these units and because they all will handle high power. The coupling loop is terminated with a 5W surface mounted resistor so in theory they would handle 500W down the inline path, but I am only interested in 100W, for some time to come.
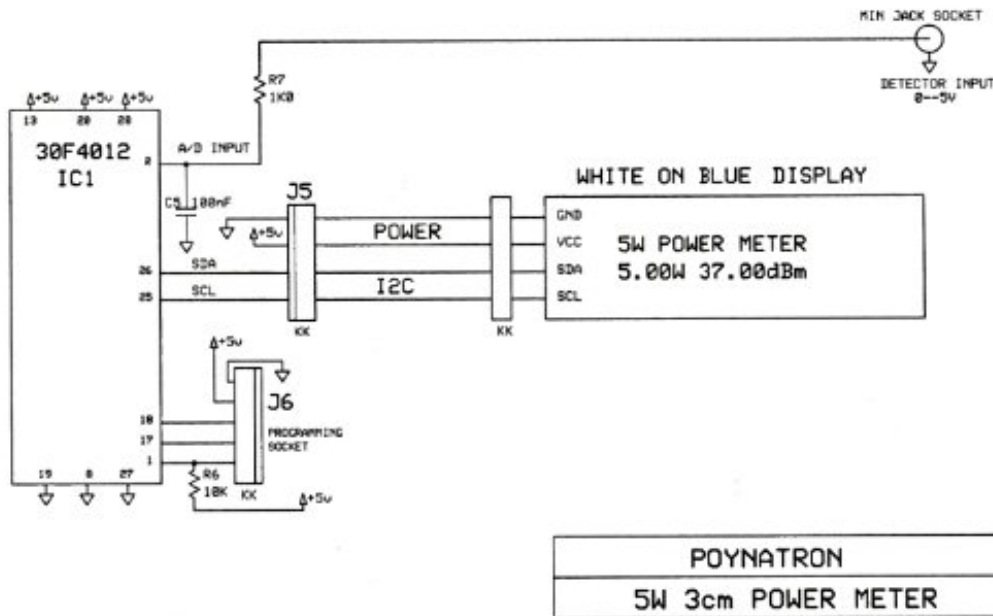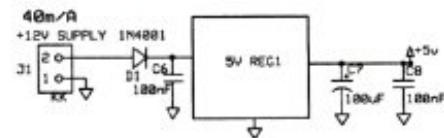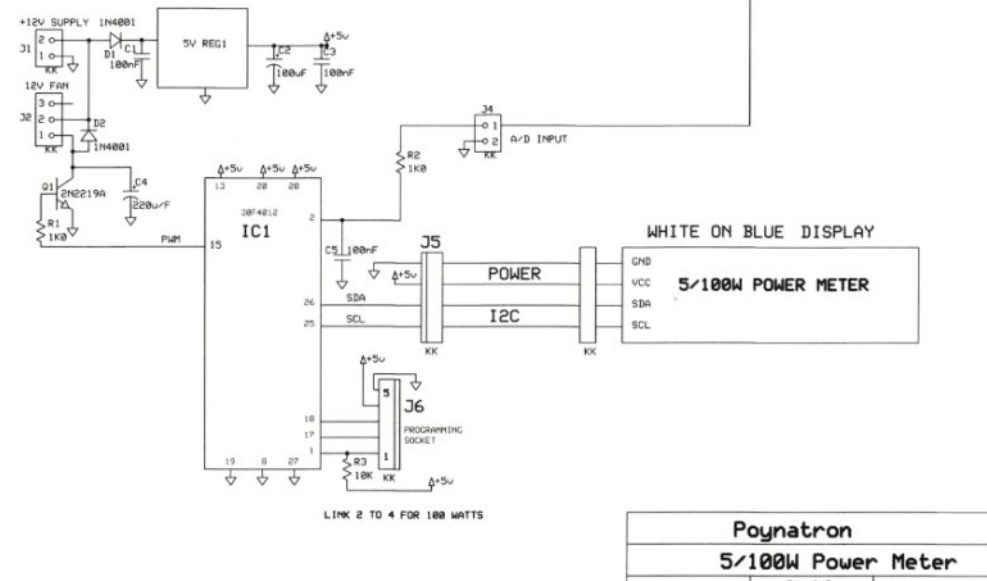
The 20db Coupler

ATV the Best Learning Hobby in the World, John G3RFL
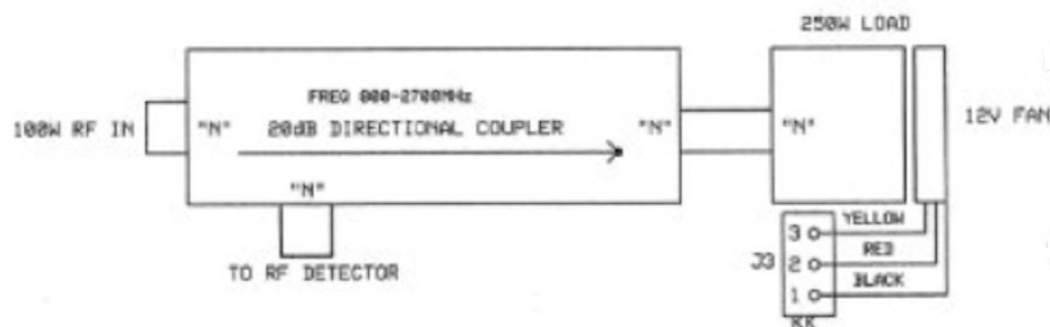
Original PCB from CQ-DATV 18

Original Power Meter from CQ DATV 18

POYNATRON
5W 3cm POWER METER

Revised Dual Range Power Meter 100w/5W

WARNING FAN WILL CUT YOUR FINGERS

Poynatron
5/100W Power Meter

Written by Armand Hoffstetter KD0PXF

These days, older, power hungry, computers are replaced as the low power boxes quickly pays for themselves and then some! I upgraded to windows 10 while free, one such computer does a great job driving my HiDes DVB-T transmitter.

I settled on using the "desktop" as a white board and skipped the usual mixing hardware. Almost any source can be expanded to full screen if desired.

There are two major problems to work around and this may save some effort.
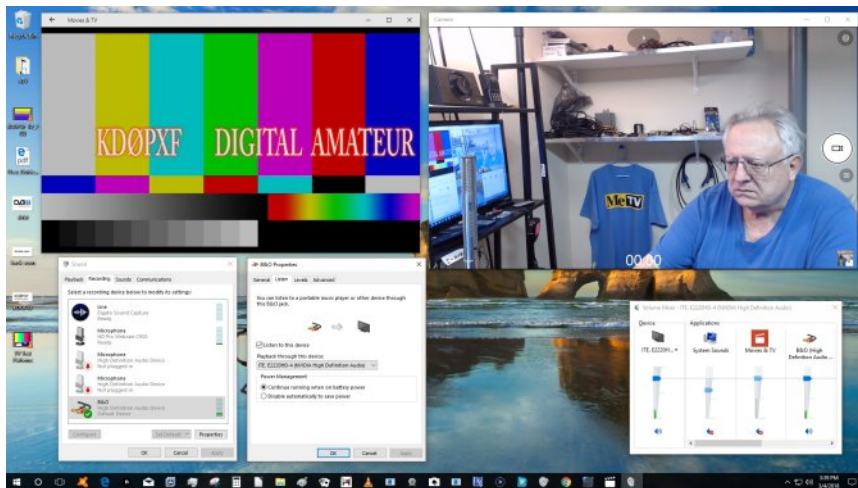
Audio

The video card must be capable of HDMI audio output. The correct microphone input must be checked in recording devices and, in the properties the listening box must be checked [stereo line in for my use]
In the audio mixer output, transmitter audio is selected much as one would a brand of TV.
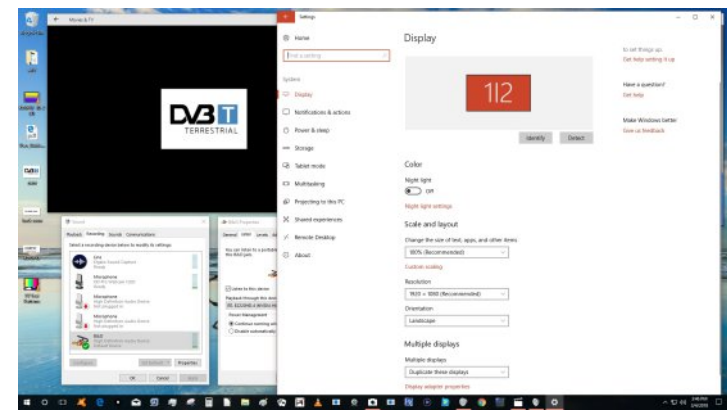
Video

Of course use a good video card capable of 1080-p 60 if that is your goal.

Duplicating the "desktop" to a monitor, one must have a monitor capable of 1080-p otherwise the video card defaults to a lower common resolution.

Results

Easy to manipulate, bringing video and audio clips or stills from where ever they are digitally stored and adding commentary to the transmission.

$70 USD for a nice web cam, then using the win-10 camera app it produces live video, 1080-p 30 fps but newer ones may be better.

Best of all a seamless stream to the transmitter at minimal cost!

A capture card is handy for the older sources.

If you need a Mic. Preamp [as I did] get an inexpensive op-amp phono preamp and remove the caps from the RIAA curve circuit. Flat and plenty of gain.

External links

If you have an eBook reader that does not have WiFi then you will not be able to use the hyper-links in this publication. If you have an eBook reader that has WiFi then you will be able to providing you are in a WiFi zone.

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Although a formatted article showing the layout can be sent, we prefer an unformatted text file of the script, along with annotations of where important images should be placed. All images should be identified as Fig 1 etc and sent seperately.

Images should be in PNG format if possible and the best quality available. Do not resize or compress images, we will do all the rework necessary to publish them.

If you are sending a construction project, please include the dimensions of any pcb's and make the pcb image black and white, not greyscale.

CQ-DATV reserves the right to redraw any schematics and pcb layouts to meet our standards.

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