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The CQ-DATV editors gratefully acknowledge all those authors that have contributed articles for this free magazine.

Production Team

Ian Pawson G8IQU
Trevor Brown G8CJS
Terry Mowles VK5TM
Jim Andrews KH6HTV

Contributing Authors

Jim Andrews KH6HTV
Trevor Brown G8CJS
John Hudson G3RFL

Editorial

Welcome to issue 100 of our electronic ATV magazine.
Well, all good things must come to an end and CQ-DATV is no exception. This is the final ever edition of the magazine!
The editors would like to thank all the people who have contributed articles and pictures over our 100 issues.

If you would like to continue reading about ATV then the Boulder ATV Club's newsletter is also a Free, via the internet publication. Any CQ-DATV readers who would like to read news about ATV could contact Jim via e-mail *kh6htv@yahoo.com* and ask to be put on the distribution list.

Trevor

Let me introduce myself, I am Trevor Brown an author of numerous articles published in "Ham Radio Today" Electronics Today International, Radcom and CQ-TV. I am or was the force behind the ATV handbooks that are now preserved in digital format in the CQ-DATV on-line library.

For me ATV and television engineering are the same thing. I have held an amateur licence since 1966, callsign G8CJS. I also had another callsign, G6AGM-T again dating back to the 60's and was necessary to be able to transmit television pictures. When I started ATV, the technology was valves and CRT's. The only band a TV picture could be exchanged on was 70 cms, but it did extend to 450 MHz I have also spent the majority of my working life in ITV, I started as an engineer in 1972 and left as a videotape editor in 1998, to build my own TV production company.

My role in the production of CQ-DATV has been in the actual copy, writing it, editing it, and encouraging others to contribute. I have been part of the CQ-DATV magazine production team from the very first issue and contributed to every issue.

I believe it is important to support TV engineering we have lost so many engineers to the relentless march of technology. At every step we either lose engineers, or they limit out impaled on the glass ceiling of progress. To stop this, we need to support each other along the lifelong learning curve. We can do that if we share our ideas our plans, designs and our understandings. To this end we need communication mediums and I hope CQ-DATV magazine has provided one of those mediums.

CQ-DATV delivered its support via digital only publishing. This was a brave step but having lost the Dutch ATV magazine "Repeater" and the German ATV Magazine "Der TV Amateur", it was time to try a different approach. Ian Pawson was the power behind digital publication, he introduced the technology when he was the editor of CQ-TV and by the time he left over 90% of the membership had switched to receiving their magazine digitally.

When Ian started CQ-DATV magazine, the format was e-book only, but with Terry joining the team and producing a PDF version we had all the bases covered. Were we successful ? well with more than half a million downloads in 8 years I would say yes, no other ATV magazine has done this! It was the result of digital publishing, coupled with producing a publication every month and free distribution. This would not have been possible unless we had embraced digital publishing technology.

Digital only as a formula does not inhibit anybody from reading CQ-DATV, there is no justification to produce a paper copy too. If we had, we would have to have faced the dilemma of the inevitable charges that would have been the only way to fund printing and posting costs. These suffer from the economy of scale and even for something as well read as CQ-DATV they are just not economical in these numbers.

This is before we question the green credentials or rather the lack of them that distributing a magazine in paper format would incur. CQ-DATV has been green or as green as electronic publishing can be and the whole team is proud of that.

The production team is now 8 years older than when we started and also 8 years wiser. Our magazine has a varied content and is not just, how to put a picture onto a carrier wave in the amateur radio band, we have taken a wider approach from making your own video's to almost anything TV related. We have supported construction wherever possible. The 29-part conversion of a Grass Valley mixer panel, which can be used to control Vmix is probably testament to that.

Sorry CQ-DATV is resting, it sounds so much better than ending and less final. We have proved it can work, we have also proved its value, we have just failed to rally the production support it deserves to keep the presses rolling. We are not short of readers we just needed a larger production team to continue. There have been a lot of outstanding contributions . The downloadable electronic index credits everyone who has contributed, and I would like to say a personal thank you to you all, without you we would not have survived the 8 years we have.

Our Facebook will continue, and the download site and library will still be there, what will not be there is CQ-DATV 101 as a downloadable magazine, sorry we did our absolute best. Will we rise like the Phoenix ? this is unknown at this time , but please add your details to the mailing list and join the CQ-DATV Facebook and then we will be able to contact you.

Terry

Well, what can I say? It was great journey while it lasted and yes, it is sad to see it go.

Like many, I too have done my time in the TV broadcast industry, both in production and on the technical side, in places from national broadcasters to small 3 person outfits in the private sector. This was back in the days when the ability to do the job was more important than the piece of paper from some (useless) educational facility saying they think you know something about it.

Travelling from the very top to the very bottom of New Zealand was one of the perks of the small private outfits, while the training and inspiration of places like the national broadcaster was worth more than any classroom was ever going to give.

I loved every minute of it and given the chance, if I could go back in time, I would do it all again.

While I had never really settled in any one place for any length of time, I did occasionally get to dabble with the amateur side of tv and there are still some remnants of those days still hiding around the place. The 1200MHz downconverter and antenna, a full spec, big and heavy ENG camera sitting on top of the wardrobe (and yes, it still works) and various other bits and pieces of a bygone era.

As witnessed by the content in this magazine, the amateur tv sector has moved on considerably what with digital tv, incredibly small and light cameras and various other modern devices in the electronics field that can enable an amateur to do a full studio setup in their own home.

Along with producing the PDF version of the magazine, I was also learning new things related to ATV and boy is it an interesting and fast moving niche in the ham radio world.

My hope is that someone, somewhere may just come along and have a go at doing something similar - yes I know there is the internet, but you have to go hunting and it is nice to be

able to access one point - like this magazine - that has a wealth of information at your fingertips.

Jim

I am sorry to see the demise of CQ-DATV. Ian, Trevor and Terry have put together a very slick, professional, electronic magazine documenting the events of our ATV hobby.

However, I have full sympathy for the "burn-out" factor. In the past I was the editor of club newsletters for a couple of ham clubs. When readers fail to provide material, it becomes increasing harder to put out a quality publication month after month.

I am a bit of a new-comer to CQ-DATV. Ian asked me to join them in the fall of 2018. That same year, I had started a newsletter for our Boulder, Colorado, USA ATV group of about 20 hams. I wrote some articles directly for Ian and he also picked up articles from our club newsletter which he felt deserved wider circulation.

Since 2018, our club's newsletter has grown to become the "de-facto" ATV newsletter for the USA. It's distribution has grown to over 450 hams nationwide and some overseas. The newsletter is not a professional one like CQ-DATV, but more the home typewriter style with pasted photos. It is only published in .pdf format. I keep it to a readable, short length of about a dozen pages. It is published at least monthly, and usually more often as material becomes available.

All is not lost for CQ-DATV readers. As Ian mentioned above, if readers want to continue to read about news and developments in ATV, they can subscribe to our FREE, on-line TV Repeater's Repeater. Simply send an email to me with your name, call sign, email address and say you were a CQ-DATV reader. Our newsletter will be sent to you as an email attachment.

All past 85+ issues are archived on my web site at:
https://kh6htv.com/newsletter/

Ian

Well, it has been an interesting time in the ATV magazine world. Most of the ATV magazines, both printed and electronic, have gone to the great bit-bucket in the sky and, sad to say, CQ-DATV is joining them.

We have had a lot of readers for each issue, but, sad to say, not many authors. So we have been forced to find content by scouring the Internet for suitable material, a situation that can't continue.

The ePub and PDF versions of this magazine were created using combinations of:

Sigil-ebook, Gimp, Ghostwriter, Calibre, PaintShop Pro & Scribus

World Wide ATV QSO Party

The event was held on Friday, August 27th. Peter, VK3BFG, again organized the ATV activity involving ATV hams in the USA and Australia. Various repeaters' signals were sent to Peter over the internet and then redistributed from Australia via YouTube and Zoom.

Peter Cossins VK3BFG, Friday night opening address

The video is presently archived on YouTube at Ian, VK3QL's site: *https://tinyurl.com/2pvyjvj3*

It is recorded in four parts of lengths: 1:31, 1:20, 5:36 & 0:17 hours. Mick, VK3CH, has written an excellent summary of the QSO party complete with photos of all the many participants. It is published in the latest North East Victoria Amateur Radio Club NEWS newsletter for Sept. 2021. It is available in .pdf format from: *https://tinyurl.com/46wp48ck*

My sincere apologies to those participating and watching. For our Boulder portion, I had asked for a 1/2 hour time slot on Friday evening. I had arranged for us to present a program with myself first talking about how we recruit new hams, then Ed, K0JOY, was to talk about our weekly nets, then Chris, K0CJG, about his experiences as an ATV newcomer, and finally Don, N0YE, about our off the repeater ATV activities.

Well, the result was we ran way over our allotted 1/2 hour time slot and totally screwed up Peter's schedule. I take full responsibility for the screw-up. I should have had our group do a "dry-run" on our own ATV net ahead of time to find out we needed to severely tighten up our presentations. I wish Peter would have exercised his program director prerogative and simply turned off our TV feed to him.

I guess we really proved we are AMATEURS at TV. Thus the acronym ATV is very appropriate. The ATV QSO party was definitely an amateur production and not up to the quality standards of broadcast TV such as from the BBC, ABC, NBC, CBS, etc.

Source: Jim, KH6HTV, Boulder, CO *www.kh6htv.com*

$17 DVB-T Receiver

Bob, WB0NRV, has discovered a really low cost receiver for DVB-T that actually works on the amateur 70cm and 33cm bands. It is made by Pantesat and the model number is HD-99T2.

It is sold on E-Bay for a ridulously low $13.69 + $3.39 shipping from China.

Bob brought it by KH6HTV's QTH recently to be checked out. We were able to easily program it successfully in the same manner as with the more expensive ($50) GT-Media receivers. Unlike the GT-Media V7 Plus for both DVB-T & S, this receiver is strictly for DVB-T. The receiver is quite small as seen in the above photo.

It comes with an attached AC power cord for 100 - 230Vac. The power plug is the European 2 pin. It can also be powered with 5Vdc via a USB port. The antenna connector is a PAL. It provides simultaneous 1080P HDMI and 480i composite video + stereo audio.

Source: Jim, KH6HTV, Boulder, CO *www.kh6htv.com*

ATSC 3.0 ROLL-OUT

For a summary of what is happening in the rollout of the new USA digital broadcast TV system, ATSC 3.0, check out this URL link: *https://tinyurl.com/s28xrj96*

At the SBE NextGen workshop, one of the speakers put up a map showing ATSC 3.0 coverage. Expected to be 30% of the country expected to have at least one station available by the end of the year. More than three dozen NextGen TV sets now on the shelves from LG, Samsung and Sony. This is rolling along faster than expected!

Source: Dan Rapak - WA3ATV, Trevose, PA

Portsdown 4 Update with Touchscreen RX Volume Control

Dave, G8GKQ reports,

I have just released a Portsdown 4 update (Version 202109051) which introduces a touchscreen-driven volume control for the DATV receiver.

Simply touch the far right of the screen, above centre for volume up, and below centre for volume down. Details here: *https://tinyurl.com/2bwa5k5t*

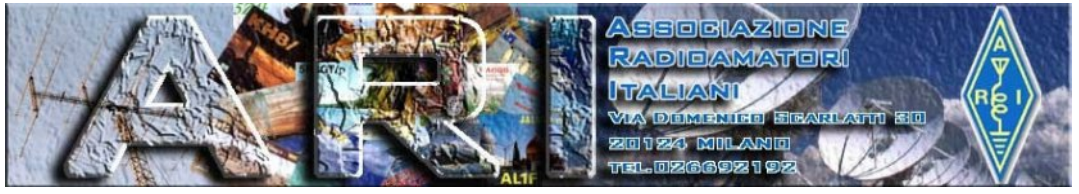
The idea is those who have built Langstone designs with the soft or rotary volume control can use their equipment for DATV reception without needing a hardware volume control. Volume settings are persistent between reboots.
Note this control only currently works for VLC (not OMXPlayer) when receiving DVB-S/S2 or DVB-T. The other media players will gain the facility as I migrate them away from OMXPlayer (which is no longer supported by its original author) to VLC in future updates.

Source: *https://tinyurl.com/rnrvffnz*

Hi-Des Firmware Issues

We have a major problem with equipment now coming from Hi-Des in Taiwan. Often times it is being shipped with Low Latency firmware installed. Hi-Des is trying to sell to the drone market and long latency (i.e. delay) with digital video is a major deterrent for drone pilots. Unfortunately the low latency firmware does not meet DVB-T commercial broadcast standards. Thus, a Hi-Des, low latency DVB-T signal will not decode in other manufacturer's DVB-T receivers, nor Hi-Des receivers with standard firmware. It can only be received by a Hi-Des receiver with the special firmware installed. Likewise a Hi-Des receiver with the low latency firmware will not decode a broadcast standard DVB-T transmission. This makes it incompatible with DVB-T Amateur TV repeaters which all try to adhere to broadcast standards. I have had to deal recently consulting with several hams who experienced non functioning Hi-Des equipment which they purchased and it traced back to the wrong firmware being installed. We discussed this issue back in April in our newsletter #75. I recommend everyone re-read it. If you are experiencing such issues, contact Calvin Yang at Hi-Des *calvin@hides.com.tw* and request he send you the proper firmware. You will need to follow the detailed instructions in the manual to install the correct firmware.
Jim, KH6HTV, Boulder, CO

Italian ATV



http://www.ari.it/ Welcome to this site, which aims to be a meeting point for radio amateurs interested in ATV broadcasts.

Everyone's contribution is required to enrich it with news and information. Each contribution can be sent by email to *info@atvitalia.it*

Continued on back page...

All about DVB-T2

Reproduced from NEVARC NEWS VK3ANE, Volume No: 08, Issue 8, August 2021

Digital Video Broadcasting - Second Generation Terrestrial DVB-T2 is the next development of the Digital Video Broadcasting - Terrestrial standards.

It builds on the technology and on the success of DVB-T to provide additional facilities and features in line with the developing DTT or Digital Terrestrial Television market. Although some may see DVB-T2 as a competitor to the existing DVB-T standard, this is not the case; it is planned that the two standards will co-exist for many years, with DVB-T2 allowing additional features and services.

DVB-T2 basics

The DVB-T2 standard uses Orthogonal Frequency Division Multiplex as the basic radio transmission medium. This form of transmission is particularly robust and allows for the reception of data signals (in this case television data) in the presence of some interference or missing channels as a result of effects like multipath.

Note on OFDM

Orthogonal Frequency Division Multiplex, OFDM is a form of signal format that uses a large number of close spaced carriers that are each modulated with low rate data stream. The close spaced signals would normally be expected to interfere with each other, but by making the signals orthogonal to each other there is no mutual interference. The data to be transmitted is shared across all the carriers and this provides resilience against selective fading from multi-path effects.

The new DVB-T2 specification provides the facility to select a variety of different options to match the requirements of the network operator.

For error correction technology, that used for DVB-S2 has been incorporated. This comprises LDPC (Low Density Parity Check) coding combined with BCH (Bose-Chaudhuri-Hocquengham) coding. The combination of these two techniques has been proved to provide excellent performance in the presence of high noise levels and interference.
As before, several options are available in areas such as the number of carriers, guard interval sizes and pilot signals, so that the overheads can be minimised for any given transmission channel.

DVB-T2 specification highlights

PARAMETER	DVB-T	DVB-T2
Number of carriers in signal	2k,8k	1k,2k,4k,8k,16k,32k
Modulation formats	QPSK,16QAM,64 QAM	QPSK,16QAM,64QAM,256QAM
Scattered pilots	8% of total	1%, 2%, 4%, 8% of total
Continual pilots	2.6% of total	0.35% of total
Error correction	Convolutional Coding + Reed Solomon 1/2, 2/3, 3/4, 5/6, 7/8	LPDC + BCH 1/2, 3/5, 2/3, 3/4, 4/5, 5/6
Guard interval	1/4, 1/8, 1/16, 1/32	1/4, 19/128, 1/8, 19/256, 1/16, 1/32, 1/128

While DVB-T2 represents the next evolution for digital terrestrial television, it is planned to operate it alongside the current DVB-T standard for many years and evolve the changeover to DVB-T2.

This evolution should occur in much the same way that has occurred between DVB-S and DVB-S2.

As DVB-T2 offers additional facilities, it will enable the broadcasters the possibility of offering new and captivating services to ensure that they are able to keep their viewers. Building on the success of the existing digital television services, DVB-T2 is bound to see a significant level of take-up over the coming years.

System differences with DVB-T

The following table (top right) is a comparison of available modes in DVB-T and DVB-T2.

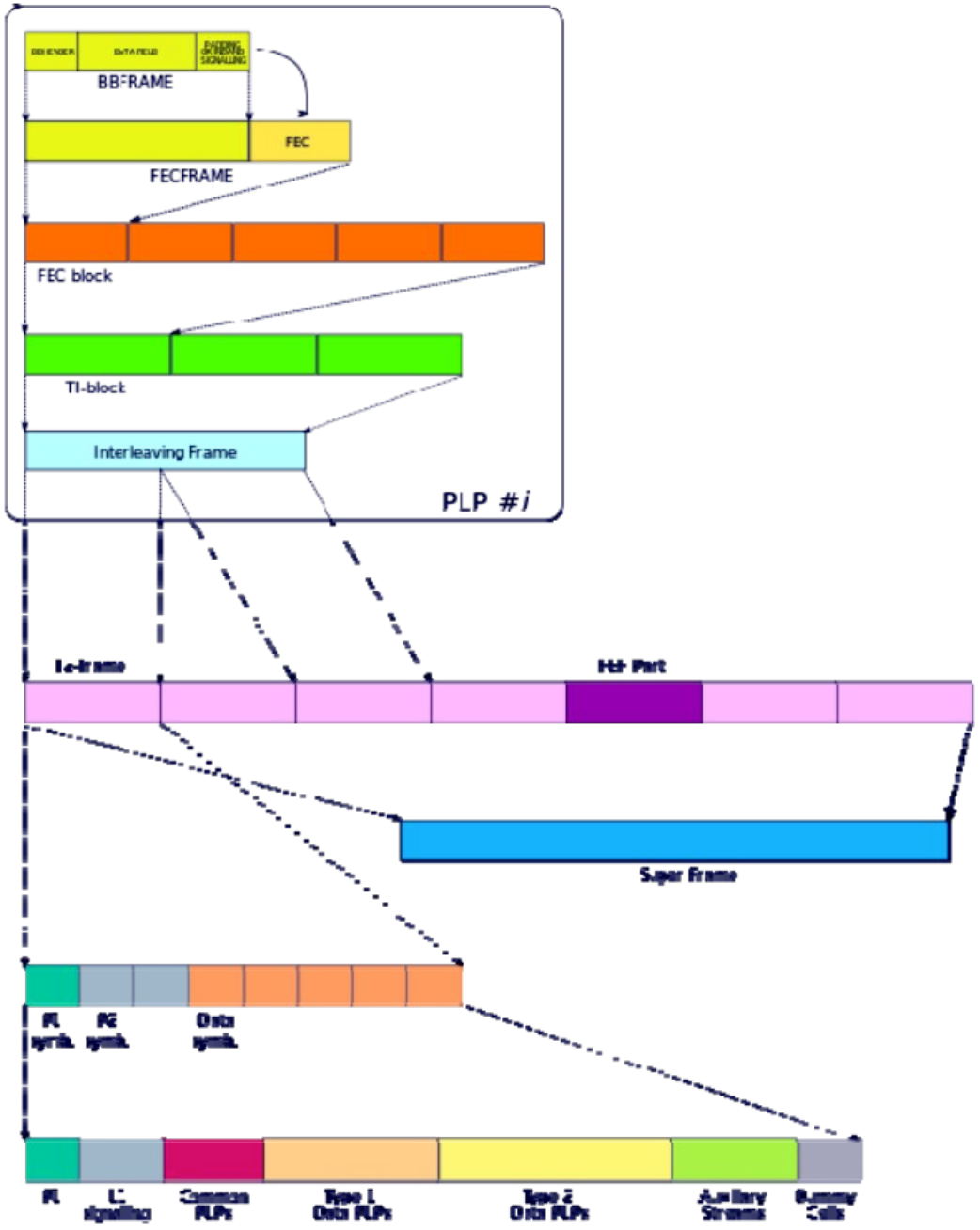
For instance, a UK MFN DVB-T profile (64-QAM, 8k mode, coding rate 2/3, guard interval 1/32) and a DVB- T2 equivalent (256-QAM, 32k, coding rate 3/5, guard interval 1/128) allows for an increase in bit rate from 24.13 Mbit/s to 35.4 Mbit/s (+46.5%). Another example, for an Italian SFN DVB-T profile (64-QAM, 8k, coding rate 2/3, guard interval 1/4) and a DVB-T2 equivalent (256-QAM, 32k, coding rate 3/5, guard interval 1/16), achieves an increase in bit rate from 19.91 Mbit/s to 33.3 Mbit/s (+67%).

Parameter	DVB-T	DVB-T2
Input Interface	Single Transport Stream (TS)	Multiple Transport Stream and Generic Stream Encapsulation (GSE)
Modes	Constant Coding & Modulation	Variable Coding & Modulation
Forward Error Correction (FEC)	Convolutional Coding + Reed Solomon 1/2, 2/3, 3/4, 5/6, 7/8	LDPC + BCH 1/2, **3/5**, 2/3, 3/4, **4/5**, 5/6, 6/7, 8/9
Modulation	OFDM	OFDM
Modulation Schemes	QPSK, 16QAM, 64QAM	QPSK, 16QAM, 64QAM, **256QAM**
Guard Interval	1/4, 1/8, 1/16, 1/32	1/4, **19/128**, 1/8, **19/256**, 1/16, 1/32, **1/128**
Discrete Fourier transform (DFT) size	2k, 8k	**1k**, 2k, **4k**, 8k, **16k**, **32k**
Scattered Pilots	8% of total	**1%**, **2%**, **4%**, 8% of total
Continual Pilots	2.6% of total	**0.35%** of total
Physical Layer Pipes	no	yes

The uptake of DVB-T2

When the digital terrestrial HDTV service Freeview HD was launched in December 2009, it was the first DVB- T2 service intended for the general public. As of November 2010, DVB-T2 broadcasts were available in a couple of European countries.

The earliest introductions of T2 have usually been tied with a launch of high-definition television. There are however some countries where HDTV is broadcast using the old DVB-T standard with no immediate plans to switch those broadcasts to DVB-T2.

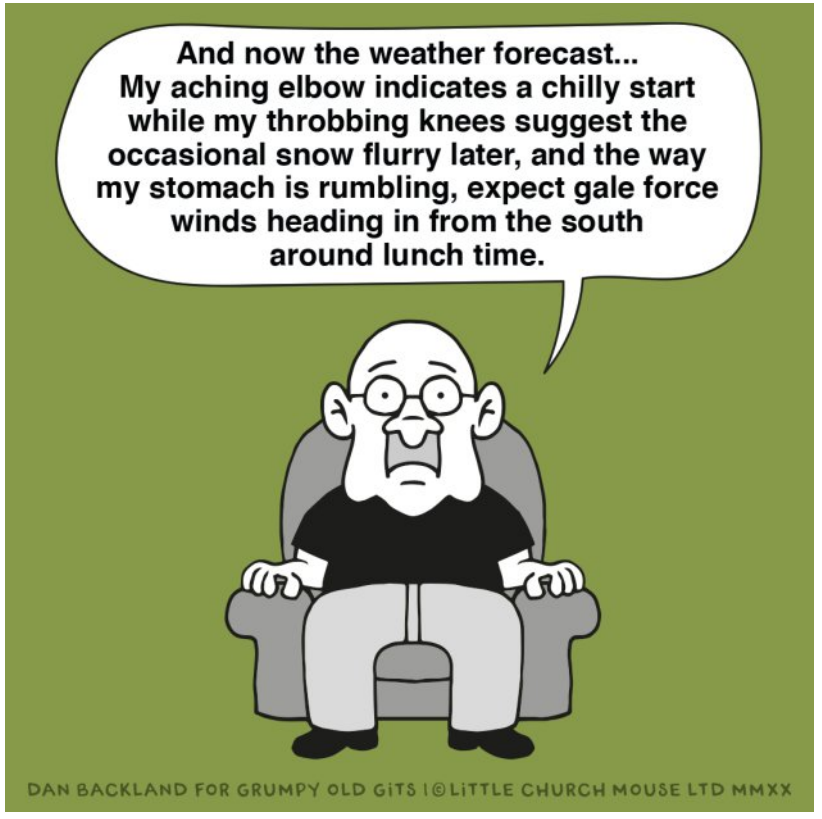


Framing structure of DVB-T2

Among countries using DVB-T for nationwide broadcasts of HDTV are France, Ireland, Italy, Norway, Denmark, Spain, and Taiwan. These are usually using MPEG4.

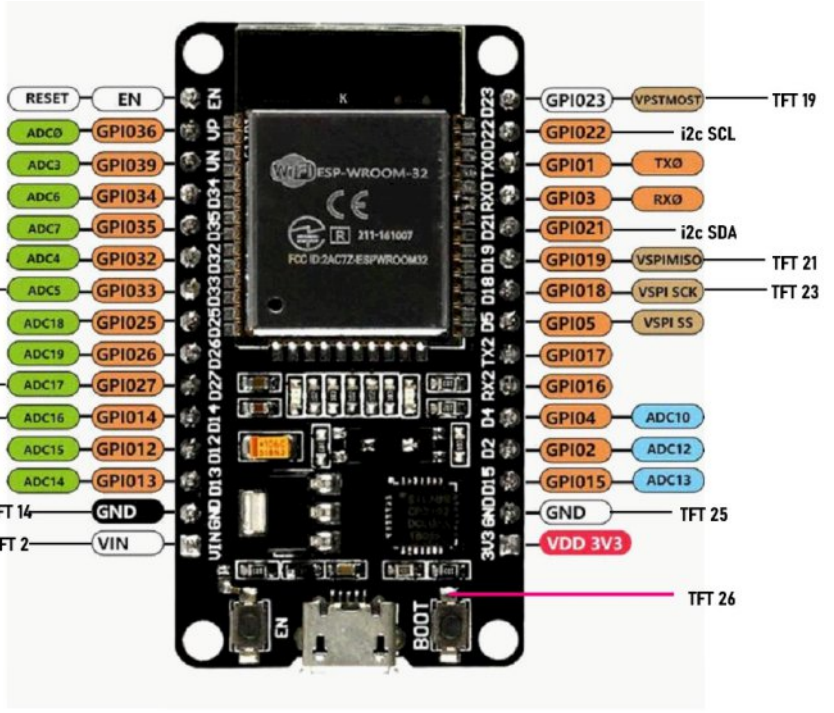
Australia started broadcasting HD content over DVB-T with MPEG2, although in 2015 some Australian broadcasters switched to MPEG4.

Source: *https://tinyurl.com/3bhnufnd*



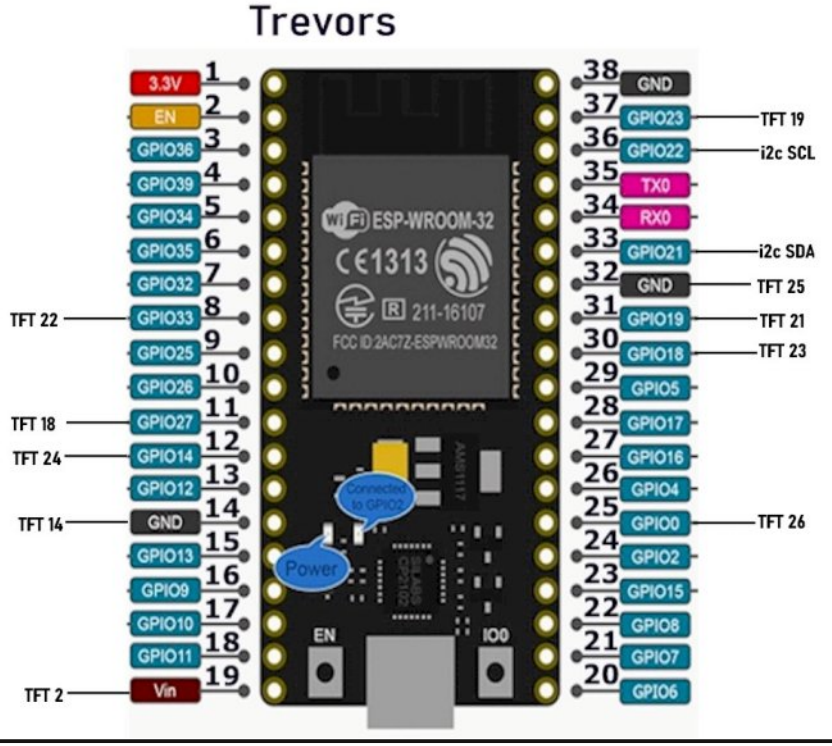
Touchscreen using ANNEX BASIC

Written by Trevor Brown G8CJS



Sad this is the last issue of the CQ-DATV magazine and I will do my best to conclude this article, or at least get it to a point where it can control the Robot Camera and pave the way for the development of interfaces for other equipment in the shack. CQ-DATV the magazine may be resting, but the download site and our Facebook site will remain active and open for developing this and other ideas. It would help if you joined our Facebook or mailing list or both, then we can contact you should the CQ-DATV magazine be resurrected.

In the previous two issues we have programmed an ANNEX 32 with a resident language ANNEX BASIC and connected it up to an ILI 9486 TFT touch screen and set up an I2C communications bus. I have received one or two emails about the different versions of ESP 32 development kits, there several different versions. I used the 38-pin version of this module, but there is also a 30-pin version around, so I have purchased one and put my engineering hat on to configure it for I2C and the touch screen TFT as per the previous issue.



There is one small problem in that the 30-pin module does not have a GPIO 0 brought out to one of the edge pins, it exists, but it is permanently wired to the top of the small right hand push button. Sorry, this is due to circumstances beyond our control, as they say in television. The missing connection on the board, can still be used it just requires a pin soldering to the top connection of the push-button.

I have redrawn both diagrams and indicated the TFT Touch screen and I^2C bus connections. There may be other versions of this module so take care. All the pins are printed with their functions; the print is small, and the pins are multi-functional, but there is a lot of help available on the net. Just ask Mr Google to show you some ESP 32 modules and you will soon find yours.

The challenge of this technology was never hardware interconnects, it was always going to be software and yes, we have walked into one or two challenges. One was the PDF version of our magazine, I wanted to push the value of an electronic magazine to the hilt as I feel it is the way to go, with its green credentials, https links and now cut and paste of software. We have been bitten a little with that last feature in that the PDF version does sometimes corrupt the software. The eBook version does not present that problem.

Fortunately, this clever friendly software points to lines with syntax errors and although the errors don't always show most times a quick retype of the syntax error line will cure it. Once this process has be completed and the save button pressed then you have a trouble-free version of the code stored as a text file inside the ESP 32.

The splash screen in CQ-DATV 99 can easily be edited to call any programme stored in your ESP 32 memory. This makes it function perfectly as an opening screen, taking you out to any programme you desire, but you will have to customise any existing software with a return button in order to get back to the splash screen and enter your next selection. Friendly ANNEX BASIC makes this not only an achievable task, but one we can all do once we get those little grey cells engaged. Remember there is always the on-line manual available by using the F2 key, and when that fails you can always ask for help on the ANNEX forum. Don't be afraid there are a lot of my dumb questions there.

Now back to the I^2C bus and a return to the Robot Camera which was part of the GVG project that first appeared in CQ-DATV 88.

This uses a custom servo module (SG90's) and an interface module based on the PCA 9685 chip. This module connects to the ESP 32 using the I^2C interface. It works just as well on an ESP 32 as it did on the ESP8266, (note the SDA and SCL are on different I/O connections), so the software commands now use GPIO 21 and 22 instead of 4 and 5.

Unlike the SPI bus, I^2C modules all sit at unique addresses and respond to commands sent to their specific address which is carried on the I^2C bus. All we have to do is discover which address the device is located at. We do this by scanning the I^2C addresses with a software routine. This won't tell us what the device is, only that there is an I^2C device responding at that address. If you have multiple devices, then you can individually remove them and see which address disappears.

Because the PCA 9685 module supplies the motors in the SG90 modules I have stopped drawing power from the ESP 32s and pressed a regulated PSU into service for the servo motors. I covered most of this in the GVG project in CQ-DATV 88, so this is just a recap. If you want to start controlling hardware with a Touch Screen, then you need to have some hardware and this inexpensive module was ready to hand. I have put this project together so far with plug and socket leads.

I have managed to leave my soldering iron out of the equation! The new challenge is to write some ANNEX BASIC that will control this new hardware configuration.

Once you have it connected then you need to check that the I²C bus is working and the easiest way is to do this is to run the I²C scanner software. This is the same as we used for the ESP 8266 in the GVG project, but the setup pins are no longer 4, 5. The ESP 32 uses pins 22 and 23 and these are not physical pins on the module they refer to GPIO outputs.

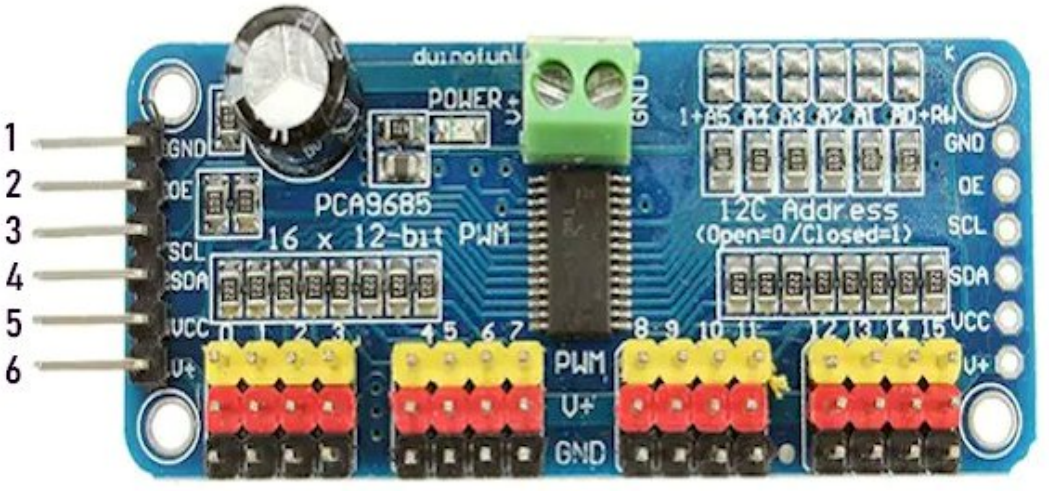
```
'I2C Address Scanner ESP32s
'print in the console the address of the devices found
I2C.SETUP 21,22 ' set I2C port GPIO 21 and GPIO 22
for i = 0 to 120
 i2c.begin i
 if i2c.end = 0 then
 wlog "found decimal address "; i
 pause 10
 end if
next i
end
```

My scan showed 3 populated I²C addresses as indicated below.

```
device found at decimal address 0
device found at decimal address 64
device found at decimal address 112
```

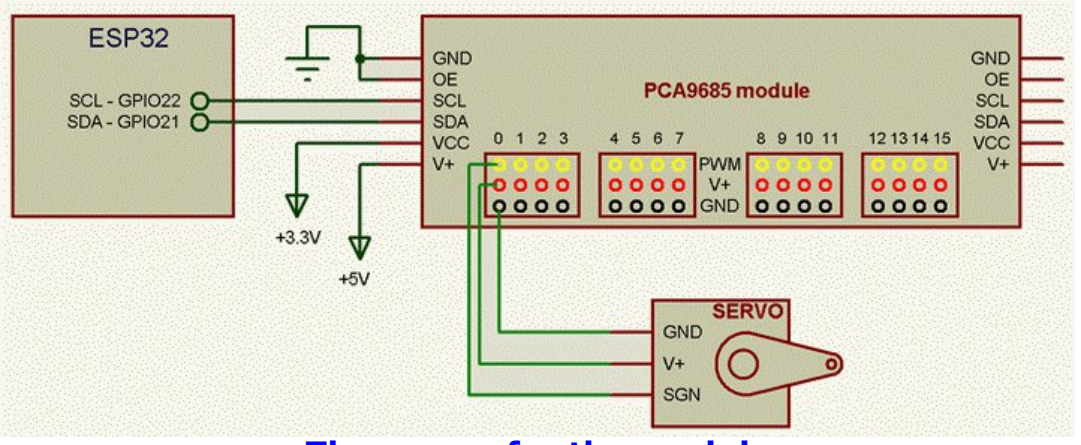
The module OE (Output Enable) needs grounding, but this does not stop it talking to the I²C bus.

Note: the PC 9685 has a separate side connection that powers the SG90's and is connected V+ which in turn supplies the red row of the connectors. Vcc +3v3 and is supplied by the ESP 32 and powers the onboard interface chip only.



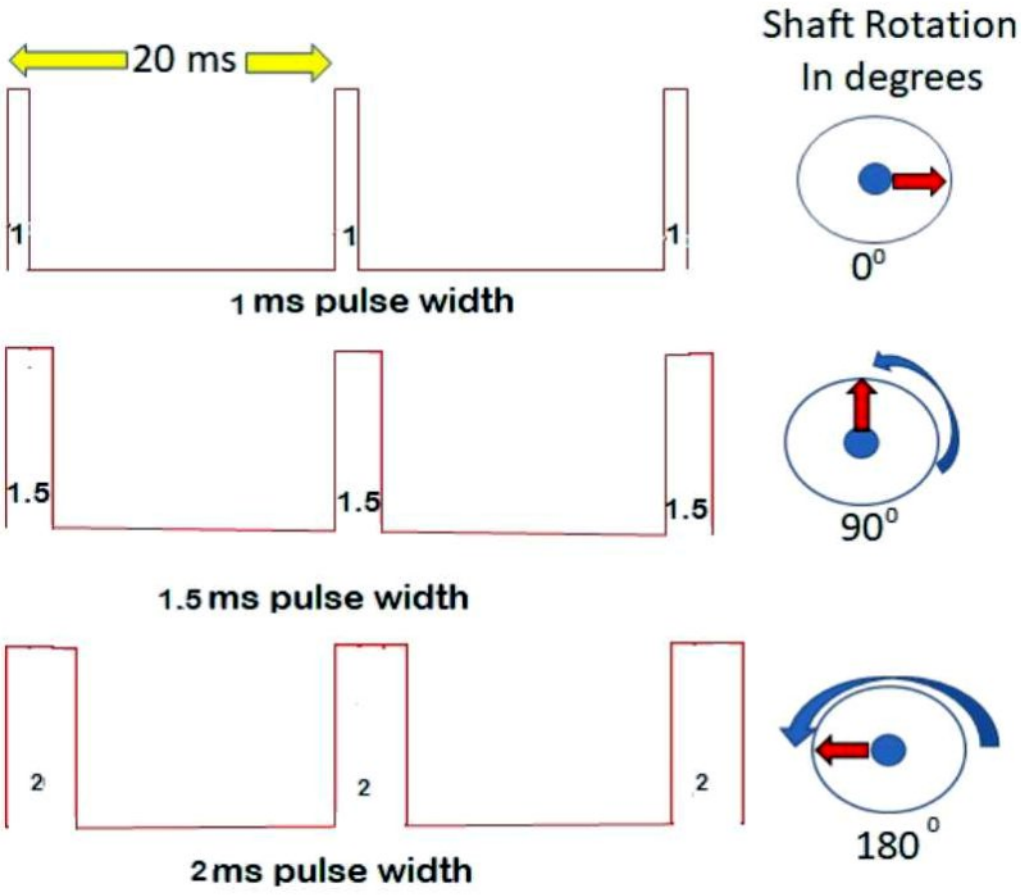
The modules I²C bus is configured with two 10k I²C pullups, so no external resistors are required.

The duty cycle for each output is adjustable from 0% to 100% with 12-bit resolution (4096 steps). This is used to control the SG90 servo actuators which have a slightly lower resolution. The PWM (Pulse Width Modulation) is set at a frequency of 50Hz by the software.



The power for the module

V+ is the power for the red row of connectors. The Vcc (3v3) can be provided by the ESP 32. The Vcc is more demanding and needs to be an external power supply.



V+ is also brought out to a tag block on the side of the module, so you are spoilt for choice on how to connect an external power source. Don't forget to ground OE (Output Enable).

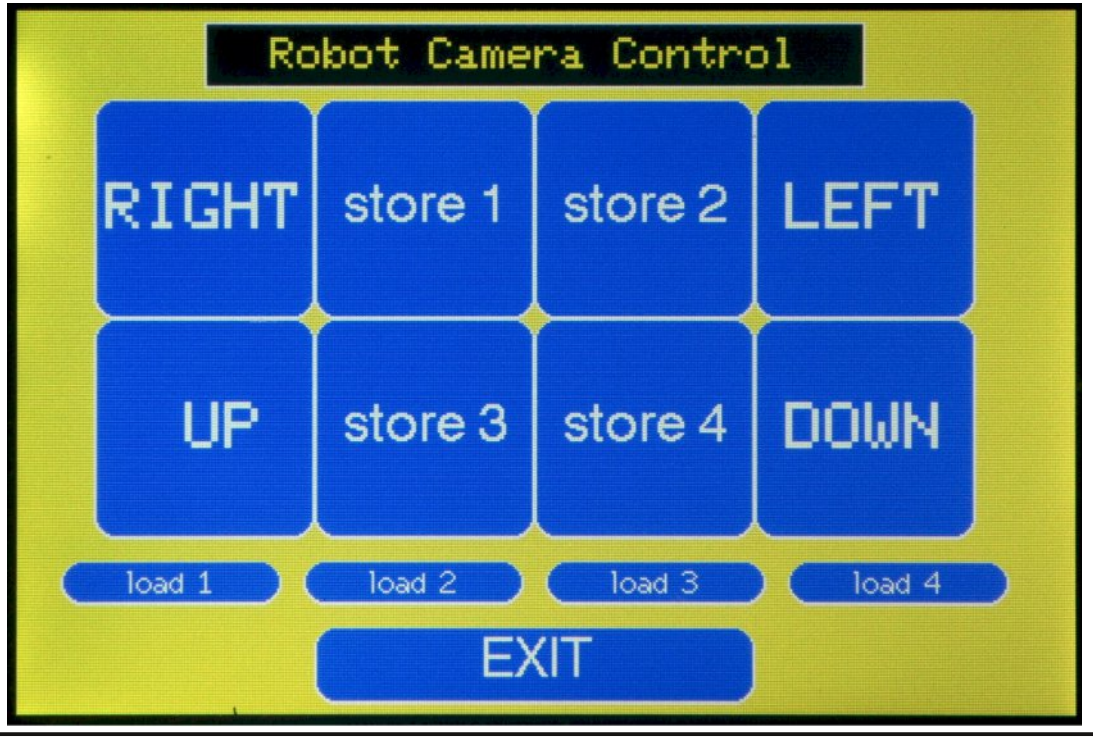
The software to set it up is easy and uses only three commands. The last one is the actual control.

```
pca9685.setup  &h40, 55
pca9685.setfreq 55
pca9685.pwm 0,a
```

0 is the socket used to connect the SG90 to, and 'a' is a number between 100 and 500 which is the position you want the SG90 to rotate to. So, varying it between 100 and 500 when a touch screen pad is pressed will pan the camera screen. You can repeat this with 'socket 1, b' and varying 'b' will tilt the camera.

You can also add additional cameras to the other sockets and expand the software.

The SG90 responds to the mark space ratio of the 50Hz signal by the PCA 9685 module (yellow pins). There are 4 banks of sockets each with 4 SG 90 control sockets so 16 SG 90's or 8 robot cameras with pan and tilt. This is a lot of hardware being controlled down a 2-wire bus. The commands sent along the I^2C bus to the PCA 9695 are all that is required. Just send a number to the module EG socket and a value and the motor will rotate to that position. It really is as simple as that.



I have written the software called robot1.bas to pan and tilt a single camera and the screen looks like this. The screen can be called from the splash screen and exit will take you back to the splash screen.

You will need to edit the end of the splash screen to the saved name of the Robot camera software and rename the push button.

```
let a=100:let b=100' set global variables
let pan1=100: let tilt1=100
let pan2=100: let tilt2=100
let pan3=100: let tilt3=100
let pan4=100: let tilt4=100
pause 10
pca9685.setup  &h40, 55' Setup servor module
pca9685.setfreq 55
pca9685.pwm 0,a' Set pan to mid position
pca9685.pwm 1,b' set tilt to mid position

'write screen
gui.init 20, Yellow 'reserve memory for 20 GUI objects. clears
screen to black
txt = GUI.Textline(85,5,300,30, "Robot Camera Control", 3)
'x,y,w,h,text,fontsize
right = GUI.Button(35, 40, 100, 100, "RIGHT",5,10 )
'x,y,w,h,text,fontsize, radius
left = GUI.Button(335, 40, 100, 100, "LEFT",5,10 )
'x,y,w,h,text,fontsize, radius
up = GUI.Button(35, 140, 100, 100, " UP",5,10 )
'x,y,w,h,text,fontsize, radius
down = GUI.Button(335,140, 100, 100, "DOWN",5,10 )
'x,y,w,h,text,fontsize, radius
ext= GUI.Button(135, 280, 200, 35, "EXIT",4,10 )
'x,y,w,h,text,fontsize, radius

store1 = GUI.Button(135, 40, 100, 100, "store 1",4,10 )
'x,y,w,h,text,fontsize, radius
store2 = GUI.Button(235, 40, 100, 100, "store 2",4,10 )
'x,y,w,h,text,fontsize, radius
store3 = GUI.Button(135,140, 100, 100, "store 3",4,10 )
'x,y,w,h,text,fontsize, radius
store4 = GUI.Button(235,140, 100, 100, "store 4",4,10 )
'x,y,w,h,text,fontsize, radius

load1 = GUI.Button(20, 250, 100, 20, "load 1",2,10 )
'x,y,w,h,text,fontsize, radius
load2 = GUI.Button(130, 250, 100, 20, "load 2",2,10 )
'x,y,w,h,text,fontsize, radius
load3 = GUI.Button(240, 250, 100, 20, "load 3",2,10 )
'x,y,w,h,text,fontsize, radius
load4 = GUI.Button(350, 250, 100, 20, "load 4",2,10 )
'x,y,w,h,text,fontsize, radius

'set up touch screen
gui.setEvent ext, TOUCH, ext
gui.setEvent right, TOUCH, right
gui.setEvent left, TOUCH, left
gui.setEvent up, TOUCH, up
gui.setEvent down, TOUCH, down
gui.setEvent store1, TOUCH, store1
gui.setEvent store2, TOUCH, store2
gui.setEvent store3, TOUCH, store3
gui.setEvent store4, TOUCH, store4
gui.setEvent load1, TOUCH, load1
gui.setEvent load2, TOUCH, load2
gui.setEvent load3, TOUCH, load3
gui.setEvent load4, TOUCH, load4

gui.autorefresh 30, 1 'display gui items automatically each
30ms including touch

wait

'sub routines
right:
```

```
let a=a+1
if a>499 then let a=500'right limit
wlog a
pca9685.pwm 0,a
return

left:
let a=a-1
if a<101 then let a=100'left limit
wlog a
pca9685.pwm 0,a
return

up:
let b=b-1
if b<101 then let b =100'right limit
pca9685.pwm 1,b
return

down:
let b=b+1
if b>499 then let b =500'down limit
pca9685.pwm 1,b
return

load1:
let pan1=a
let tilt1=b
return

load2:
let pan2=a
let tilt2=b
return

load3:
let pan3=a
let tilt3=b
return

load4:
let pan4=a
let tilt4=b
return

store1:
let a=pan1
let b=tilt1
pca9685.pwm 0,pan1
pca9685.pwm 1,tilt1
return

store2:
let a =pan2
let b=pan2
pca9685.pwm 0,pan2
pca9685.pwm 1,tilt2
return

store3:
let a =pan3
let b=tilt3
pca9685.pwm 0,pan3
pca9685.pwm 1,tilt3
return

store4:
let a =pan4
let b=tilt4
pca9685.pwm 0,pan4
pca9685.pwm 1,tilt4
return

ext:
wlog bas.load "/splash.bas"
end
```

That leaves work to do interfacing kit to the remaining buttons on the splash screen, but unfortunately there won't be a CQ-DATV 101 next month! I will keep on with adding to the software and Ian will update the software downloads page. Mike is investigating a PCB to hold all the kit together. This will become available and again I can only urge you to join our mailing list and our Facebook page. The R&D will continue and if we can find a way to kick start CQ-DATV we will be able to contact you. In the meantime, let me leave you with the links where you can find help and improvements as others above me develop projects for this clever module.

The last thing is to make the Splash screen autorun, this is an entry in the Config menu. The splash screen will the appear at switch on and the PC is not required other than to provide +5v down the USB connection. If you supply this power from an external source via pin- 19 on the 38-pin module or pin 15 on the 30-pin module and the USB connection is not required. There will be a WI-FI connection should you wish to edit the software.

This is a brief look at a TFT control and a specific interface to the CQ-DATV Robot Camera. It is software controlled project and is the other side of a door some engineers wish to keep firmly closed. The choice of ANNEX BASIC was used as a gentle way of opening the door and trying to entice you through. There are more complex languages around but BASIC has been around along time and was written to try and help people through that particular door.

It compliments the hardware design skills and may provide a link into the software world. That's up to you as technology evolves, we lose engineers or they hit a glass ceiling which limits their skills.

This and the earlier GVG article have been an attempt at least denting that ceiling with a friendly language that has some well established credentials for ease of understanding.

I will leave you with some helpful links, you are never on your own, there is a lot of help out there.

Sorry to say goodbye and I hope that reading CQ-DATV has brought some enjoyment. It has been a pleasure to write for, and a chance to work with, a brilliant and supportive production team.

Annex forum *https://tinyurl.com/4hdxwc28*

ESP32 connections *https://tinyurl.com/ykcnt6vy*

ESP 32 help manual *https://tinyurl.com/vfkpchu8*

Annex tool kit download *https://tinyurl.com/bbea9u9n*
(The password for the zip file is annex)

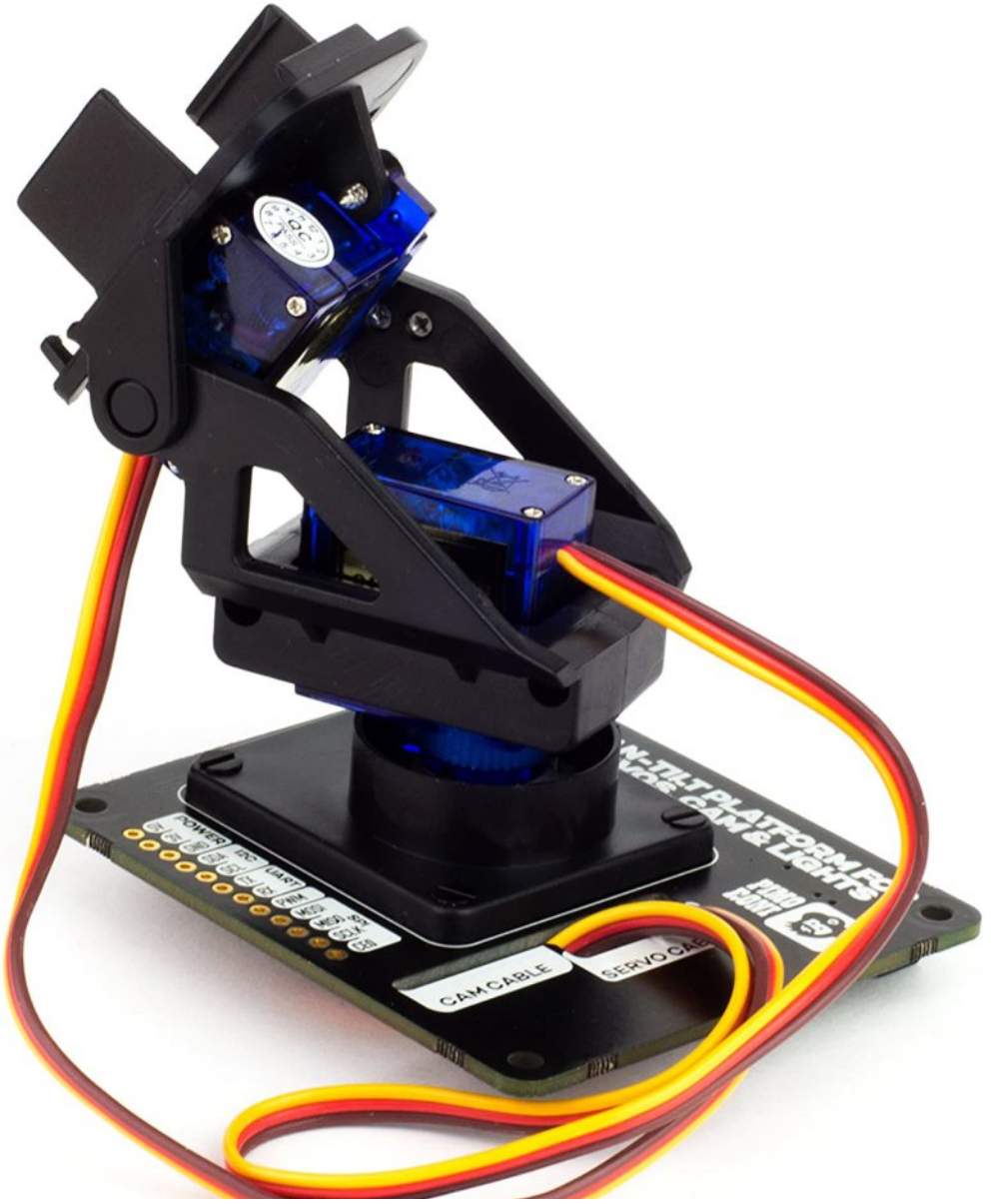
PCA9685 modules *https://tinyurl.com/sbw6baca*

SG90 *https://tinyurl.com/hdbxtka9*

Pan and tilt head *https://tinyurl.com/yfhbn3ty*

ESP32s (38 pin) *https://tinyurl.com/ukwncp2y*

More pics next page...



Top left: The tilt motor just about to be fitted

Bottom left: Robot Camera excuse the scuba weight mount

Above: The bracket - one SG90 fitted for Pan

Down-East Microwave 10 GHzPre-Amplifier - Product Review

(photo from DEM spec. sheet)

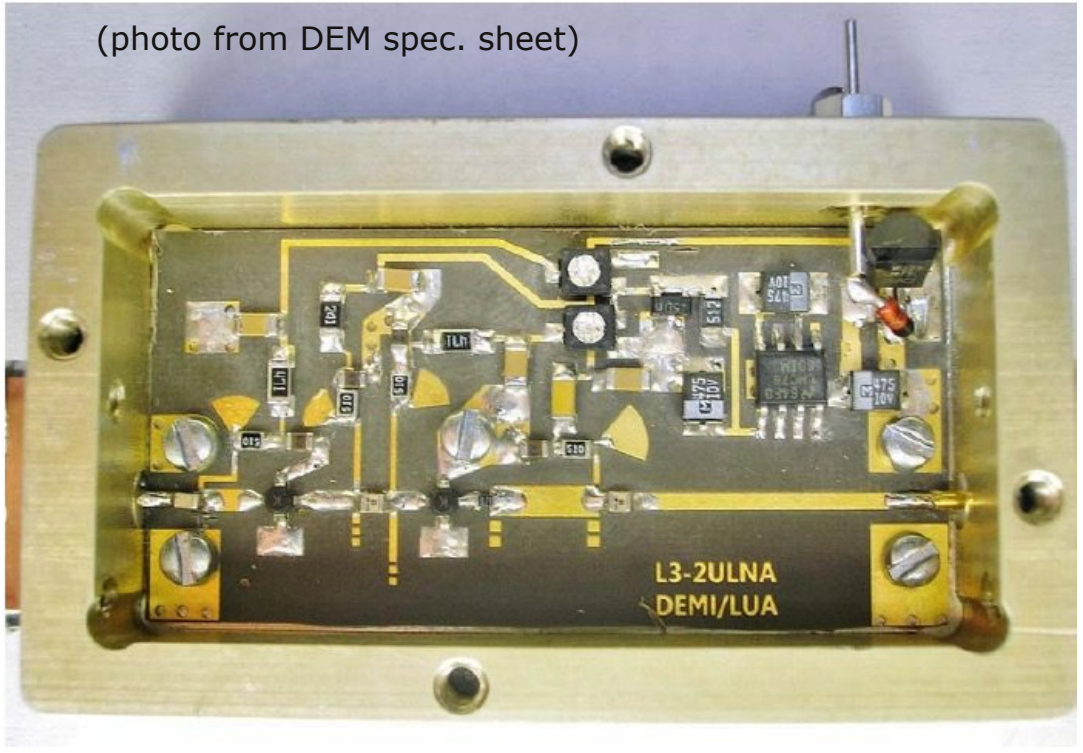
A key building block for any microwave transverter is a good, low-noise, pre-amplifier, or often referred to as an LNA or Low Noise Amplifier. If a pre-amp is not used, then the noise figure of a transverter is no better than the RF to IF conversion loss of the down-converting mixer, which is typically 6dB or worse.

Two suppliers of microwave pre-amps for the amateur radio market are Kuhne Electronic in Germany https://shop.kuhne-electronic.com/kuhne/en/ and Down-East Microwave in the USA https://www.downeastmicrowave.com/.

Kuhne offers a large selection of pre-amps for 144MHz thru an astonishing 76GHz. For the 3cm, 10GHz band, they offer four models with prices of the order of 209 - 229 €. Down-East Microwave (DEM) offers pre-amps for 50MHz thru 10GHz. For 10GHz, their pre-amp costs $150 assembled, or $105 in kit form.

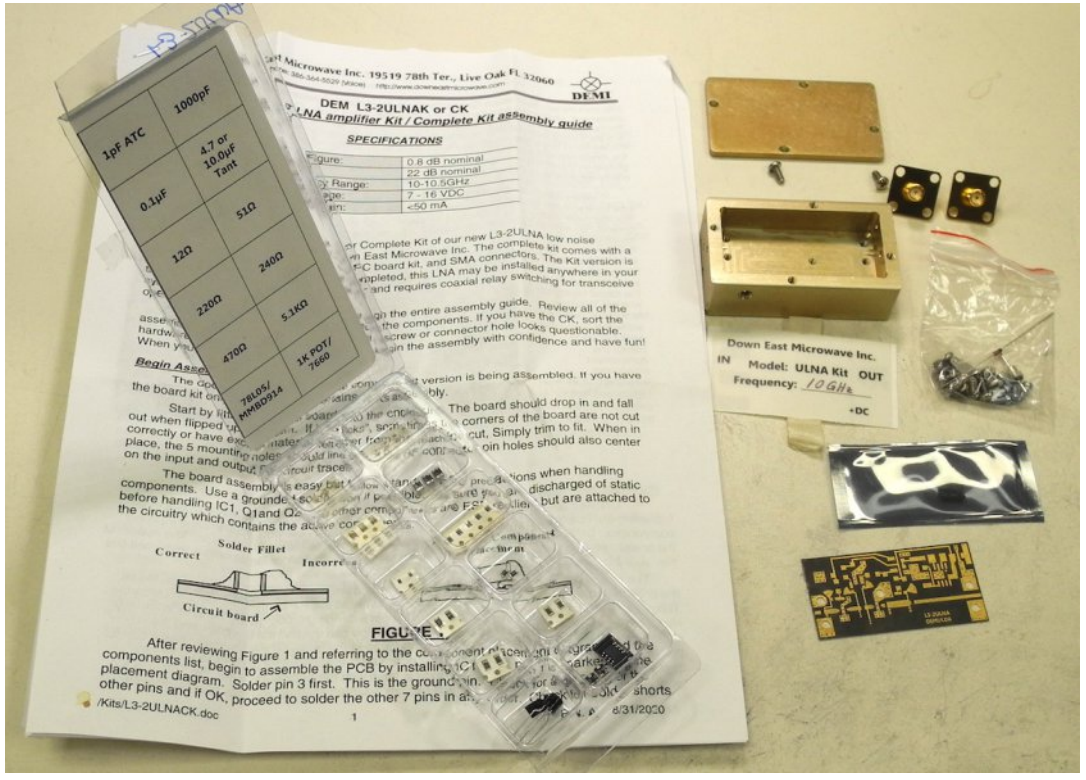
I recently purchased the DEM, 10GHz pre-amp kit. The model number is L3-2ULNA. The DEM specs. are minimal and consist of only: Frequency range = 10 - 10.5GHz, Gain = 22dB, Noise Figure = 0.8dB, Supply Voltage = 7 - 16Vdc at < 50mA. DEM says the LNA was designed by Texas microwave legend, Al Ward, W5LUA using PHEMPT technology. The DEM spec. sheet does include this photo below showing the internal construction.

(photo from DEM spec. sheet)



The pc board is very well designed and built on thin, microwave quality substrate with gold plating. The reverse side is a solid ground plane, The rf input is on the left and the output is on the right. SMA connectors are used. DC power comes in via a feed-thru capacitor on the upper right.

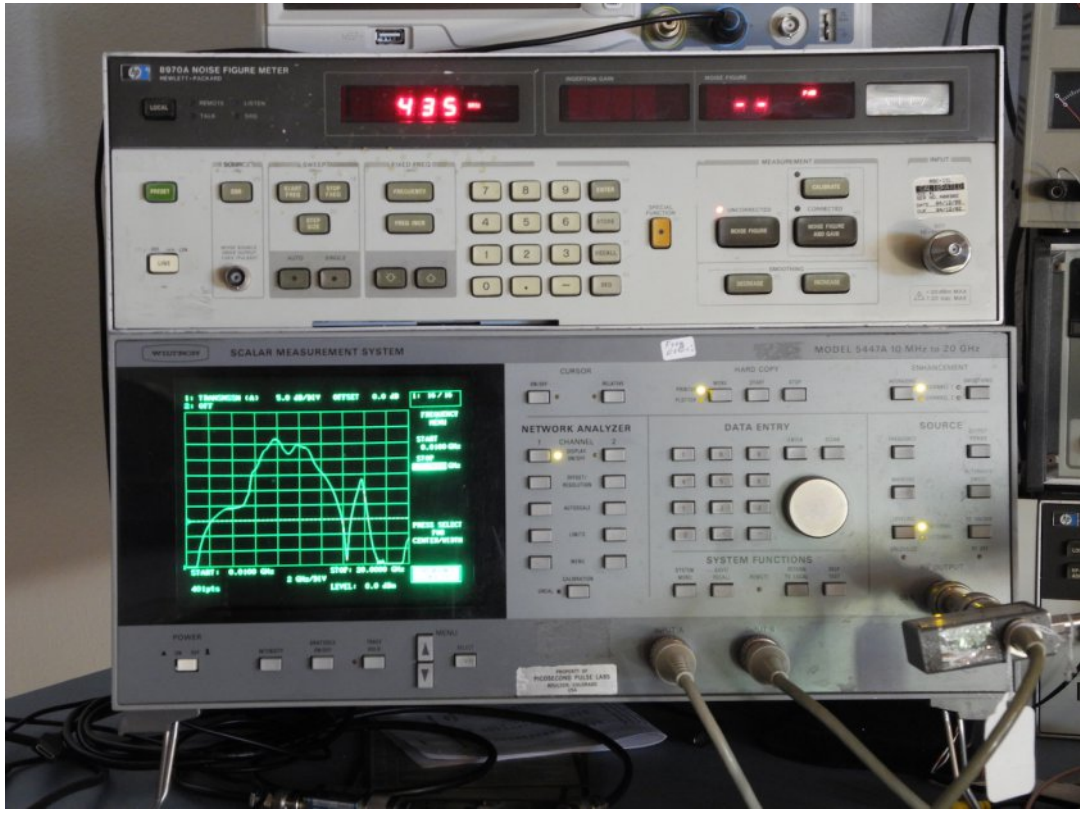
The circuitry is seen to consist of two, RF, FET transistors in cascade. In the upper right is a 78L05, +5V voltage regulator. The 8 pin IC is a 7660 +5V to -5V switching regulator to provide negative gate bias voltage. In the upper center are seen two mini trim pots for independently setting the gate voltages for the two FETs.



DEM provides a very nice kit. It comes with a well written set of assembly/test instructions. All of the various tiny parts come in a sealed plastic tray which is well marked to ID the contents. The mechanical parts for the enclosure are well made.

I was able to assemble and test the pre-amp in one evening. However, a word of caution, this pre-amp is built with surface mount components (SMD) and some of them are very tiny. Several are 0805 size and one resistor is 0603. I had to put on two pairs of magnifying reading glasses to see the markings on the FETs to be able to orient them properly. The bottom line -- If you are not totally comfortable assembling tiny SMD parts, then you are well advised to not purchase the kit, but spend an extra $50 to buy a completely assembled and tested pre-amp from DEM.

The initial test procedure is setting the proper DC gate bias for each FET. The 1 KΩ trim pots are adjusted to set the FET's drain voltage to +2Vdc and drain current to about 10 mA. There are no other adjustments to be made. For mine, the current drain from a +12Vdc supply was 22mA. At this point, you should now have a working pre-amp. W5LUA did provide on the pc board a few tiny stub pads which could be jumpered in/out if one wanted to do some really fine tuning of the frequency response and/or noise figure. I did not make any changes, but took the pre-amp "as is".

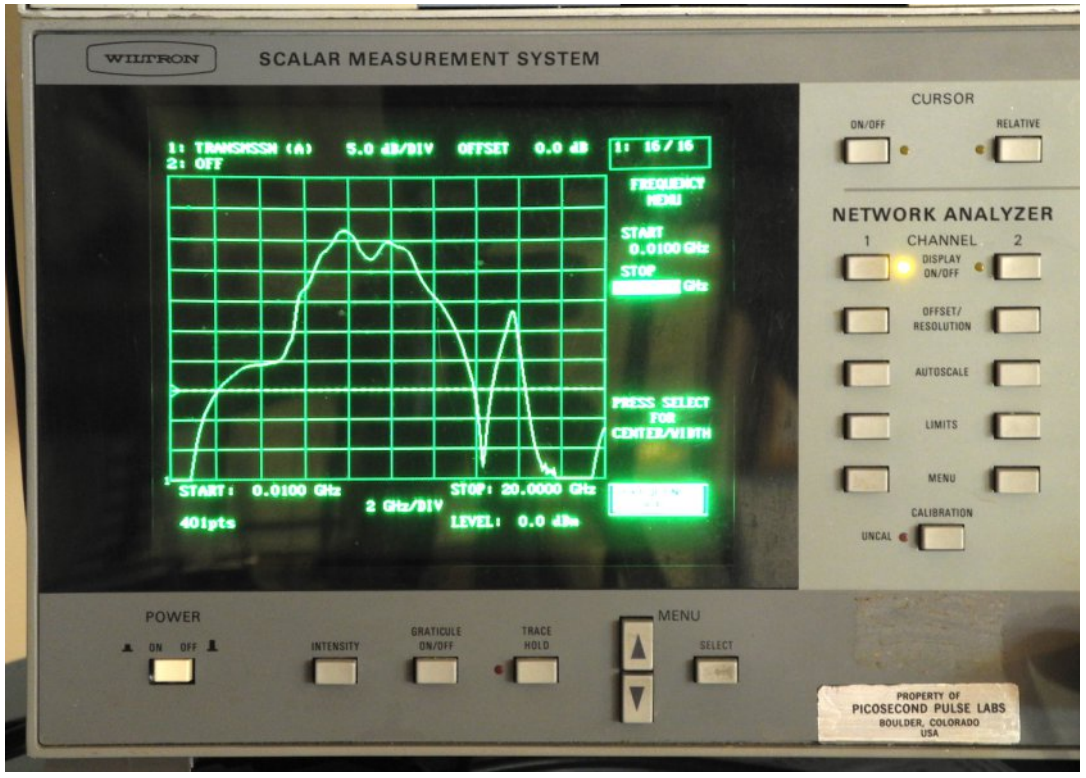


My first test of the amplifier was to measure the gain, S21. I used my 30 year old, Wiltron 5447A, network analyzer which covers from 10MHz to 20GHz. The other instrument on the top is an HP noise figure meter which I used later to test NF. The frequency response shown on the CRT is with the top cover not yet installed. However, when I placed the cover on the amplifier, it took off oscillating. This is a very common problem with microwave amplifiers. The small metal box, when completely closed up makes an excellent, high Q cavity resonator. The LNA's box internal dimensions was actually very similar in size to a piece of X band waveguide.

At my old company, Picosecond Pulse Labs, we built extremely broadband amplifiers with -3dB bandwidths extending from a few kHz up to the microwave range with some as high as 60GHz. We had the same oscillating issue. We solved it by using what we coined "Magic Rubber". This was a special EM absorber material containing carbon and ferrites. I still had in my ham shack some left over magic rubber from PSPL. I cut a rectangular strip of it and attached it to the lid of the DEM preamp. The magic rubber comes with an adhesive backing. This solved the oscillation problem with the DEM preamp.

I have communicated with DEM on this issue. I expressed the opinion that I felt that they should include a piece of microwave absorber in their kit along with instructions on precisely where to place it. They felt it was not necessary as not all 10 GHz LNAs oscillate. They did admit they needed to use microwave absorber in some of the amplifiers that they assemble and test to sell. Their position was that anyone building the LNA kit would be a very knowledgable microwave ham with suitable test equipment and would have their own microwave absorber to use if necessary.

Based upon DEM's reply and their explaining how completely they test the LNAs they assemble, I feel that the best advice

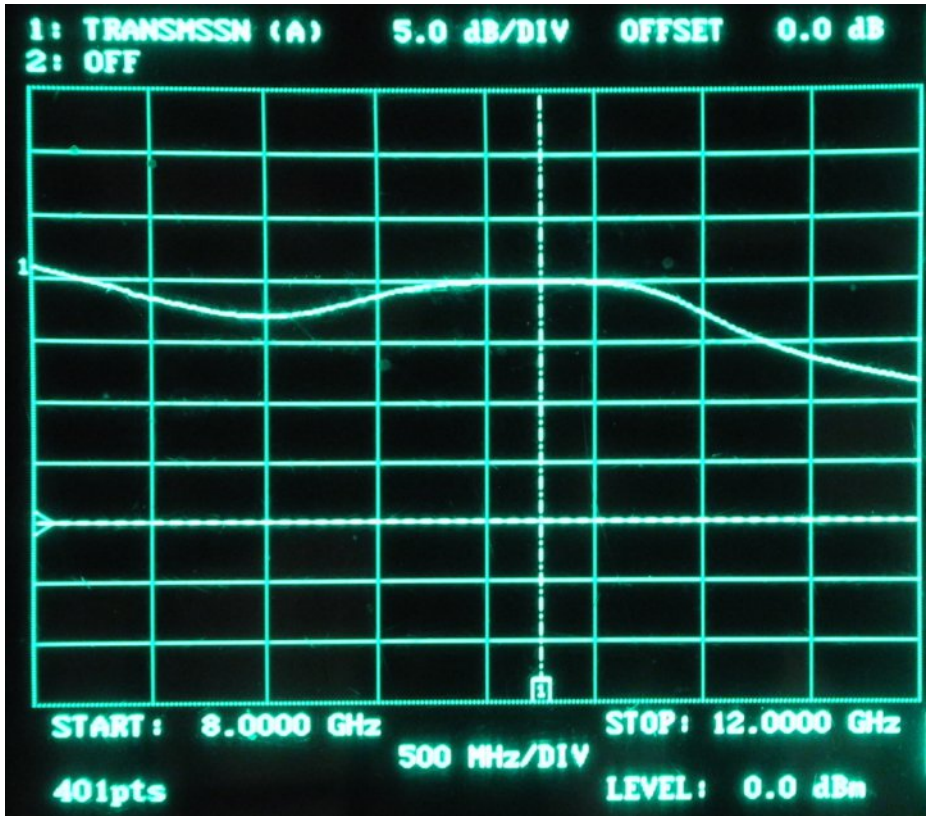


S21 vs. Frequency: sweep 0.01 to 20 GHz, 2 GHz/div. Pin = -36dBmVertical scale = 5dB/div. 0dB reference line is 3 divisions up from the bottom.

to most hams is to forget purchasing the kit. Spend a few more dollars and just buy the assembled and tested LNA from DEM.

So, let's go back to testing the finished product with the magic rubber installed and lid attached. In the above S21 photo, I am sweeping over the full range up to 20GHz. The amplifier is seen to have it's peak gain at 8GHz with a second peak at 10GHz. On the lower slope it still has appreciable gain at 5.8GHz.

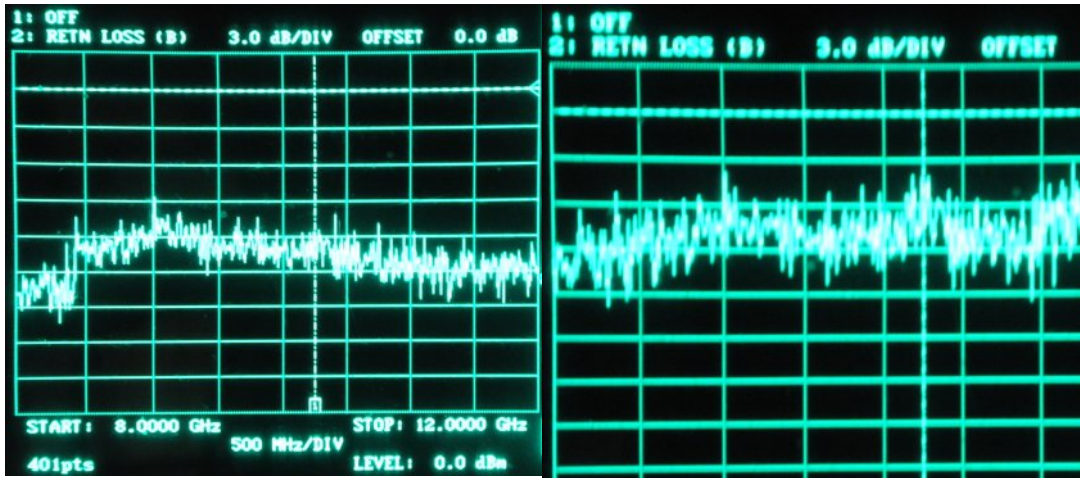
The photos (next page - right side) show the amplifier's gain plus input and output return loss sweeping over X band from 8 to 12 GHz.



This is the S21 Gain over X band from 8 to 12 GHz. 500 MHz/div. The vertical scale is 5dB/div. The 0 dB reference line is 3 divisions from the bottom. Pin = -36dBm

At the center of the 3cm ham band, 10.25GHz, S21 = 20dB, S11 = -13dB and S22 = -6dB.

The next test was to determine the max. output power capability of the amplifier. The Wiltron network analyzer in the CW mode was used as the signal source, plus a Weinschel rotary step attenuator was used to set the rf input levels. RF power was measured using an HP-432A power meter with an HP-8478B thermistor power head. The -1dB gain compression was found to be P(-1dB) = -9 dBm. The max. saturated output was found to be P(max) = -8 dBm. Thus this amplifier is strictly for low level, weak signals.



Return Loss measurement - sweep from 8 to 12 GHz, 500 MHz/div, Pin = -36dBmInput S11 (left) & Output S22 (right), 3dB/div, 0dB ref. line is 1 div. from top

The final test was for Noise Figure. An HP-8970A Noise Figure meter was used with a Noise Com model NC346B (0.01 - 18GHz) noise source head. The 8970A only measures up to 1.5GHz. Thus a down-converter was setup using a local oscillator, mixer and band-pass filter to reject the unwanted sideband. The noise figure was measured at 10.36 GHz. The results were 21.7dB gain and 1.06dB noise figure. This NF value was felt to be quite acceptable.

Jim, KH6HTV, Boulder, CO

From the vault - Inexpensive home constructed dummy load

Written by John Hudson G3RFL
Appropriately, this article first appeared in issue 1.

In a senior moment, I managed to damage my RF dummy Load, by using it on a 13cms transmitter that was more than capable of delivering 120W. So it was time to consider a replacement and an upgrade to cope with the higher power Levels.

I started by purchasing a 50ohm 250W surface mount resistor. The resistor I chose has a specification. (see data sheets below)

That will enable it to be used up to at least 2GHz,and cost £7. I have seen some on eBay for about the same price, but only 150W versions.

I was fortunate to find suitable heat sync in my junk box, something I suspect was left over from a computer upgrade. It was a simple task to drill the heat sink and mount the resistor applying a liberal dosage of heat transfer compound.

I folded the TAB back over itself onto its top and filed an "N" type connector plug, filing the centre pin down as much as possible as this goes over the resistor and compression touches the resistor tab, carefully not over tightening it or you will break the resistor.

In theory the unit should work up to 2GHz, but my first test was on 2m with just 50w, the heat sync soon got too hot to hold, after only a few minutes.

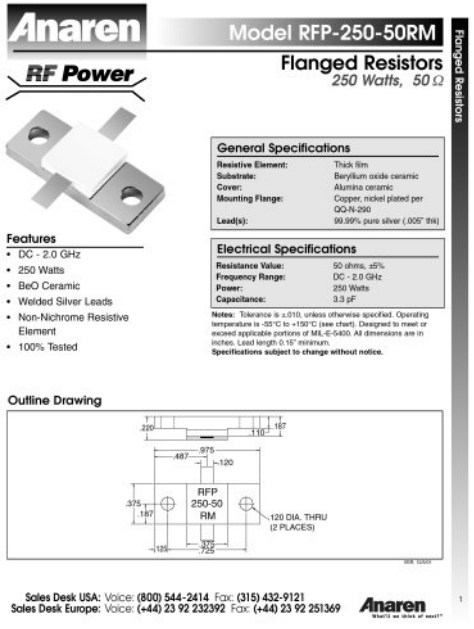
So I decided to add a fan, quick search of my junk box and I failed to come up with a suitable fan for the heat sink, probably why the heat sink was in my junk box, so it was time to invest some of my children's inheritance in a commercial product.

The 12V fan I chose came from CPC and was designed for use used on PCu/P and cost just over £7.

When the fan arrived I fitted it and repeated the experiment with the two meter source, once the heat sink became to hot to hold, I powered up the fan, and after only a few minutes the temperature dropped to just a few deg above room temperature.

I was well pleased with my £7 investment, in what proved to be a very quiet fan, well worth the £7. The fan also has the third wire which provides pulses to indicate the fan is spinning, this might be useful for the future when I develop the unit further, but my first addition will be a Voltage detector interfaced to a PIC so I can read out the POWER via a USB lead.....watch this space.

Completed unit ….so far



Anaren — Model RFP-250-50RM

Flanged Resistors
250 Watts, 50 Ω

RF Power

Features
- DC - 2.0 GHz
- 250 Watts
- BeO Ceramic
- Welded Silver Leads
- Non-Nichrome Resistive Element
- 100% Tested

General Specifications

Resistive Element:	Thick film
Substrate:	Beryllium oxide ceramic
Cover:	Alumina ceramic
Mounting Flange:	Copper, nickel plated per QQ-N-290
Lead(s):	99.99% pure silver (.005" thk)

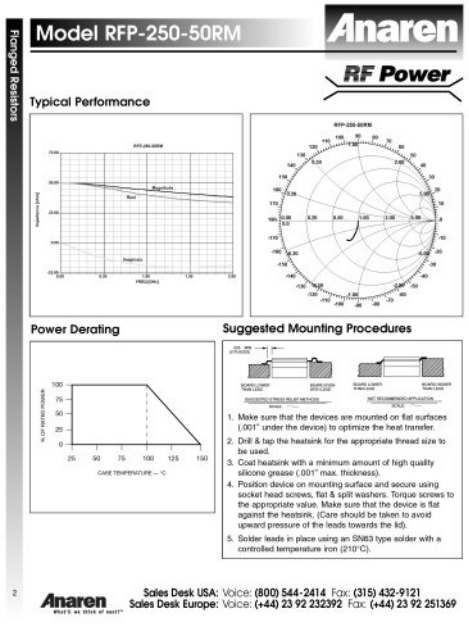
Electrical Specifications

Resistance Value:	50 ohms, ±5%
Frequency Range:	DC - 2.0 GHz
Power:	250 Watts
Capacitance:	3.3 pF

Notes: Tolerance is ±.010, unless otherwise specified. Operating temperature is -55°C to +150°C (see chart). Designed to meet or exceed applicable portions of MIL-E-5400. All dimensions are in inches. Lead length 0.15" minimum.
Specifications subject to change without notice.

Outline Drawing

Sales Desk USA: Voice: (800) 544-2414 Fax: (315) 432-9121
Sales Desk Europe: Voice: (+44) 23 92 232392 Fax: (+44) 23 92 251369



Anaren — Model RFP-250-50RM

RF Power

Typical Performance

Power Derating

Suggested Mounting Procedures

1. Make sure that the devices are mounted on flat surfaces (.001" under the device) to optimize the heat transfer.
2. Drill & tap the heatsink for the appropriate thread size to be used.
3. Coat heatsink with a minimum amount of high quality silicone grease (.001" max. thickness).
4. Position device on mounting surface and secure using socket head screws, flat & split washers. Torque screws to the appropriate value. Make sure that the device is flat against the heatsink. (Care should be taken to avoid upward pressure of the leads towards the lid).
5. Solder leads in place using an SN63 type solder with a controlled temperature iron (210°C).

Sales Desk USA: Voice: (800) 544-2414 Fax: (315) 432-9121
Sales Desk Europe: Voice: (+44) 23 92 232392 Fax: (+44) 23 92 251369

Data sheets

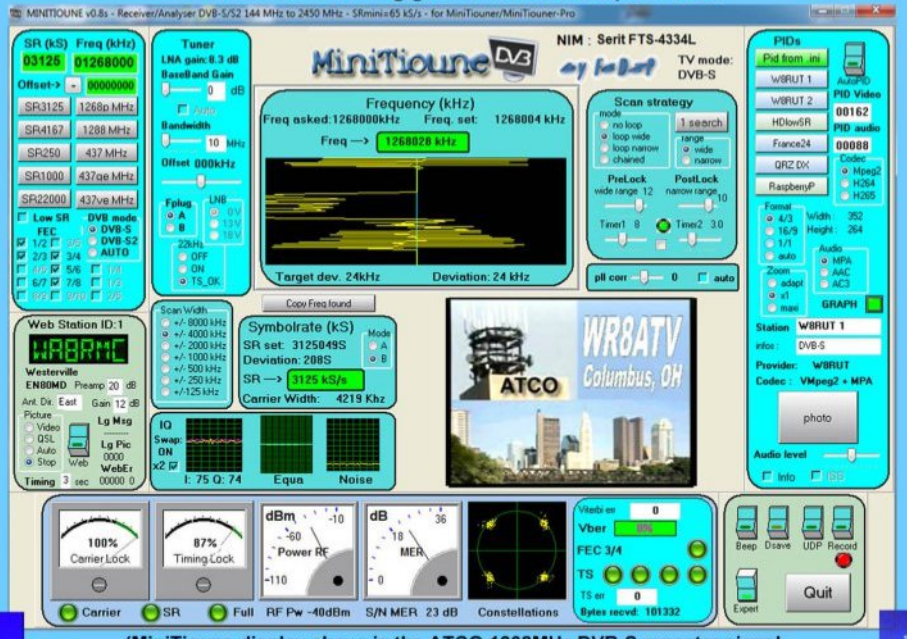
MiniTiouner-Express

Digital Amateur Television DVB-S/S2 Receiver / Analyzer

Available at DATV-Express.com

- Operates with Windows PC using free MiniTioune software from Jean-Pierre F6DZP
- Smaller than a stack of 2 decks of cards (picture above is full size)
- Two independent simultaneous RF inputs with internal preamps
- High sensitivity -100dBm @1288MHz – at 1/2 FEC
- Fully assembled/tested in aluminum enclosure
- Covers 144-2420MHz (ideal for Space Station DATV reception)
- Symbol rates from 75 KSymb/s to >20 MSymbols/sec
- Uses external 8-24VDC supply or +5V from USB-3 port (with small modification)
- Real time signal modulation constellation & dBm signal strength display
- Price: US $75 + shipping – order with PayPal

For details & ordering go to www.DATV-Express.com



(MiniTioune display above is the ATCO 1268MHz DVB-S repeater signal at WA8RMC QTH 15 miles away).

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.

But if you have a Kindle 3G then yes, but only to Amazon, and there is not a lot of ATV material on their site.
Smart phone reading apps are ok providing that you have a 3G data connection.

Note: These links will fire up your devices browser and if you are using 3G/4G then you will incur data usages charges.

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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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~~CQ-DATV is published on the last day of the month. The cut-off day for submissions/corrections/alterations is 5 days before the day of publication.~~

Home computing pioneer Sir Clive Sinclair dies aged 81

Sir Clive Sinclair, the inventor and entrepreneur who was instrumental in bringing home computers to the masses, has died at the age of 81.

His first home computer, the ZX80, named after the year it appeared, revolutionised the market, although it was a far cry from today's models. At £79.95 in kit form and £99.95 assembled, it was about one-fifth of the price of other home computers at the time. It sold 50,000, units while its successor, the ZX81, which replaced it, cost £69.95 and sold 250,000. Many games industry veterans got their start typing programs into its touch-based keyboard and became hooked on games such as as 3D Monster Maze and Mazogs. The ZX80 and ZX81 made him very rich: in 2010 Sinclair told the Guardian: "Within two or three years, we made £14m profit in a year."

A Sinclair ZX Spectrum. Photograph: Stephen Cooper/Alamy

In 1982, he released the ZX Spectrum 48K. Its rubber keys, strange clashing visuals and tinny sound did not prevent it being pivotal in the development of the British games industry. Much-loved games – now in colour – that inspired a generation included Jet Set Willy, Horace Goes Skiing, Chuckie Egg, Saboteur, Knight Lore and Lords of Midnight.

RIP

CQ-DATV, the electronic magazine supporting the DATV hobby, has now ceased publication.