In this issue

Editorial..... 2
News & World Roundup.....3
DVB-T Television Repeater..... 5
DATV-Express Project Report..... 10
I2C EPROM reader..... 11
70cm Band-Pass Filter.....16
Quadruplex VTR's last stand.....19
Arduino SimpleSat Rotor Controller.....22
One from the Vault..... 25
Information.....26
Coming up..... 27

Production Team

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

Contributing Authors

Jim Andrews KH6HTV
Trevor Brown G8CJS
Tom Doyle W9KE
Ken Konechy W6HHC

This area is getting decidedly sparse.
Please consider contributing an article!

Editorial

Welcome to 2019. We started publication of CQ-DATV in February 2013, so the next issue will take us into year 6 of producing a free monthly ATV magazine.

What did we expect CQ-DATV to do to the ATV world? We had aims and ideas but most of the time it was just run it, look at the downloads and see if the numbers are there to justify continued publication.

These have been up and down, but Issue 7 was just short of 18,000 downloads! Did this mean it was a good issue or that issue 6 was so good everyone downloaded the next issue or did we get a good review in some mainstream publication?

The short answer is, we will never know. The content has varied and we have been reprinted in many other ATV magazines. Our theme is television engineering and not necessary all digital, but we needed a title and ATV seems to have been hijacked by the 4 wheel motor bike people.

We have always covered ATV and contributions have been on all its different facets, from emerging digital hardware, to contest results. But we have also tried very hard to support the project side of ATV with home construction articles and a little bit of television history.

Covering colour television history and Trevor's contributions to how Broadcast video tape evolved. Through this wide dynamic range of content we have tried to always provide a story for everyone.

This is we think going to be the format for the coming year with another exciting project conceived by Trevor and that is to adapt a redundant TV control panel to use in ATV. At the time of writing this editorial nothing has been started so let's see if Trevor can deliver the goods in monthly instalments.

The panel chosen is the Grass Valley 100 and its variants, the 110 and the 1000, for no other reason that it's pretty and Trevor has one. If you feel left out the project, well they do turn up on eBay and they have been modified elsewhere to interface to the ATEM units.

Trevor hopes that it will eventually interface to Vmix which is more widely used in amateur circle and Mike G7GTN is working backwards from Vmix developing a universal interface that will support either Trevor's GVG panel or Mikes home constructed panel…wait and watch or if you want to be part of the voyage then email the editor, *editor@cq-datv.mobi*

So now you have our future plan, now let's look at this issue:-

- *Jim Andrews KH6HTV is looking at DVB-T repeaters, and also in a separate article 70cms filters.*
- *Ken W6HHC is looking at the min tuner "Rev B".*
- *Trevor has been using the ESP8266 micro development kit to read EPROMS via the i2c bus.*
- *Trevor has had a look at a spinoff of Quadruplex VTR, the TV Cartridge recorder.*
- *Tom Doyle W9KE has used the Arduino micro to control a Yaesu G-5500 Az-El rotor.*

So as we always say sit back and enjoy CQ-DATV 67, wishing you all happy New Year from the production team.

CRARC launches its YouTube channel

With more and more Canberra club presentations being recorded, the CRARC committee resolved at the last meeting to launch its own YouTube page.

Already on the site is the Sporadic E presentation by Roger VK2ZRH and one given by Wade VK1MIC about his 3-day work in Bimberi.

It is envisioned that all recorded club presentations will be uploaded there - For ATVers interested in streaming some of these contact CRARC for more info.
CRARCs YouTube channel is located on
https://www.youtube.com/channel/UCy82dQ0txOP02o_WKkKpVpQ
Source: WIA News Dec 2 2018

A Dish or two

Ok lets all drool together over these two dishes and several others "free to a good home before they go to landfill"

Now the bad news they are in Italy, *Claudio Mazzoleni* made the offer on facebook and there were takers, so you don't need to explain to the XYL that Italy would be a great place for a short break and then start planning how to get them on the aeroplane.

One thing is for sure they don't make the hand luggage size on Jet 2.

Are you ready for ES,hail2?

DATV-Express Project

Just a quick announcement that a v1.25LP12 version of software upgrades the software to be compatible with the latest firmware from Lime MicroSystems.

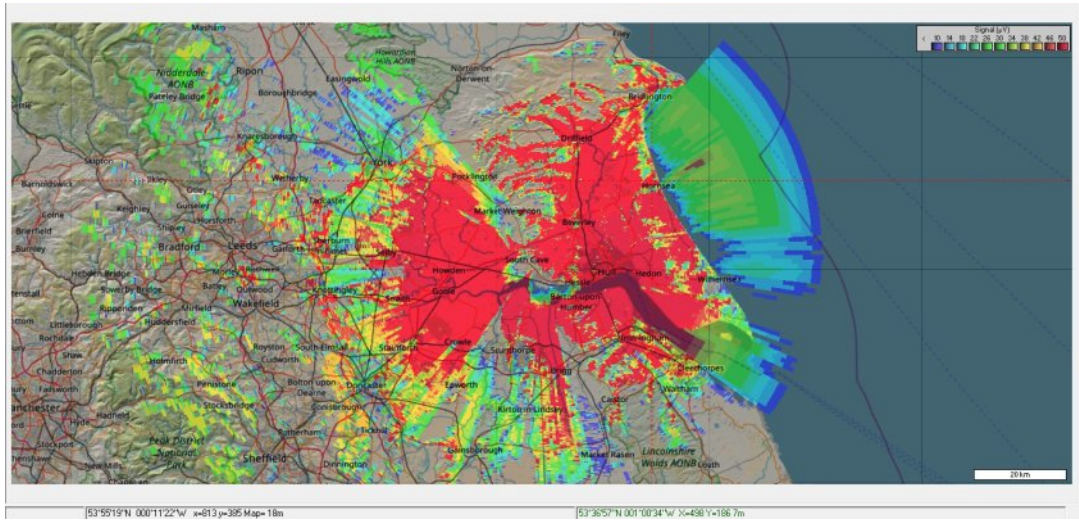
The Windows set-up.exe file and the NOTES file are now available at *www.DATV-Express.com* on the DOWNLOADS page.

Many thanks to G4GUO for his efforts.

73…de Ken W6HHC

GB3EY move and rebuild

A new NoV was issued for GB3EY in August allowing us to move it to the East Yorkshire Repeater Group's site at Cave Wold Radio Station near South Cave in East Yorkshire. The new site is 155m ASL with a good take off in most directions. The predicted coverage was created using Radiomobile and assumes 10m mast with a 15dBi antenna at the receiving end. This will be a substantial improvement over the old site on the North Sea coast at Aldbrough.



GB3EY Coverage

The repeater will return using digital ATV to reduce the bandwidth occupied. The parameters have not been finalised but will most likely be 4MS/s, FEC 3/4, with MPEG-2 encoding on 1308MHz. Test transmissions will be run from a temporary mast until the weather improves in the Spring and then the main tower can be brought down and the DATV antennas installed at 20m AGL.

Progress to date is good; the logic has been renovated and updated by Bill G3RMX, a Comag receiver has been found and the transmitter, comprising of two modules funded by G4YTV and made by Bert PE1RKI is on test.

An Alford Slot has been donated by Ken G8VDP and is being worked on and the original filter and a new duplex filter have been tuned up.

A dual band beam for 2m and 70cm will be installed with a Minitioune for inputs on those bands in the future with 333kS/s or similar RBDATV signals.
Clive G3GJA

Source:
https://forum.batc.org.uk/viewtopic.php?t=5785&p=17775#p17775

Written by Jim Andrews, KH6HTV

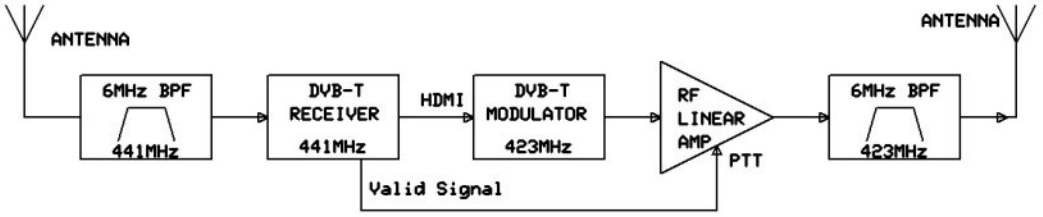


Fig. 1 A 70cm, Digital TV Repeater, block diagram

The FCC allows licensed amateur radio operators in the USA to transmit wide bandwidth, fast-scan, video on the 70cm (420-450MHz) band and all higher microwave bands. On the 70cm band, the ARRL national band plan [1] calls for TV repeater inputs to be on Ch 60 (438-444MHz) and outputs to be on Ch 57 (420-426MHz) with TV simplex operations on Ch 58 (426-432MHz).

A DVB-T repeater is extremely easy to assemble. It is much easier to build than an older analog TV repeater. A cross-band repeater only requires a receiver, modulator, and rf power amplifier along with a pair of antennas. The receiver is simply patched to the modulator via an HDMI cable and "Bingo" you have a repeater. An in-band repeater is a bit more complicated, requiring good band-pass filters on both the receiver and transmitter.

To build an in-band, 70cm, Television Repeater, Fig. 1, very high selectivity, band-pass filters (BPF) are mandatory on both the transmitter and receiver. On the 70cm band, 6 MHz channels are used and per the ARRL band plan, the typical spacing between the input and output is only 18 MHz. The purpose for the BPF on the receiver input is to prevent fundamental overload of the receiver's front end by the extremely strong, near-field signal from the transmitter.

Fig. 2 Typical, 70cm, Inter-Digital Band-Pass Filter. Shown with top cover removed

The purpose of the BPF on the transmitters' output is to prevent any out of band spurious spectrum from polluting the RF environment of adjacent channels and especially the receiver's channel.

The BPFs used are typically of the Inter-Digital BPF design, Fig. 2, as described in application note, AN-22 [2].

Most 2m and 70cm, narrow-band (15kHz), FM voice repeaters typically use a single antenna for both transmit and receive. A duplexer is typically used between the antenna and the transmitter and receiver. On 2 meters, the frequency separation typically used is 600 kHz, or a ratio of 600/15 = 40:1. On 70 cm, the frequency separation typically used is 5 MHz, or a ratio of 5000/15 = 333:1. For TV signals with bandwidths of 6 MHz, the ratio of transmit/receive separation to bandwidth is only 18MHz / 6MHz = 3:1

With this close separation of only 3:1, it is very difficult to build an effective duplexer for TV repeater service. Thus, usually TV repeaters do not use a single common antenna for both transmit and receive, but two separate antennas as shown in Fig. 1. If omni directional antennas are used, they should be positioned on the same supporting mast, directly one above the other so that they are sitting in the null position of each other's antenna pattern to achieve the maximum isolation.

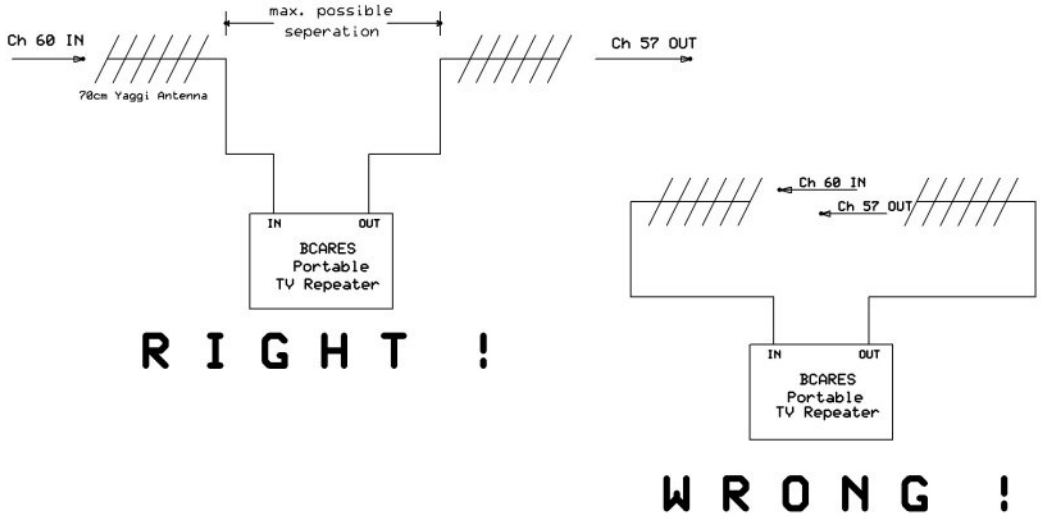


Fig. 3 Portable TV Repeater using Yagi Antennas. The secret to a repeater is high isolation between the transmitter and the receiver

For portable repeaters using directional antennas, there is definitely a right and a wrong way to position your antennas ! See Fig. 3.

Cross-band TV Repeaters

Repeaters can also be built as "Cross-Band", meaning the input and output frequencies are not on the same bands. Assembling a cross-band repeater is much simpler than building an in-band repeater because of the extreme separation in input/output frequencies. In many cases, the special band-pass filters can even be eliminated. Then it is a simple matter of patching the output of the receiver into the transmitter and you are on the air repeating. Especially easy is when the input frequency is on a band lower than the output frequency.

If the output frequency is however on the lower band, then much more care is required. One must first consider the selection of frequencies. One should especially avoid choosing frequencies where the receive frequency is on one of the harmonics of the transmitter frequency. If this is unavoidable, then extra low-pass filtering on the transmitter and high pass filtering on the receiver will be required.
DVB-T Repeater

It is a very straight forward matter to assemble a DVB-T repeater, especially when one uses the modulators and receivers from Hi-Des Technologies in Taiwan (*www.hides.com.tw*) For a 70cm in-band repeater use either the Hi-Des model HV-110 or the newer HV-120A. For a cross-band DTV repeater with a 23cm input, the Hi-Des model HV-120A is the recommended receiver. However, it's 23cm sensitivity is quite poor and a good, low noise, 23cm preamp, such as the KH6HTV Video model 23-4LNA, should always be used with the HV-120A. For the DVB-T modulator, either the older model HV-100EH or the newer model HV-320E is recommended.

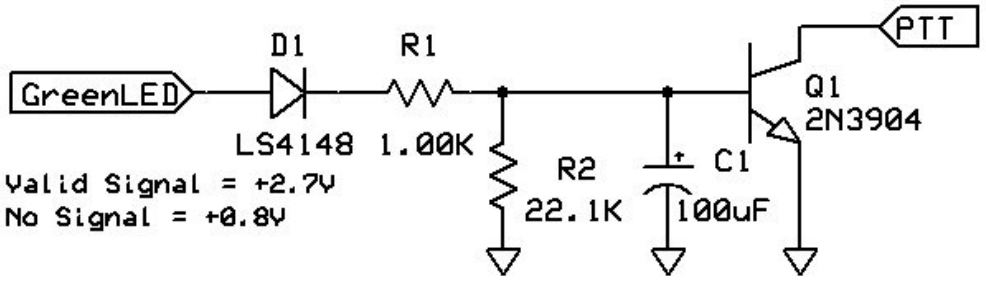


Fig. 4 Simple circuit modification to obtain "Valid Signal" from HV-110 receiver

For automatic operation of a repeater, one only wants it to be transmitting when it is receiving a valid, DVB-T, incoming signal. At all other times the transmitter needs to be disabled. Disabling is easily accomplished using the PTT (Push-To-Talk) line on the RF amplifiers. KH6HTV VIDEO RF Linear Amplifiers are all equipped with the ability to use a PTT control line. They typically have PTT On/Off ratios of >130dB. Low PTT = RF ON, High PTT = RF Off.

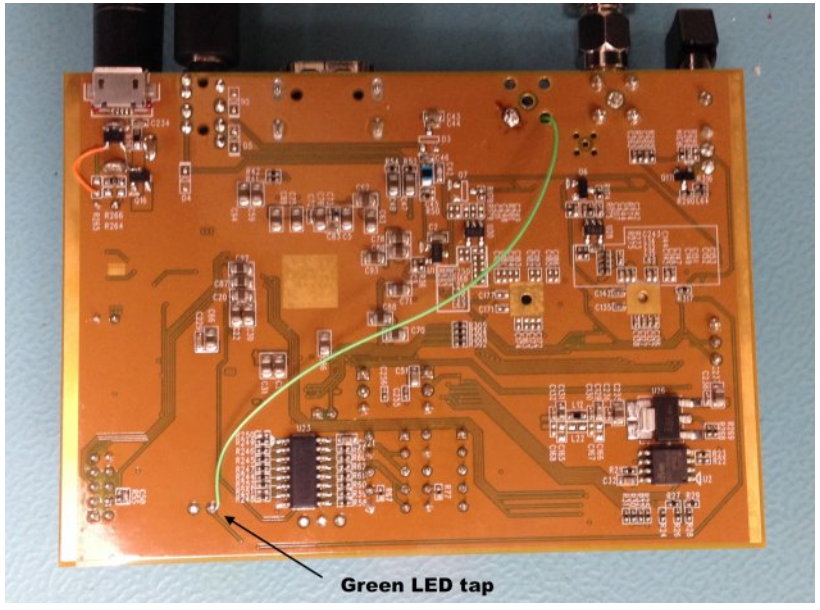


Fig. 5 View of underside of HV-110 pc board showing location of Green LED tap.

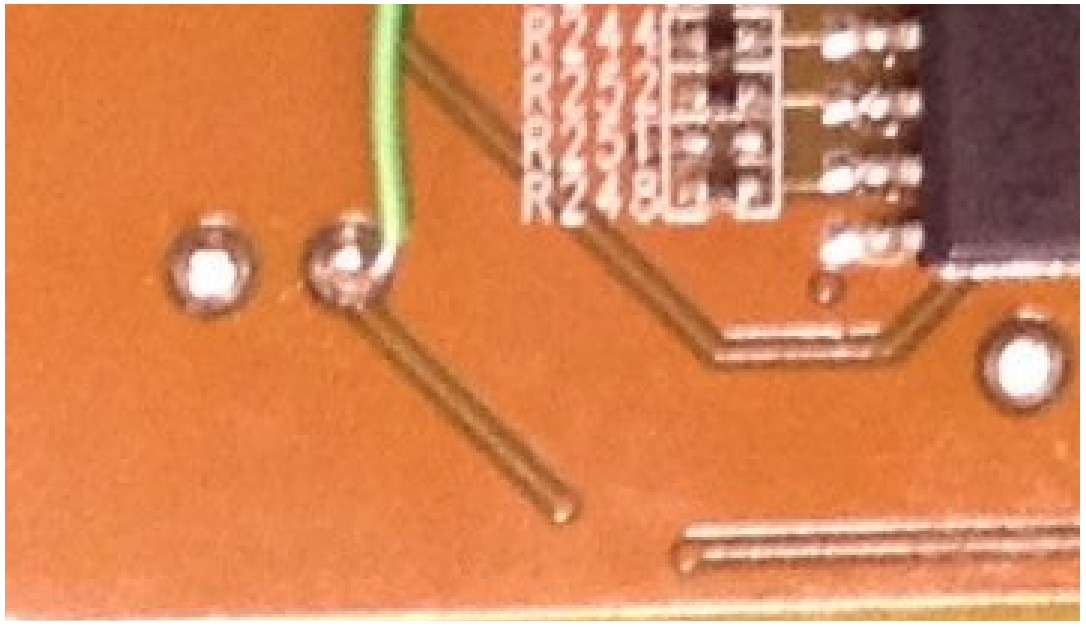


Fig. 6 View of topside of HV-110 pc board showing installation of "Valid Signal" circuit modification

It is a very simple matter to obtain a "Valid Signal" logic signal from the Hi-Des model HV-110 receiver. The receiver has a front panel bi-color LED which indicates the status. When it is red, no signal is being received. When it is green, a valid signal is present. Thus, connecting a wire to the green LED provides the necessary "Valid Signal".

A simple buffer circuit is shown in Fig. 4 to convert this signal into a suitable open collector transistor switch to drive a PTT line. The capacitor, C1, is used as a low-pass filter to remove the rapid fluctuations which occur for a very weak signal at digital threshold. It adds some turn-on delay but improves the overall performance. Fig. 5 shows where to find the green LED tap point. Fig. 6 shows the installation of the "Valid Signal" circuit.

A similar modification can also be added to the HV-120A, however the dc voltage levels are a bit different and an additional series diode is required.

FCC ID & Control

The FCC requires that all USA amateur radio transmissions be identified at least once every ten minutes. Using a Hi-Des DVB-T modulator, identification can be automatic and we never have to do it manually or with extra circuitry. In the original design of the DVB-T system, identification of the "Service Name" is included in the outgoing DVB-T digital data stream header. By programming your own call sign as the Service Name, your transmissions are continuously identified automatically. They can appear on the screen of a receiving station.

The FCC also requires that a control operator maintain positive control over a repeater in the event of malfunction, or malicious usage. For a repeater in one's own home, or a manned portable repeater, this is a simple matter of the operator turning off the master power switch. For an unmanned, remote base repeater, control must be maintained either via a land-line or radio link on a separate control frequency. This will necessitate the installation of additional circuitry in the transmitter's PTT line.

Other Features

Obviously, repeaters can grow to have much more exotic capabilities than the simple one shown in Fig. 1. The complexity will increase exponentially the engineering challenges. A repeater might have multiple receiver inputs, both multiple bands, and multiple modes such as VUSB, FM, DVB-S, DVB-T, IP, etc. A repeater might also have multiple transmitters on multiple bands with multiple modes. A nice feature to have on a repeater is a "Beacon" mode. This allows a user to activate the repeater transmitter to be turned on without an incoming signal. This is very useful to allow users to optimize their home receiving stations with a known signal from the repeater. In the Beacon mode, the video source would be generated locally at the repeater site.

It could be a tower mounted TV camera. Another useful source is to have a DVD player at the repeater site playing a continuous loop slide show of information about the repeater, the sponsoring club, etc. Each slide should carry the repeater's call sign for identification.

70cm In-Band vs. Cross-Band

While most TV amateurs prefer to use strictly the 70cm band, there can be major RFI issues with other users of the band. Both RFI to them and from them. When planning to build a new DTV repeater, strong consideration should be given to the possibility of making it a cross-band repeater.

The original ARRL band plans for TV allocations were based upon using a VUSB-TV signal. Even though the signal occupied a 6 MHz channel, the bulk of it's rf energy was centered within a few hundred kHz of the video carrier which was positioned 1.25MHz above the lower channel edge.

In contrast, a modern DTV signal spreads it's rf energy uniformly all across the entire 6 MHz channel. While the DTV energy density at any one frequency is considerably lower than what is found near the video carrier of a VUSB-TV signal, it has a higher potential for causing RFI, and also receiving RFI, from other licensed amateur users, especially on 70cm.

The experience of the Boulder, Colorado, USA, TV amateurs is probably typical. We have found that operating at the low end of the 70cm band on channels 57 (420-426MHz) or 58 (426-432) to be totally free from RFI. However, operations on channel 60 (438-444MHz), we often encounter RFI on the DTV repeater's input. When using analog, VUSB-TV input on Ch. 60, it is very easy to recognize RFI for it's impact on the repeated TV signal. Strong RFI from other narrow-band FM users causes total drop-outs of the DTV signal and is much harder to diagnose.

Only using a spectrum analyzer, is one able to determine the RFI causes. In comparison, when we use the cross-band, 23cm input to our TV repeater, we never encounter any RFI issues.

The TV amateurs in the ATN network of southern California have found that to operate DTV on 70cm with their repeaters, they have had to QSY lower in frequency from Ch. 60 and also use narrower DTV bandwidths.

REFERENCES

1. ARRL Band Plan, *http://www.arrl.org/band-plan*

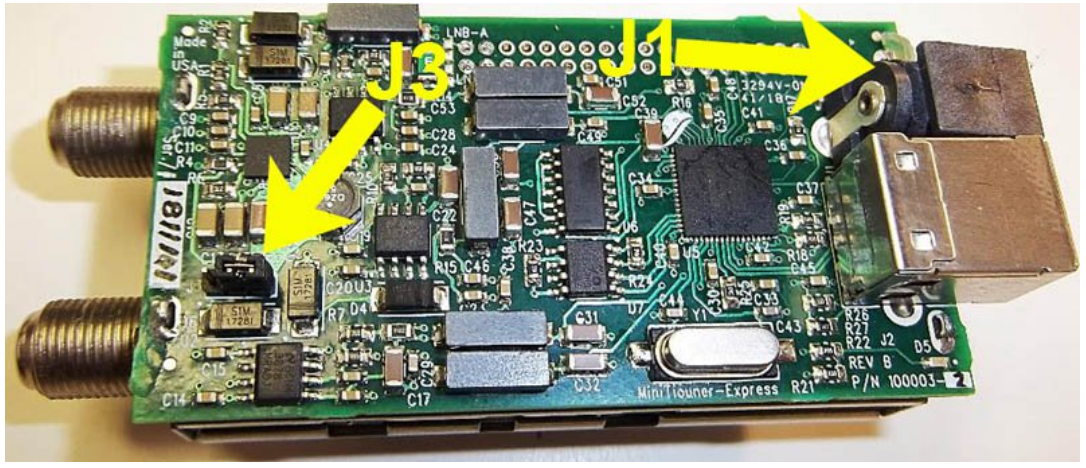
2. "Inter-Digital Band-Pass Filters", Jim Andrews, KH6HTV Video Application Note, AN-22b, July, 2015, 8 pages

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/*

DATV-Express Project Report

Written by Ken W6HHC

Art WA8RMC picked-up and tested the "production build" of 100 MiniTiouner-Express units of the design called "Rev B" from the assembly house. All units were tested by the second week in November and shipments started…mainly bulk-shipments to Charles G4GUO for redistribution to EU customers. 18 Units have been ordered and/or shipped to hams in EU. 2 more units have shipped within North America.



New RevB of MiniTiouner-Express with arrow pointing to the new J3 jumper set-up that was added. The push-on shorting plug is shown positioned (away from end of the board) to configure power regulators as the original design (that is: from J1 ext power supply)

It important to note that the new RevB units will ship with J3 configured to work like the original design; that is: to use external power supply connected to J1.

If the J3-jumper-shunt is moved to be closest to the end of the board with RF connectors, then the power for the unit is obtained from a USB-3 port.

The huge spike in orders of MiniTiouner-Express units of course is due to the launch of the Es'hail-2 ham DATV satellite into orbit on November 15th.

Charles G4GUO has been spending much of his time designing a 250W RF Power Amplifier for 2.4 GHz for his Es'hail-2 satellite up-link transmitter.

The project team PCB layout guru, Tom WB6P, has been helping G4GUO by converting the AutoCAD files into industry-standard gerber-files

Ken W6HHC is continuing to update the Express_DVB_Transmiter User Guide to emphasize that v1.25LP11 software has transitioned to cover four transmitter boards:

- *DATV-Express board*
- *LimeSDR-USB (larger) board*
- *LimeSDR-mini board*
- *PLUTO-ADLM board*

New photos are being prepared using MiniTiouner-Express-B and using LimeSDR-mini (etc.) with the v1.25LP11 software for the User Manual updates

Art WA8RMC has been helping Ken W6HHC to upgrade the MiniTiouner-Express User Guide to include the new power supply options available with the addition of J3 in RevB.

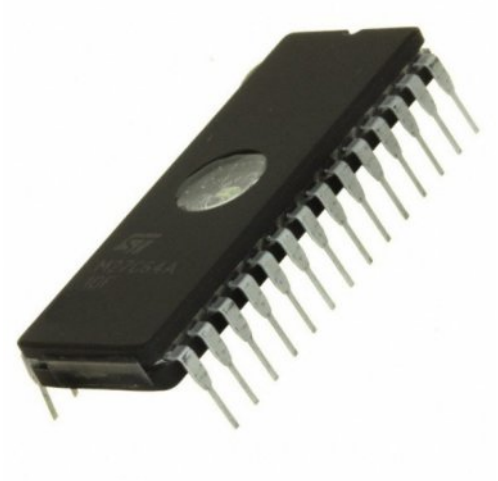
Project Speed is set to slow….de Ken W6HHC

This is your free ATV magazine.
Please consider contributing an article!

I2C EPROM reader

Written by Trevor G8CJS

Being very old and once having a day job repairing VTR machines in a busy ITV station I still remember when broken kit started turning up at the workshop door containing EPROMS (remember the chips with the little glass windows).



This was before the more modern 2708's 2716, range, and they proved not to be the most reliable of devices.

They were used with the new dreaded micro, which if I remember correctly was the 4040, the forerunner of the 8080 followed by the beloved (not by me! Long live the 6502 - ED) Z80.

In order to understand this kit it was necessary to know what was in the EPROMS. Something that the manuals always omitted. I built my first reader and to say the least, it was crude. BCD thumb wheels connected to the EPROM address lines and 8 LEDs, one for each data line. As you thumbed your way through the LED's changed, not a bad start.
The code displayed by the 8 LEDs was noted down in hex and the instructions were looked up to see what the micro was doing - time consuming and labour intensive was what comes to mind. I felt like a Bletchley Park code breaker.

You had to learn to count in hex E.G 1,2,3,4,5,6,7,8,9,A,B,C,D,E,F so if all the LED's were illuminated the result was FF i.e. blank memory not 00 (first lesson)

There were several EPROMS in the memory map so it was necessary to learn how they were addressed by the micro in order to get the instructions in the correct order. The manuals helped, but some track following was a inevitable.

The mark two reader was more sophisticated and connected to the centronics port of a computer, I avoided the word PC because it wasn't! The code could be read onto the screen and saved on disc and could be programmed into a blank replacement EPROM. What a quantum leap in technology!

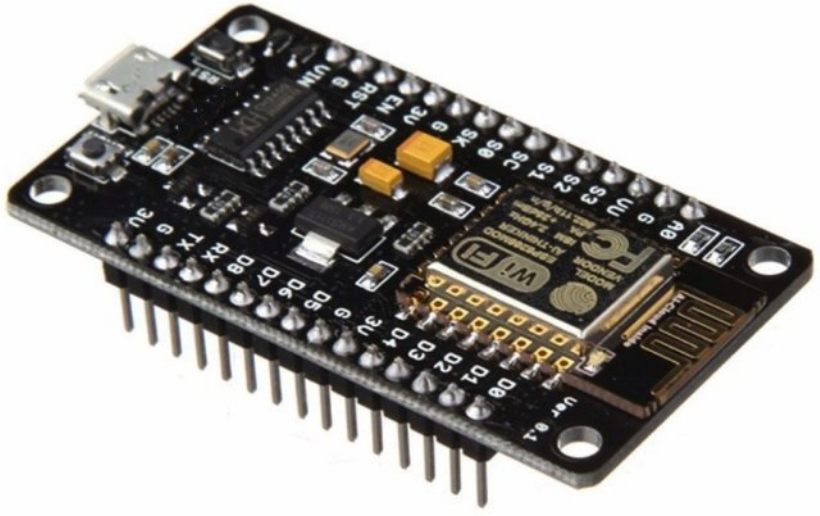
It could also be disassembled so the mnemonics could be seen and edited. Why edited? Well the original source code would have meaningful labels like Jump to Keyboard. Comments don't make it to the EPROM so the disassembly would just be jump to L1. If you could figure out what L1 did you could edit the list and make it more humanely understandable, if that's the right word to use for computer code.

Eventually I owned a computer of my own (Sinclair Spectrum) and I adapted my EPROM programmer to suit. The design is in Micro and Television Projects, you can still download the book from *https://www.cq-datv.mobi/mtp.php* although the original Spectrum computers are a little thin on the ground, not necessary a bad thing (I remember changing the memory chips in them which often failed and this was not a pleasant task) instead of the dreaded blue screen you got

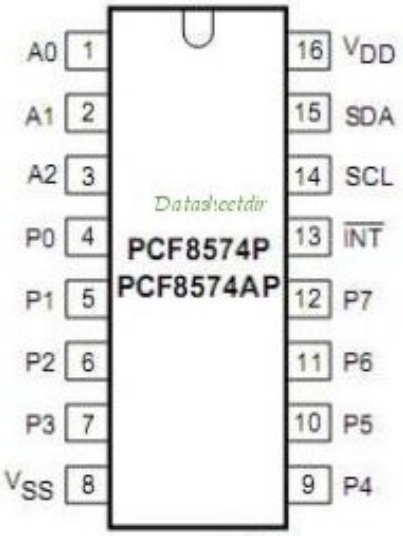
the dreaded black square when it refused to boot up after failing a memory check. Once you sorted the problem, word would spread and soon a queue would join all the other problems, but this time it comprised of people holding Spectrum Computers.

Fast forward to the modern world. During a clear out of the loft I found a box of EPROMS. They did have labels across the window but in most cases it was faded unreadable writing, (that did not help), so as to what was in them I have not a clue or as to whether any data was still stored within. What would be useful would be a reader that would reveal if the data was still there and if so what it did.

Looking in my junk box which is a little more modern, I came across the ESP8266 micro development kit and some old PFC8575AP I2C port chips, so how about an I2C EPROM reader? One chip replacing the thumb wheels to deliver an address and the other to read the data and deliver it to my browser down the WiFi. It's only going to manage 8 address lines, but that enough to get a flavour of the contents.



ESP 8266 Development kit



Onto the prototyping board went the two port chips and the ESP8266 which was flashed with ESP BASIC (see CQ-DATV 43, again available from *https://www.cq-datv.mobi/43.php*). ESP BASIC is loaded with features and they are dirt cheap and more powerful than an Arduino.

BASIC is a language beloved by millions of people. It's what many of us started out with and was used on BBC and Spectrum computers. It's how Microsoft got started and one of the reasons for the explosive growth of computers in the 80s. BASIC is a simple, but a powerful language that lets you do amazing things without needing a degree in computer science. There is an online manual available for the EPS BASIC (see end links below).

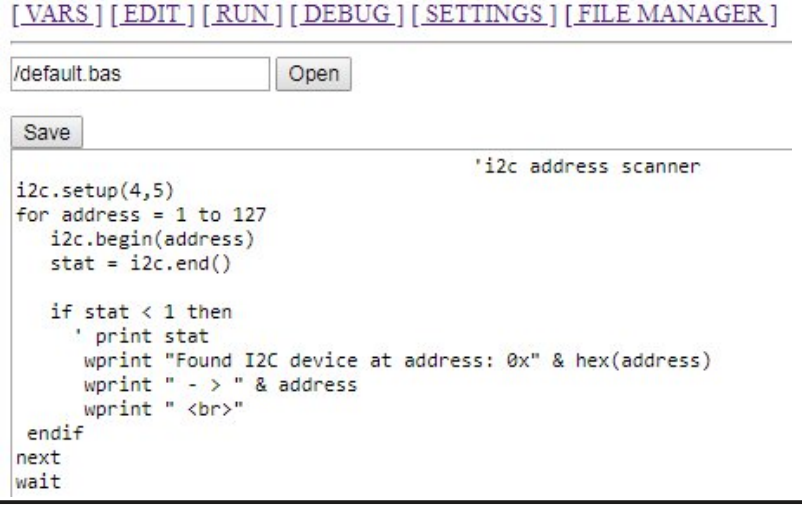
This is necessary because there many variations to each version of BASIC often called dialects and this is was lead to its decline.

The port chips I used were old, but in common with all I2C devices they have a user programmable address pre-set by three address lines A2, A1, A2 so they can sit at different I2C addresses.

I grounded them all on one chip and connected them to the +5 on the other using the on-board +5 rail provided by the ESP then ran the I2C scanner programme of which I claim no originality, but it's really useful.

```
          'I2C address scanner
i2c.setup(4,5)
for address = 1 to 127
    i2c.begin(address)
    stat = i2c.end()

    if stat  <  1 then
          ' print stat
    wprint "Found I2C device at address: 0x"  &
    hex(address)
    wprint " -  >  "  &  address
    wprint "  <br>"
    endif
next
wait
```

Just cut and paste it into your browser, save and run. On the screen will appear the address of any I2C devices on the bus. This was 63 and 56 remember BASIC works in decimal, but the software provides both decimal and hex



The following code can be used to drive the address port and check with an LED that the address is changing - yes it's flashing, much better than thumb wheels.

```
let address=63
 let bite = 1
i2c.setup(4,5)
wprint " hex address------data "  &  "
<br>
"for a=0 to 127
    i2c.begin(address)
    i2c.write(a)
    i2c.end()
    wprint "---- "  &  hex(a,4)     '
    next a
end
```

Lets ground four of the pins on the other port and wire the others to +5 and run the full code. Apologies to any BASIC officinardoes.

The on-line book is a little difficult to understand and some examples would really help, but some trial and error and you will soon get a result, any problems the software has debug on the menu bar which will soon point out your mistakes. Always nice to know an idea works before we fit the EPROM.

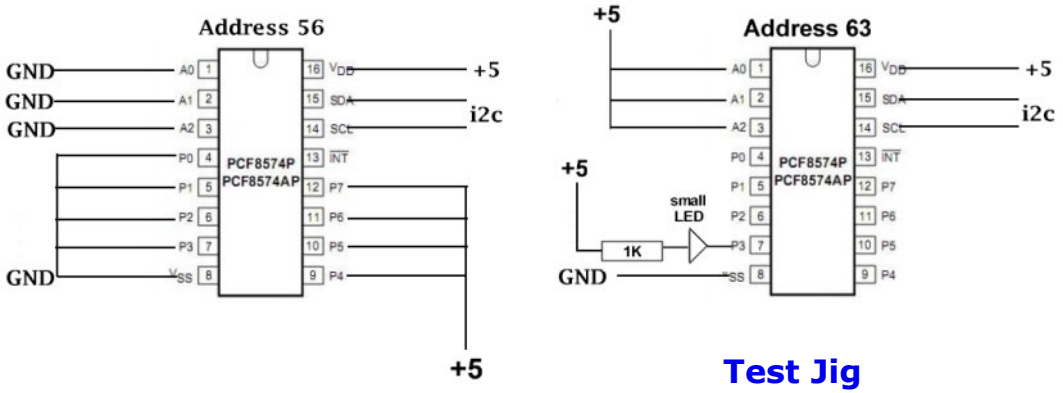
To read any data we need the full programme. I have added comments eg anything after the ` which is not necessary to run the code, it replaces what used to be REM statements. The test jig should report data as "0F" and the addresses will increment and the LED flash.

If all is well, fit the EPROM. The circuit diagram shows the wiring for most of the common types, the 24 pin chips,

Left: Control Panel and the result of the I2Cc scanner programme

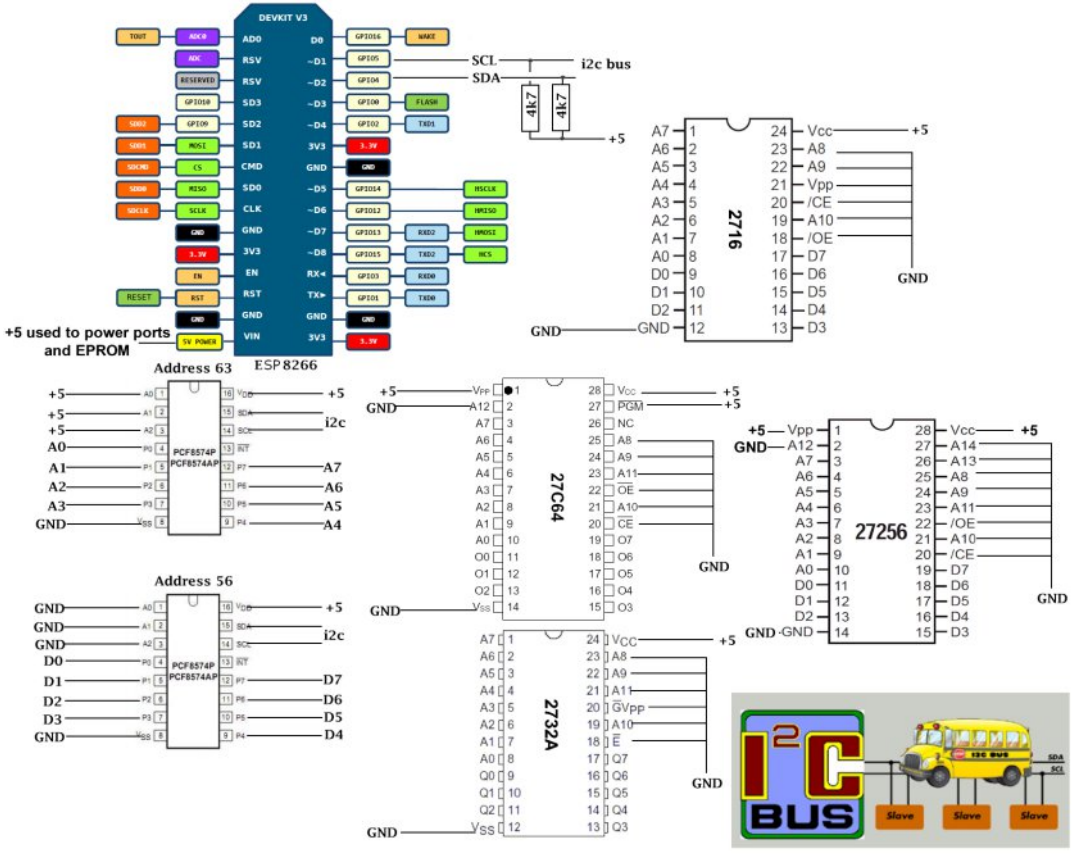
should be compatible with the 28 pin devices, if located at the bottom of the 28 pin socket, eg a sort of compatibility which would work if the NC pin on the 2764 was connected to +5. I don't think anyone expected the 27256 to come along as pin 26 was needed for the A14 address so switches became inevitable, but never the less a nice try.
This unit was only built on a prototype board so the EPROM wiring could easily be changed.

```
        'Eprom reader code
let address=63 'PCF8574 i2c Address set by hardware
let data=56 'PCF8574 i2c read address
let bite = 1
i2c.setup(4,5)
wprint " hex address------data "  &  "
<br>" 'column header

for a=0 to 127          'set how much of the eprom to read
    i2c.begin(address)
'address of PCF8574
    i2c.write(a)
'set address to read
    i2c.end()
    wprint "---- "  &  hex(a,4)
'print the eprom address
    wprint "----------"

'read routine
i2c.requestfrom(data,bite)
    d = i2c.read()
    i2c.end
    let e = val(d)
'change to a value
    wprint hex(e,2)  &  "  <br>"
'print data
    next a
'terminate the loop
    end
```



Test Jig

Circuit diagram of the interconnect to suit various EPROMS



Lets connect up the EPROM and run it.

Remember there are only eight address lines, so it is not going to read the whole EPROM and remember the port is a soft counter, with a ”for next loop” stepping it through as the value of “a” increases. Don’t step it through more, if you leave the leave connected you will see it flash (BASIC is Slow). If it lights continuously you have filled and frozen the address count.

So now we can remove the test wiring and fit an EPROM and run the full Unit.

The display is just a single column of numbers.

Everything was powered by the +5 supplied by the ESP micro on pin 15 which in turn was powered by the USB input.
This unit is the bases for something that could be expanded to read an entire EPROM by adding either a larger Port chip such as the MCP 23017 to manage all the address lines, or by utilising port connections of the ESP8266 other than the two providing the I2C bus.

The software could be expanded to make better use of the browser screen by adding multiple columns. I used BASIC to programme the unit only because it makes it easy to cut and past the code from our magazine pages, and also as a refresh for myself who is not a great code writer and its a long time since I wrote any BASIC, but I am always up for a challenge.

Hope you have fun and if you develop it further with better hardware or improved programming, please, we would love to hear about it. Our email is *editor@cq-datv.mobi*

ESP BASIC language manual, it’s free and on line at

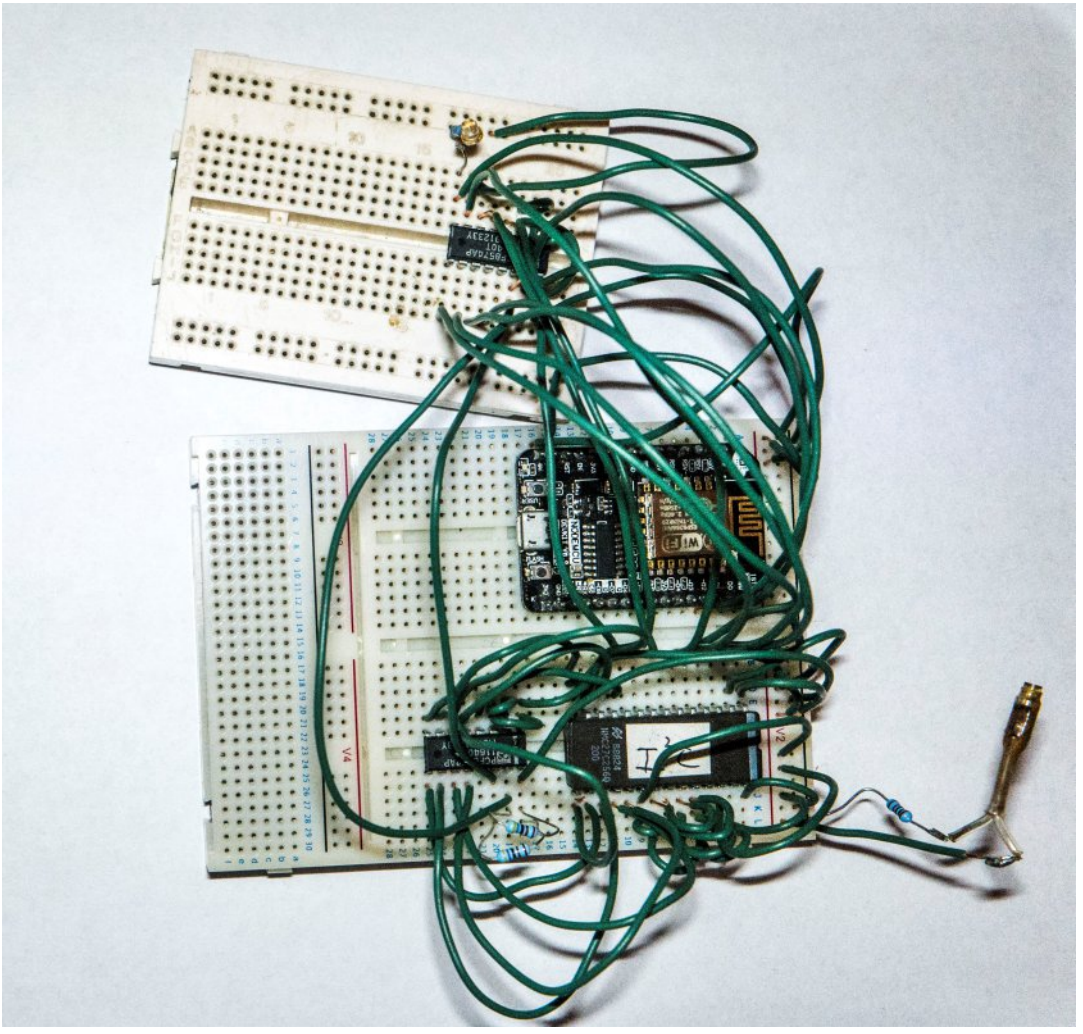
https://docs.google.com/document/d/1EiYugfu12X2_pmfmu2O19CcLX0ALgLM4r2YxKYyJon8/pub#h.o9kamrmfwc3u

Flash Link *https://www.esp8266basic.com/download.html*

Forum Help

http://www.esp8266.com/viewtopic.php?f=40&t=6732

There are lots of ads for the Node MCU module on the internet, but shop around and be prepared for delays.



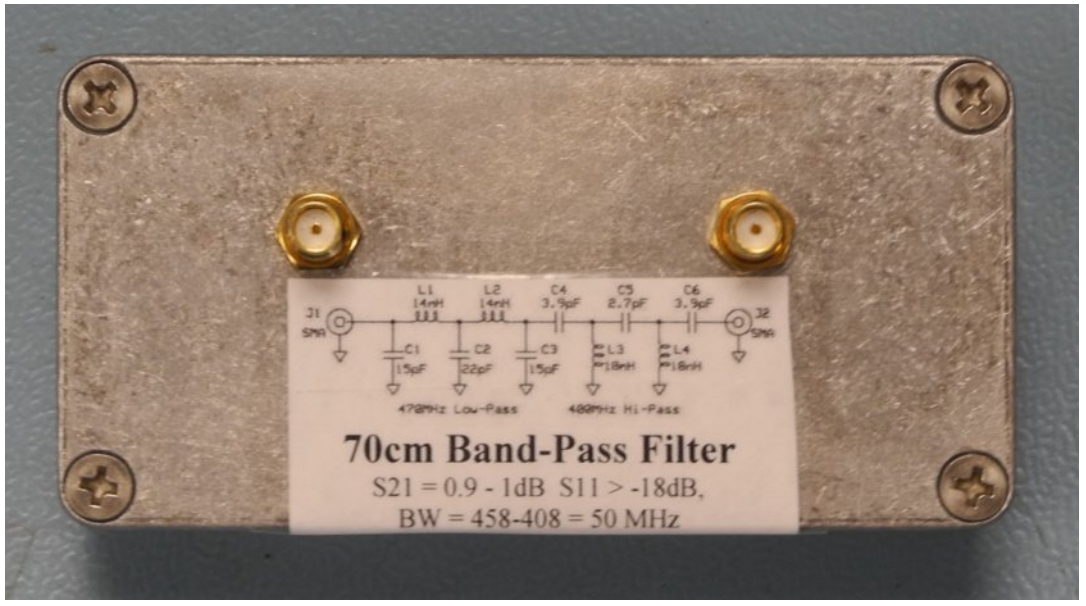
Note to self, Green is good, but other coloured wires are available.

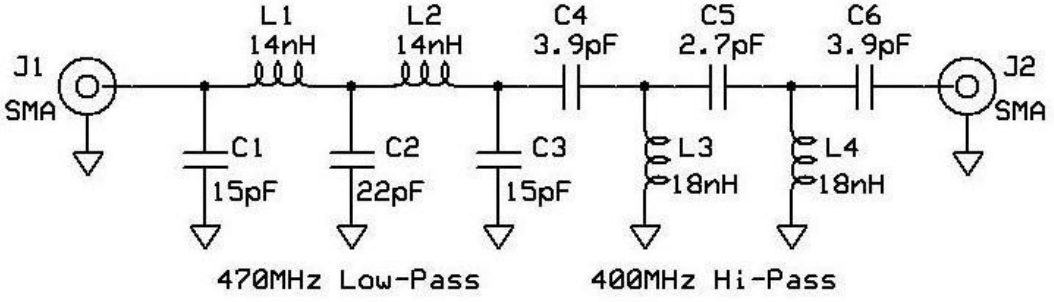
70cm Band-Pass Filter

Written by Jim Andrews, KH6HTV

I was having some issues with my 70cm receiver at home and thought perhaps a band-pass filter might help.
I wanted to build a simple filter just using simple capacitors and inductors, not a mechanically complex filter, like the inter-digital filters Don, N0YE, builds. I didn't need a steep skirted, narrow band (6MHz) one like we use on the repeater, just one to cover the whole 30 MHz wide, 70cm band. Hopefully a flat response across the 70cm band and then relatively steep skirts with good insertion loss at 2 meters and 23cm.

I first went to the internet and googled for a Chebyshev Band-Pass Filter (BPF) on-line calculator. Putting in my desired center frequency, bandwidth, etc. I got solutions, but they were not very realizable values. Very tiny inductors of less than 1 nH were required. My next approach was to instead use a combination of a 470 MHz, low-pass filter (LPF) and a 400 MHz, high-pass filter (HPF). This put the corner frequencies 20 MHz above and below the 70cm band edges. I used 5th order filters for both the LPF & HPF. This gave solutions with realistic values for both capacitors and inductors.

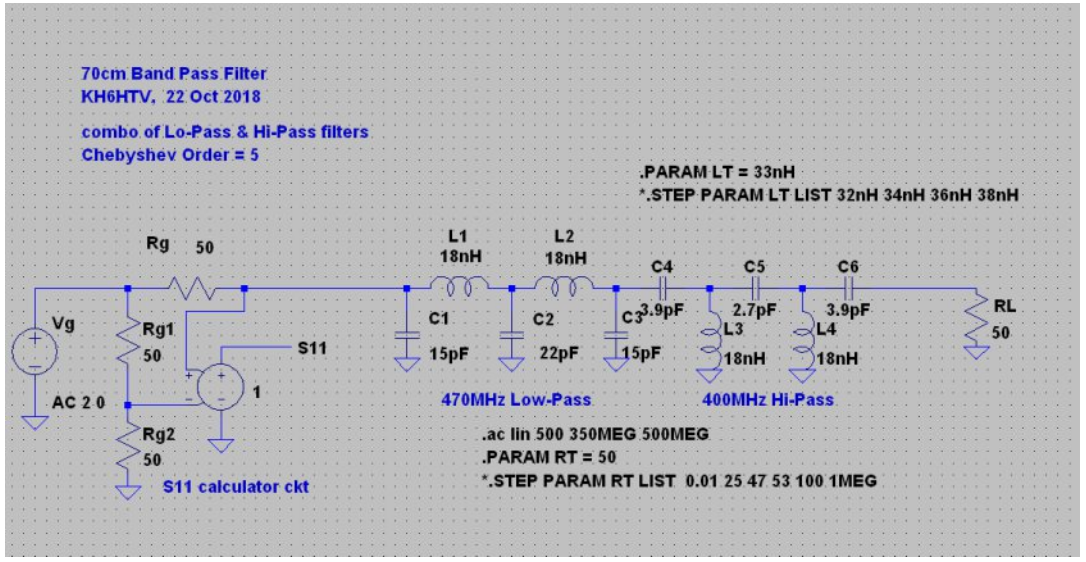


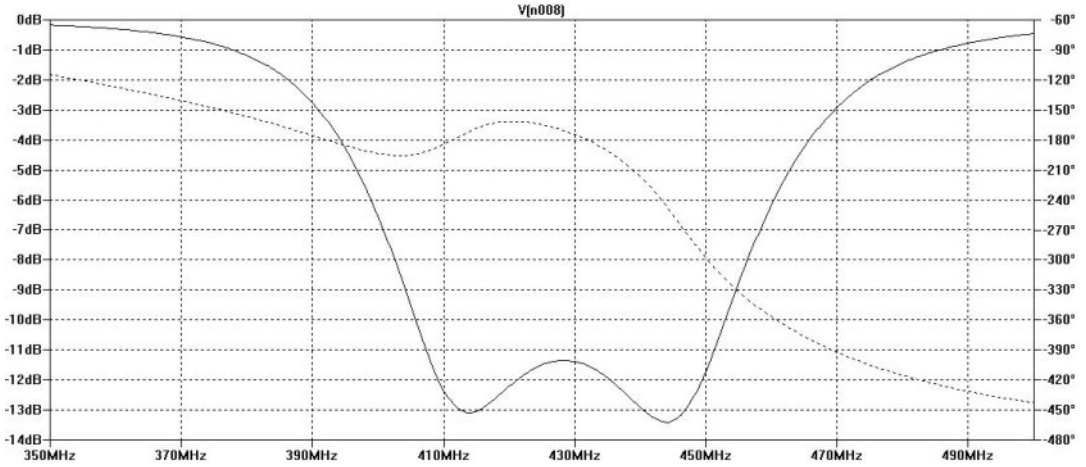


This is the resultant circuit diagram I used. The original design using the on-line calculators, called for all of the inductors to be 18nH.

My next step was to take the combo LPF / HPF and use the circuit simulator program LT-Spice to calculate the theoretical frequency response for both insertion loss, S21 and return loss S11.

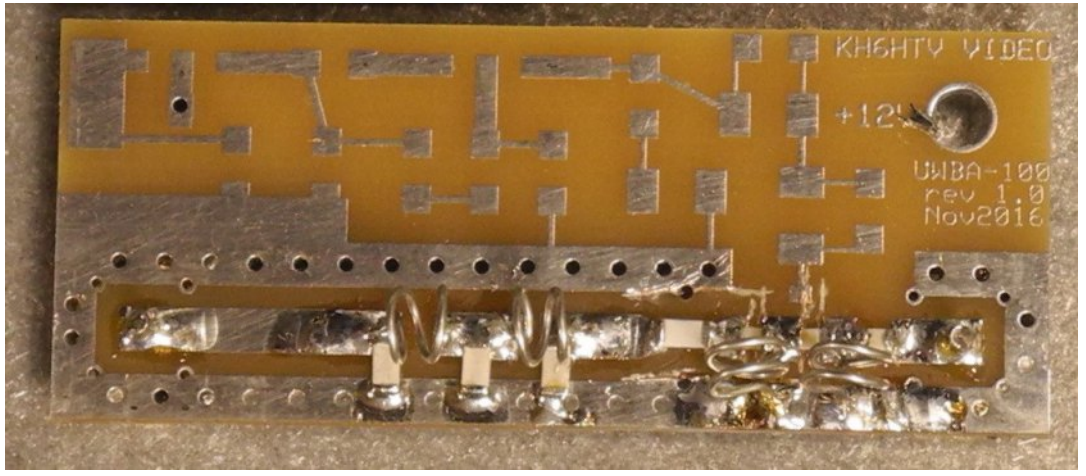
LT-Spice is available free from Analog Devices.
https://www.analog.com/en/design-center/design-tools-and-calculators/ltspice-simulator.html



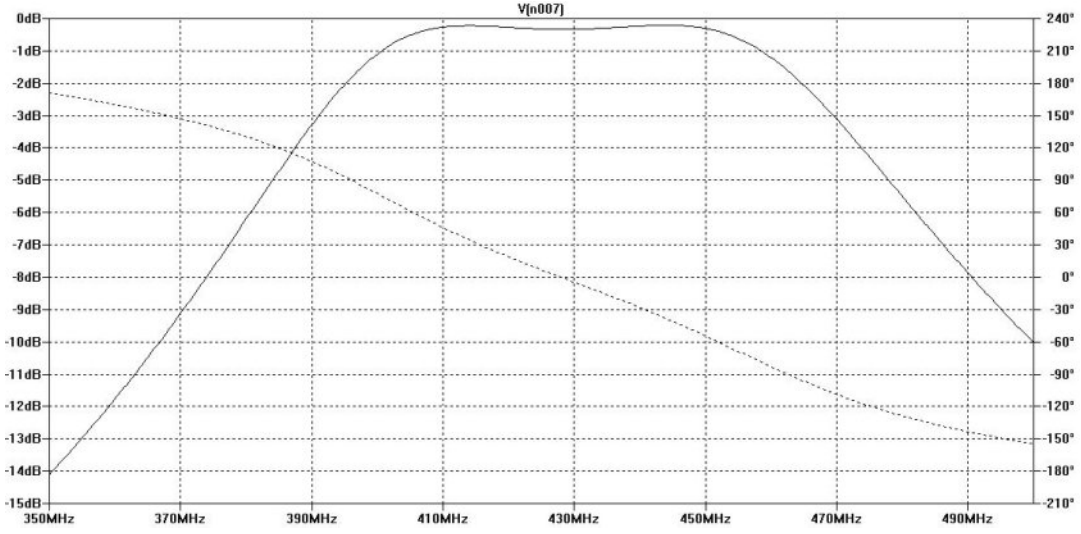


70cm BPF S11 Return Loss: 350 to 500 MHz, 1dB/div & 20MHz/div

This is the LT-Spice circuit I used. The funny circuit on the left modeled the source, Vg & Rg, and a means of measuring S11. The following two plots show the LT-Spice simulation for S21 and S11 from 350 to 500MHz. IL = 0.3dB (430MHz), flat from 410 to 450MHz -3dB BW = 471 - 390 MHz = 81MHz -65dB @ 145 MHz & 1270 MHz, RL = -11.4dB (430MHz), >11dB 410-450MHz



Interior view showing mounted pc board. note 2 turn loops, L1 thru L4

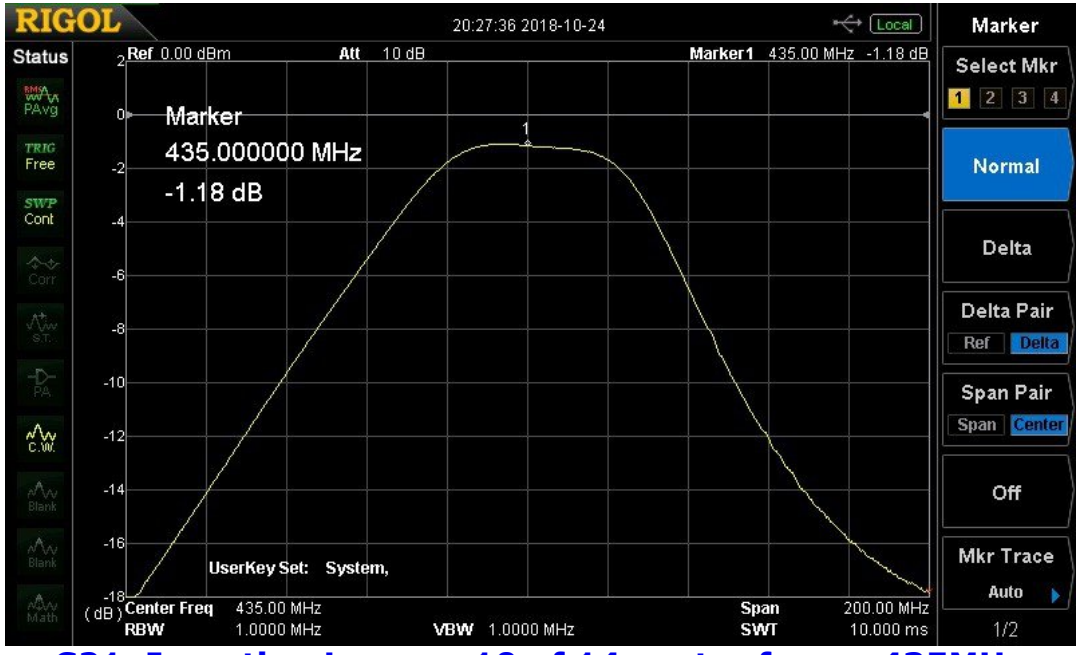


70cm BPF S21 Insertion Loss: 350 to 500 MHz, 1dB/div & 20MHz/div

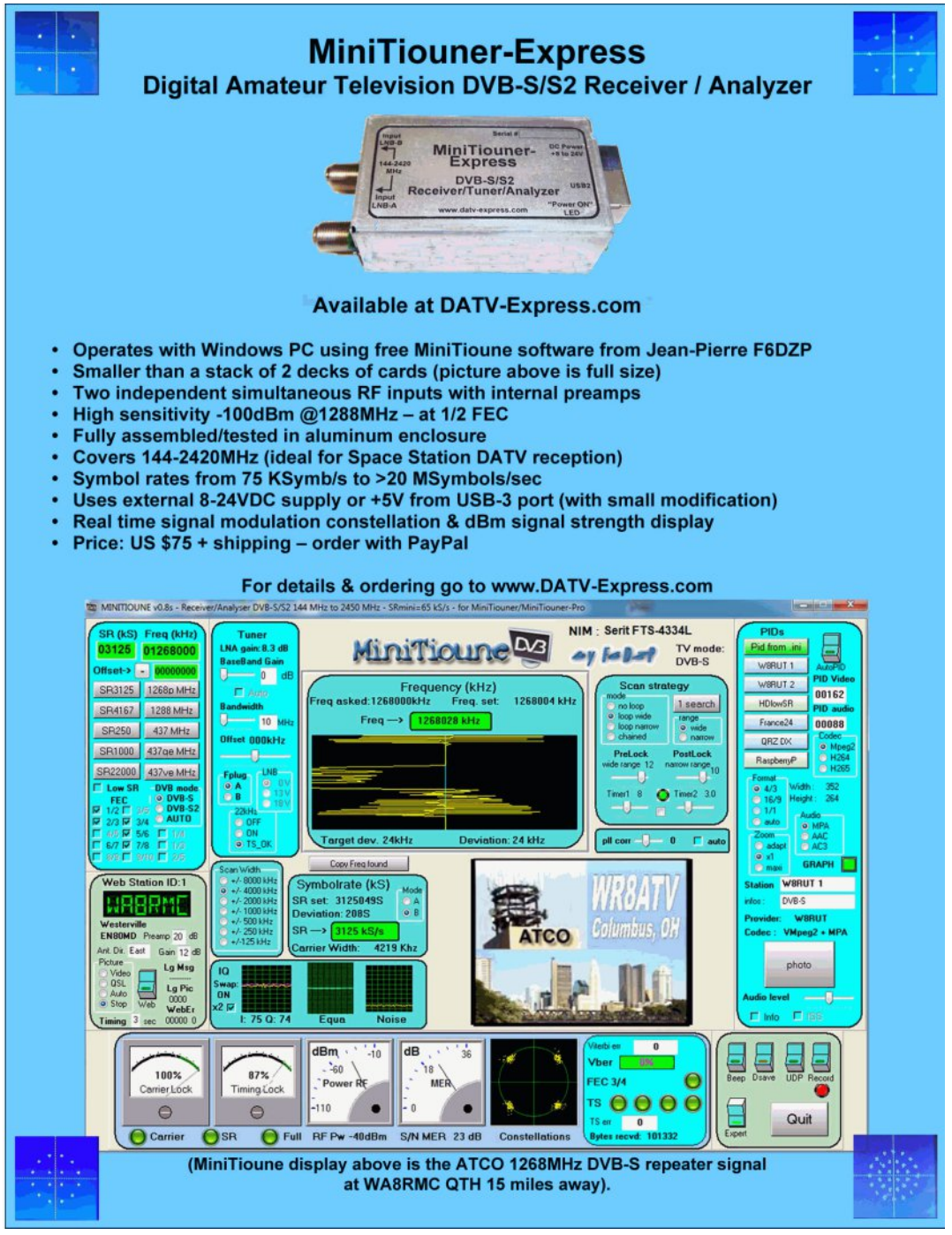
I then actually built the combo HPF/LPF. I used one of my own model UWBA amplifier pc boards as an FR-4 base. It already had a layout for attaching SMA connectors and also a 50 Ω circuit trace from input to output. A few simple cuts with a sharp knife enabled me to have appropriate solder pads to attach the various L & C components. I used 1206 SMD capacitors for C1, C2 & C3.

I used 0805 SMD capacitors for C4, C5 & C6. For the 18 nH inductors, I used a two turn loop of #26, bare wire. I found an on-line calculator for calculating the inductance. *http://www.circuits.dk/calculator_single_layer_aircore.htm* The calculator said to use 2 turns #26 with a diameter of 0.125" and coil length of 0.03". I added about 0.1" on each end as tabs to be soldered to the pads. I formed the circular loops by bending the wire around a 1/8" drill bit. I fine tuned the inductance by stretching or compressing the two coils.

The results were quite satisfactory. The mid-band S21 insertion loss was about -1.2dB. It was flat from 420 to 445MHz where I wanted it to then start rolling off. The -3dB bandwidth was 70 MHz, extending from 400 to 470 MHz, per the design. The S11 return loss was excellent across the whole band being better than -18dB. The out of band, insertion loss was about -50dB at 150 MHz and 750MHz. After 750 MHz, the IL started to rise reaching -35dB at the 23cm band. This rise was not predicted by LT-Spice.



S21, Insertion Loss: p. 10 of 14 center freq = 435MHz, 200MHz span 2dB/div & 20MHz/div



Quadruplex VTR's last stand

Written by Trevor G8CJS

In the last issue we heralded the arrival of C format video tape, which did seem to have Quadruplex outnumbered and on the run. It had slow motion replay, portable recorders, pictures in shuttle and record verification and serial communication with edit controllers. So was this the death of Quadruplex? Well almost, but not quite.

TV stations that had to raise their revenue through commercials had a requirement for a cartridge video recorder. TV commercials had almost been exclusively transmitted from 35mm film. This was achieved by splicing them into a single reel with film leaders in between each break, so breaks could just be cued up and rolled and parked on the next break.

Every time a commercial was transmitted in an evening it required a separate print from the labs. There was a team of commercial assembly staff that took the reel to bits every morning and compiled a new reel, depending on what the sales team could sell. This was slow and expensive and eyes turned to video tape to automate this process.

Initially the film reel was supplemented by videotape commercials, usually one at the top and or end of the break, but each commercial required a separate machine to insert it so that it could be live switched on air.

What was wanted was a TV Juke box with the records being TV cartridges that could auto thread and play using two decks for continuous uninterrupted play-out. One deck on air the other cueing up ready to go on air and well C format did not lend itself to this sort of rapid automated threading, but quad did also B format too.

RCA TCR100 The distinctive Tank track rotates back and forth to deliver the correct cartridge to the deck loading arms

RCA came up with the TCR 100, a twin deck VTR that could play TV cartridges with up to 3 minutes of Quadruplex tape. With the TCR 100, the Tank tracks were filled with red Cartridges. Each one had a single TV commercial that would auto thread and Autocue to tones on the tape. One deck played while the other reloaded. This limited the minimum duration of the add to 15 seconds unless it was first or last in the break. First because both decks were loaded last because the other deck did not need to reload.

The pictures were not of the highest quality because the normal quadruplex discipline of aligning the machine to suit the recording could not be achieved. All adjustments were made in the record domain to try and emulate a standard tape. The decks used a wrap around capstan motor with no pinch roller and mechanical arms to thread the tape. The logic was all DTL which was outdated by the time the machine was developed. The logic nest comprised of 200 PCB's with 5 chips per card, **so approximately 5000 logic gates, locating faults was not easy.**

The famous TCR 100 red box containing 3 minutes of Quadruplex video tape

RCA were not the only manufacturer to have a go at solving the problem of moving commercials away from the expensive film prints to a Videotape solution, that could accommodate late commercial E.G. made on a Saturday distributed over network lines recorded onto cartridge and transmitted within the hour (popular with Sunday newspapers).

The Ampex machine was the ACR 25 and used a vacuum thread rather than the TCR mechanical thread.

ACR 25 Cartridge Machine

They came out around the same time and the Ampex machine proved to be the more reliable. The vacuum capstan performed better than the TCR wrap around capstan and the ACR Time Base corrector had a larger window which helped the open servo loop (the RCA TBC could not dump into the servo as there were two servos and one TBC, normal RCA Quadruplex practice).

The short commercial restriction applied to both machines as they required threading up time.

A later development came from Bosch and was the BCN 100 using B format, which was also suitable for auto thread. This machine had no problems with a single short commercial as it had three decks more than two sequential short commercials could be a problem and was best avoided.

The technology was later too, no more DTL logic the micro chip had arrived. Play lists could be compiled away from the VTR area and brought through on floppy disc (8” remember those). The tape was cued up on time code and the cassettes could be identified by an optical type face label that the machine could read. So the 32 cassette bins did not need the commercials loading in strict transmission order.

Repeat commercials could be found by the machine as long as they were somewhere in one of the 32 bins. 32 commercials would not get you through the evening so some input was required from the VTR operation department, contrary to the caption over the only picture I have of a BCN 100 it needed an operator and the remote panel was not available in the bar despite numerous requests.

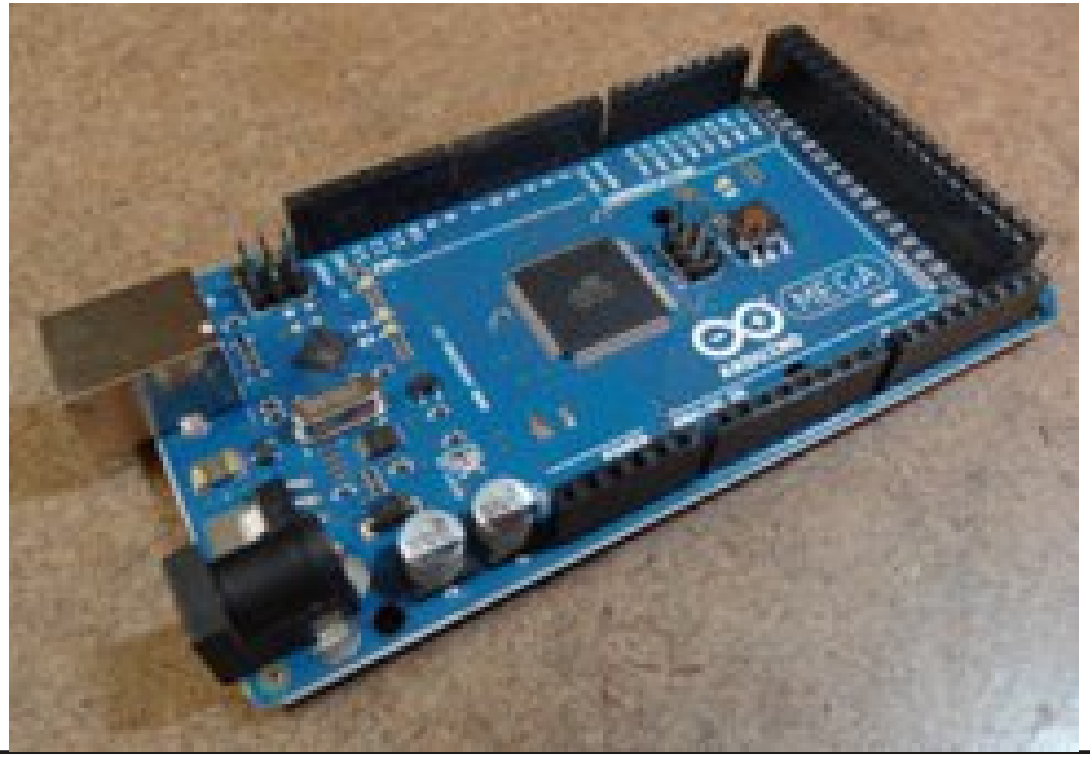
BCN100 2nd generation cartridge machine with computer logic from its own on board computers (ISIS) master computer talking to several Z80 boards. Never thought I would be pleased to see micro control, but after fault finding in the TCR100 logic nest…it was a welcome change. Thank you Darmstadt, pleasure to work on your kit

The BCN pictures looked better than the TCR pictures and the computer control was a relief after the TCR logic nest, but I must stress this was a much later machine and to compare it with the ACR25 and the TCR100 is a little unfair. It was really second generation and if only it had more bins so that all the stored commercials could be located by its robotic arm, then it would have been the outright winner..This feature came along with the third generation machines with a hexagon of rotating shelves called library machines where every commercial in the station was accessible. But this really was generation three and again should not be compared with the much loved BCN 100.

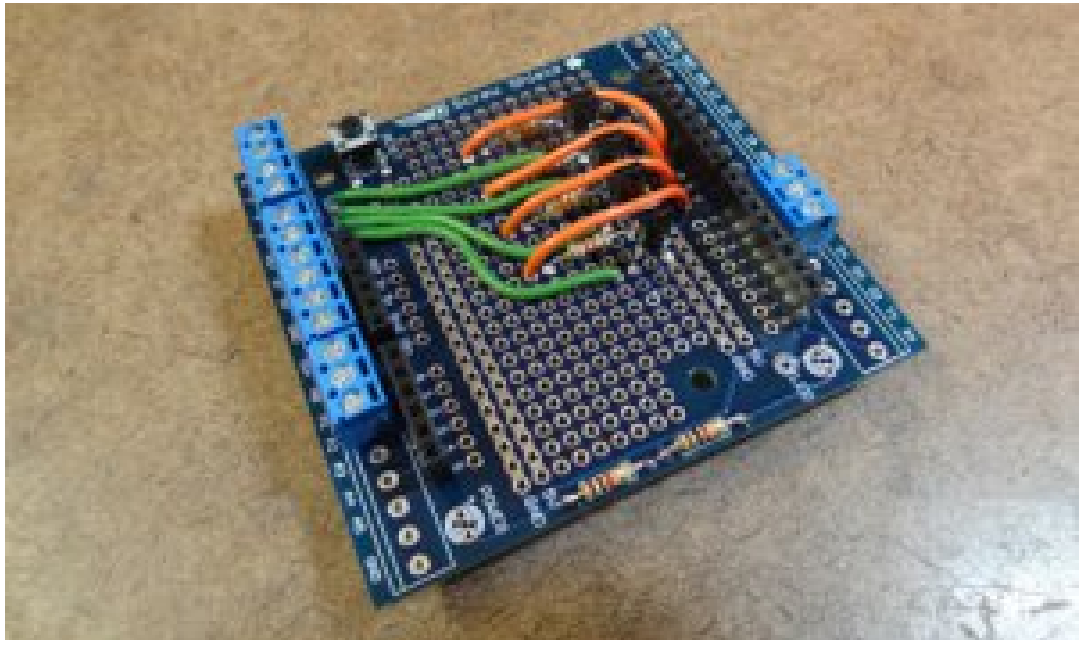
Arduino SimpleSat Rotor Controller

Written by Tom Doyle W9KE

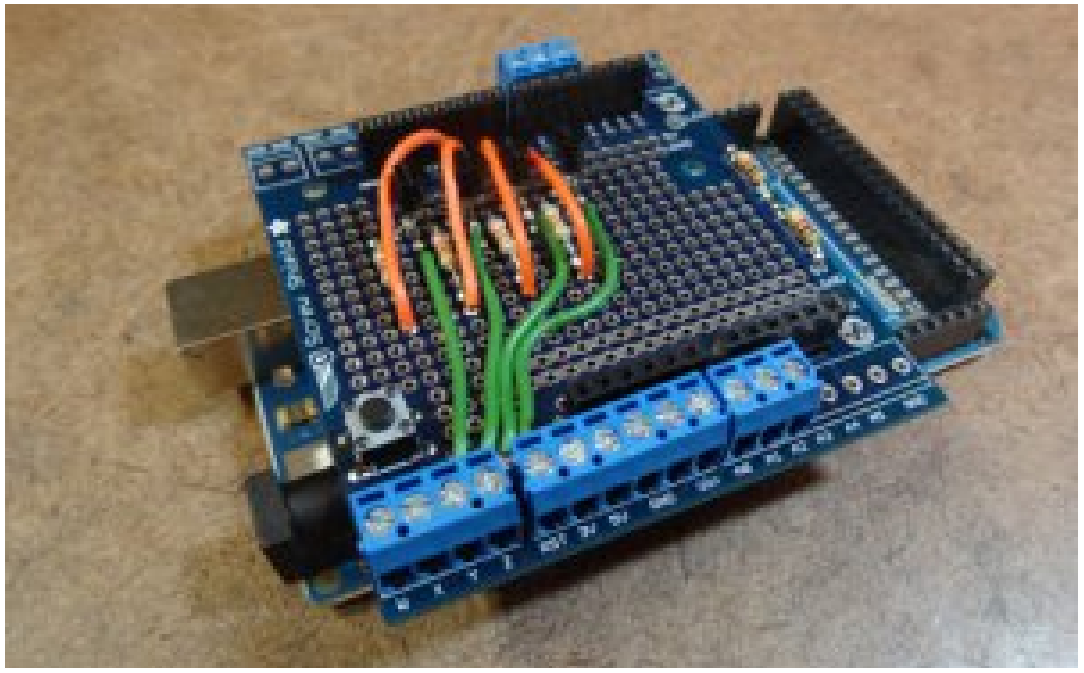
The Arduino series of boards is an excellent choice for a satellite rotor controller. This controller uses the Yaesu GS-232 command set to control a Yaesu G-5500 Az-El rotor. The controller was designed to be compatible with the SatPC32 tracking program and should work with any tracking program that supports the Yaesu GS-232 format. This controller has been tested with the Arduino UNO and the Arduino Mega2560. Below is a picture of the Arduino Mega2560 board. The board has a USB interface and is capable of being powered from the USB port or an external power supply.

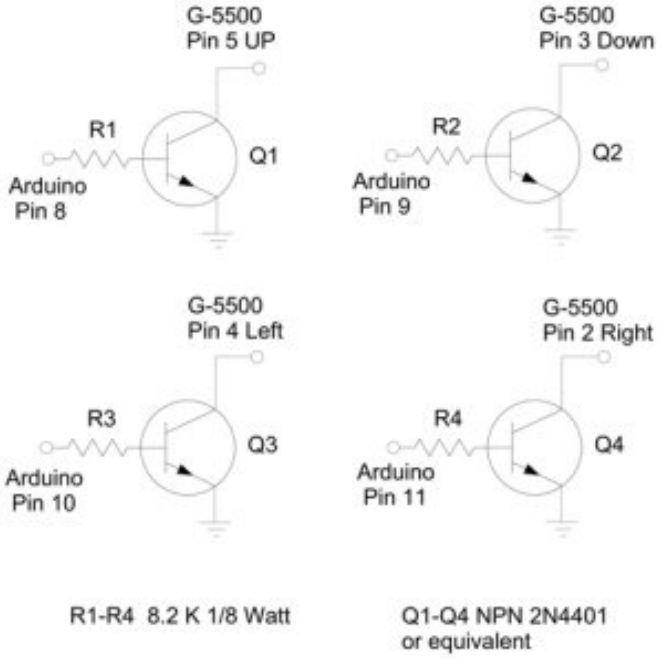


The Arduino series of boards are set up for plug in daughter boards (shields). There are a hundreds of different plug in shields available. I picked the 'Proto Screw Shield' from Adafruit Industries. The board offers screw terminals that are ideal for connecting to the cable that connects the controller to the G-5500 control box. The board also offers a prototype area which is used for the four 8.2K 1/4 watt resistors and four small signal npn transistors (2N4401 or equivalent) that are used to drive the UP, DOWN, LEFT and RIGHT control lines on the rotor control box. The picture below shows the completed daughter board.



The next picture (next page) shows the completed daughter board plugged into the Arduino Mega2560 board. The four orange wires connect the four output pins (8, 9, 10 and 11) that are used to control the rotor to the four 8.2K resistors. The other side of each resistor is connected to the base of an npn transistor. The collector of each transistor is connected (green wires) to one of the four output screw terminals (labelled W, X, Y and Z on the board). These four screw terminals connect to the UP, DOWN, LEFT and RIGHT pins on the G-5500 rotor control box.



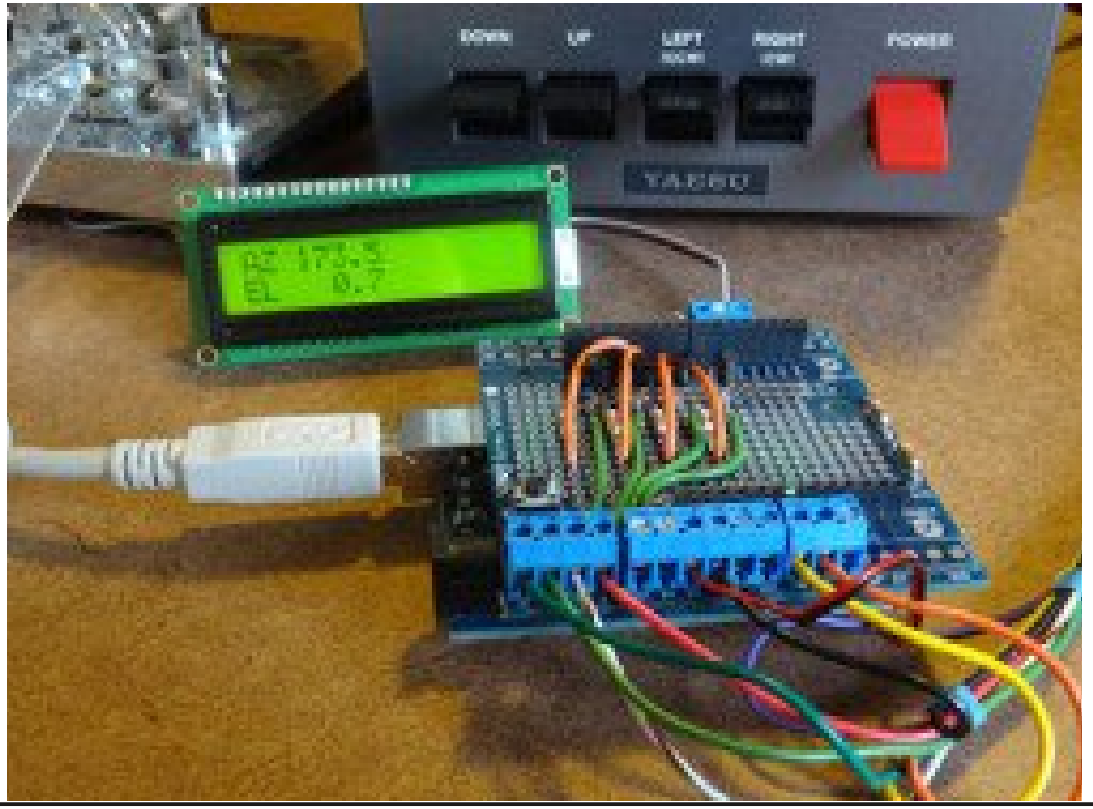


The emitter of each of the four transistors is connected to ground.

Top right is the schematic for the parts on the shield board. The transistors are used as switches to isolate the G-5500 from the Arduino. There is no need to use relays with the G-5500. There are three additional connections to the G-5500. Pin 8 (Ground) on the G-5500 connects to ground on the shield board. Pin 6 (Azimuth analog voltage) on the G-5500 connects to pin A0 on the shield board. Pin 1 (Elevation analog voltage) connects to pin A1 on the shield board.

Bottom right you will see the completed daughter board plugged into an Arduino UNO connected to the Yaesu rotor control box.

The USB cable connects to the computer running SatPC32 and provides power to the controller. The controller can also be powered from an external power supply. Do NOT power the controller from the Yaesu rotor control box.



The backlit serial LCD display is a 27977 from Parallax Inc.

If you plan on using the LCD display you might want to order a 805-00011 10-inch Extension Cable with 3-pin Header at the same time. The LCD display is not necessary for operation of the controller but is a very worthwhile addition.

Program compiled with Arduino 1.0

SimpleSat Rotor Control Source Code

http://www.tomdoyle.org/SimpleSatRotorController/SourceCode/W9KE-SimpleSatRotorController-v1_7.zip

Source

http://www.tomdoyle.org/simplesatrotorcontroller/SimpleSatRotorController.html

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

First published in issue 8

Simple Microwave Power Meter

Written by John Hudson G3RFL

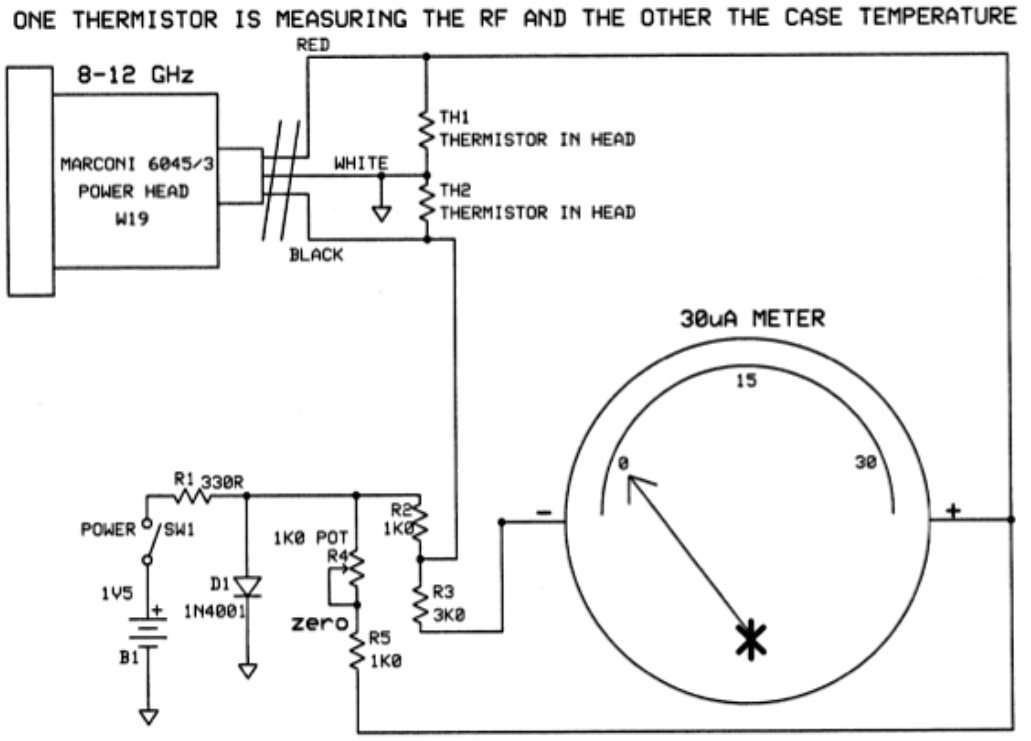
The original unit used a Marconi waveguide and transition to coax via a probe. The probe was removed and a thermistor put in its place at the focal point.

The second thermistor is mounted in the power meter case to measure the ambient air temperature. The RF will only warm the waveguide thermistor, so the resistance difference is proportional to the RF. This needs some initial calibration for the temperature offset and this is the purpose of the POT R4 which should be used to zero the 30µA meter, before the RF is applied. R3 can be varied to set the sensitivity or FSD (full scale defection) of the meter.

Apply the RF and the head thermistor will reduce in value and produce an increased current flow and change the balance of the two thermistors and this change in balance will result in current flowing through the µA meter, current that is proportional to the amount of RF entering the waveguide.

The unit is not calibrated so it is difficult to use it for power measurements, but it is useful for tuning up 10GHz transmitters and proved valuable for setting GB3FY up.

I did try using the Wife's hair dryer and a can of freezer to check for stability in various conditions and the unit does track the temperature changes via the case mounted thermocouple which cancels out these violent temperature changes.



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.

Legal Niceties (*the small print*)

E&OE. Whilst every care is taken in the production of this publication, dotMOBI accepts no legal responsibility for the advice, data and opinions expressed. dotMOBI neither endorses nor is it responsible for the content of advertisements or the activities of those advertisers. No guarantee of accuracy is implied or given for the material herein. dotMOBI expressly disclaims all liability to any person in respect of anything and in respect of the consequences of anything done or omitted to be done wholly or partly in reliance upon the whole or any part of this publication.
As the regulations for the operation of radio frequency equipment vary in different countries, readers are advised to check that building or operating any piece of equipment described in dotMOBI will not contravene the rules that apply in their own country.
All copyrights and trademarks mentioned in this publication are acknowledged and no infringement of the intellectual copyright of others is intended.

Copyright

Notice to Contributors

Authors are alone responsible for the content of their articles, including factual and legal accuracy, and opinions expressed by them may not reflect the editorial stance of the publication. Material submitted to dotMOBI should not infringe the copyright of other writers or bodies.
Contributions are accepted for publication on this basis alone.
dotMOBI publications - *http://cq-datv.mobi*

Author Guidelines

CQ-DATV welcomes contributions from our readers. It does not necessarily have to be on ATV, as long as it is of interest to our readers.

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.

Coming up in CQ-DATV

Is this the latest issue of CQ-DATV? *Click here* to go to our web site to check to see if there is a later edition available.

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.

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? Join our *mailing list*.