CQ-DATV

dotMOBI

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Editorial

Welcome to issue 62 of our electronic ATV magazine.

We now have two more ATV handbooks on the CQ-DATV download site.

The books are vintage and were written by Trevor back in the 80's (1980's that is - Ian). There was PCB support for at least one of them back then, but alas these are now no longer available.

Both copies were from Trevor's personal archive and have been scanned and turned into PDF downloads by Ian using character recognition software.

They are like everything on the CQ-DATV site, free of charge so please download and enjoy.

In this issue we have two articles translated from the German ATV magazine "TV AMATEUR" and we are indebted to Klaus DL4KCK for the translation.

One is a review of an LCD digital microscope for dealing with those small components that seem to shrink more as the years go by, perhaps we are just getting old. There is an unconfirmed rumour Trevor had a 70'th Birthday this month (a youngster - mine was six months ago - Ian).

The other is the conversion and use of PLL LNB's both are very interesting and we thank AGAF the German ATV magazine for allowing us to publish them.

Richard VK4XRL has been investigating ITS (Insertion Test Signals) those test patterns that can often be found above the picture in the vertical interval.

He started by looking at an old design By Dave Long G3PTU and has added modern components and design updates to breathe some new life into something from the ATV past.

Trevor Has written a final part to 50 years of PAL and explains the thinking behind the D2-Mac system that was at one time going to replace PAL as part of a European Directive for satellite direct broadcasting throughout Europe.

We all know what happened, DVB-T and DVB-S became the adopted system for Digital Terrestrial an Digital Satellite Television, but other ideas were tried along the way and it's interesting to look back at them.

For the mechanically minded we have a mast support constructional article Written by Jack Albers, VK2TUT. This first appeared in the Dutch Kingdom Amateur radio magazine which is also a free down load and can be found at *http://www.dkars.nl/index.php?page=magazine* along with all their back issues.

Kdenlive was an open source video editor project that was started in 2003. It seems to be undergoing a face lift and revamp so we are having a look at this free software and putting it though it paces.

Martin Johannessen has put together a rather ingenious back pack television station for use in places where conventional television hardware has its limitations. It is designed to broadcast live the up and coming adventures of Lars Thorbjørn Monsen a Norwegian adventurer and journalist famous for his explorations and backpacking expeditions in the harsh wilderness.

Ken W6HHC has updated us with the latest news on the DATV Express Project and has finished testing the LimeSDT-mini unit with v1.25LP7. and is pleased to report everything is working

Ian Parker, G8XZD reports on this year's IARU Region 1 ATV Contest where entries were amongst the highest for many years with seasoned veterans exchanging pictures with first timers. In the UK section top marks goes to Rob, M0DTS/P for scoring 10,000 points.

So as we always say - Sit back and enjoy CQ-DATV 62

CQ-DATV Production Team

CQ-DATV
Followed all over the world

Telford & DARS ATV Academy 4th/5th Aug 2018

Over the first weekend in August we are holding a free ATV event aimed at getting more people on air with Amateur TV. We will kick of at 10am on Saturday 4th August with a couple of presentations about ATV by the world experts from the BATC Noel Matthews and Dave Crump and then dive in for a full day of workshops and Clinics. Bring your Portsdown / Minitiouner / 5.6GHz Drone hack or anything else ATV along and we will be on hand with suitable soldering and test equipment to help you finish your project, get it configured, set up and working.

There will be a lunch option at reasonable cost so that you don't have to take too much time out of the fun and games with soldering irons and electrickery. If there is enough interest we will all head over to a local pub for a relaxed dinner on Saturday evening.

On Sunday 5th August we will try to get as many people on air as possible. If numbers permit we will have a team set up on a nearby hilltop and we can get some decent QSOs going, try out your newly finished kit and maybe borrow the bits you still haven't got working so that you can get on air. Venue: Eaton Manor Country Estate, Eaton-under-Heywood, Church Stretton, Shropshire. SY6 7DH

We cannot offer accommodation, but if there are enough people wanting to stay over then we can do a house booking with Eaton Manor estates at very reasonable rates.

Please Contact Heather on *heather@myorangedragon.com* or 07802 548938 to book a place.

Kdenlive: test the future

by Jean-Baptiste Mardelle Jul 4, 2018
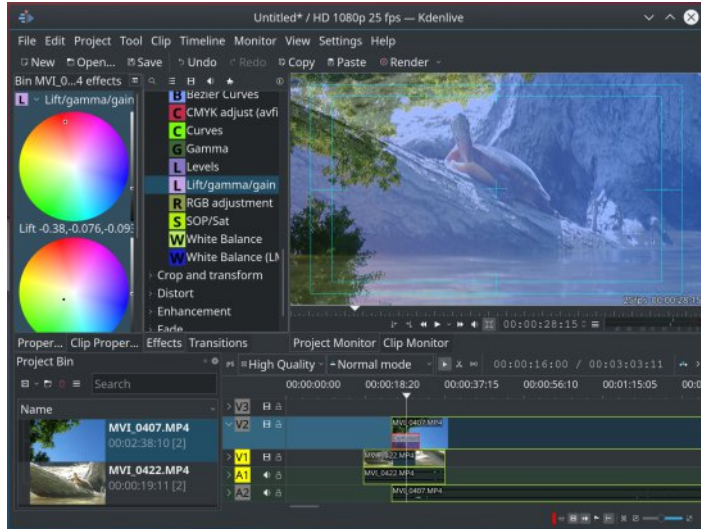
After more than 1.5 years of work, we are planning to release the refactoring version of Kdenlive in august, part of the KDE 18.08 Applications release. But taking such a decision is not easy. Most of the code was rewritten, which also means many possible regressions. So while we are very excited to have the opportunity to finally release our work to the public, it's also a bit stressful. So what now ?

Well that's where we need you. The latest refactoring code has been published as an AppImage, and we need some feedback. So you can help us by downloading the latest AppImage, and try it on your computer (just download the file, make it executable through your file manager and run it).

Improvements and new features include:

- *Clips with video and audio are now automatically separated when dropped in timeline*

- *All clip types in timeline can now easily be disabled/enabled*

- *Slowmotion should work reliably*

- *The long standing issue where moving groups of clips corrupted timeline should be gone*

- *Most effects now use a common keyframe interface*

- *Insert/lift/overwrite should work reliably*

- *Easily share your rendered video through KDE's Purpose library (YouTube, NextCloud, Twitter, Kde connect,…) requires a recent KF5 environment, not enabled on the AppImage.*

- *It is now possible to generate lower resolution clips for the timeline preview to have a faster rendering*

- *Resizable track height*

- *Several overlay guides available for each monitor*

- *New keyboard layouts can be installed in 1 click (we need help to create interesting layouts)*

And most importantly, the code is now much cleaner and ready for new features.

You should be able to create new projects, add clips, move them in the timeline, add effects and compositions, and render your projects. But there are still a number of known issues that we are working on:

- *Compatibility with older kdenlive project files is not perfect*

- *The curves effect does not work (Bézier curves works)*

- *Composition settings don't update on resize*

- *A performance issue in audio thumbnails causes major slowdowns on high zoom levels*

Some feedback on this beta version would be really appreciated. So please help us, test this AppImage version and let us know what you think of it. You can leave comments in this post, or on our mailing list, and we will soon organize a bug squashing day to make this release as reliable as possible!

So we hope to hear from you soon!

Source:
 https://kdenlive.org/en/2018/07/kdenlive-test-the-future/

DATV-Express Project

Just a quick note to say that the experimental software release of v1.25LP9 (on Windows) is now available to DOWNLOAD (free) from the DATV-Express web site at www.DATV-Express.com

v1.25LP9 now supports four different DATV exciter boards:

DATV-Express board
LimeSDR board
LimeSDR-mini board
PLUTO board

While the v1.25LP9 needs more testing by users...it seems stable with all four board types and has no obvious bugs. This is much better than the V1.25 software that had been around for about one year. Read the NOTES_v1.25LP9 text file for a description of recent fixes. Give it a try. Let us know of any bugs that you find.

73...de Ken W6HHC
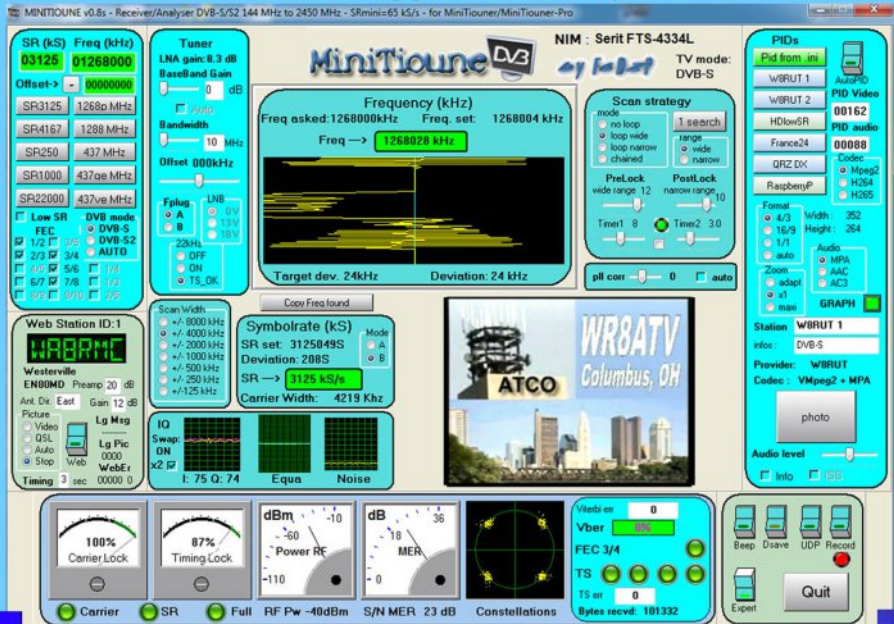
MiniTiouner-Express
Digital Amateur Television DVB-S/S2 Receiver / Analyzer

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).

Written by Ian Parker G8XZD

Entries for this year's IARU Region 1 ATV Contest were among the highest for many years with seasoned veterans exchanging pictures with first timers.

It was good to see so many of the stations active from more than one location showing that trying to get a picture to as many people as possible was just as important than scoring points - in the true spirit of amateur radio.

Logs were received for all bands between 146.5MHz and 24GHz, and a even a couple on 76GHz - if the contest had been a few weeks later no doubt 71MHz would have joined the list.

Some operators filled up vans and car boots with multiple bands and modes while others were content to test out their 5.6GHz stations - many built from model aircraft transmitters and receivers - showing it's possible to get on the air without spending a fortune.

Of course it wouldn't be a contest without the odd fuse blowing- or transmitting into the pre-amp, but that's another story.

Other comments included operators wishing they'd built a sun screen around the monitor while others accepted they should have put a bit more effort into the stability of their tripods.

But the common theme was that everyone who took part enjoyed the weekend. It's one of the few areas in amateur radio where you can build your own kit and then get the thrill of a long distance contact.

Right: G8GKQ All-band Portable

In the UK section of the IARU contest top marks goes to Rob, M0DTS/P for scoring 10,000 points with Noel, G8GTZ/P in second (9,601), and Dave, G8GKQ/P third (8,616)

And it was great to see all the BATC Portsdown transmitter kits and PCBs that have been flying off the shelves of the club shop being put to good use rather than sitting in the back of a drawer.

At the same time the BATC ran its own mini contest with £50 Amazon gift vouchers for the overall winner on 146.5MHz, the best two-way contact on 5.6GHz, and to the transmitting station using a Portsdown system received at the furthest distance (any band).

The prizes will be presented at the BATC BGM at CAT 18.

See the end of this magazine for the UK Log entries to the IARU contest.
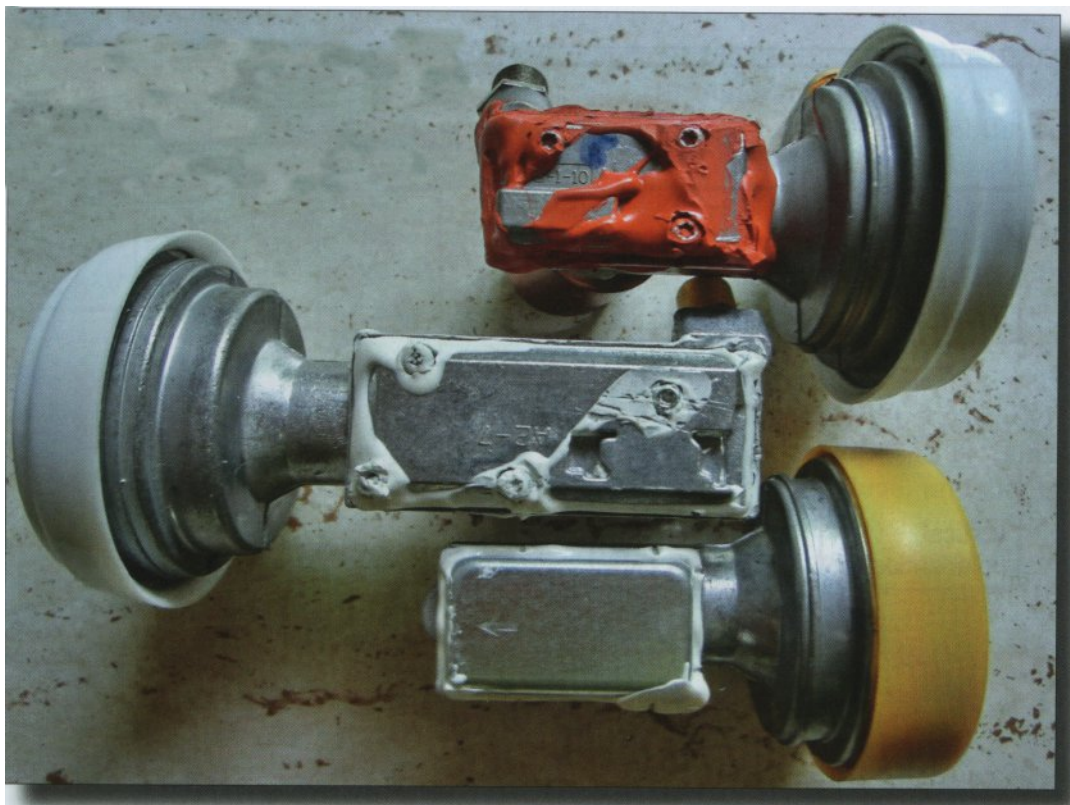
Conversion and use of PLL-LNBs

Written by Herbert Hommel, DL4AWK

Reprinted from TV-AMATEUR 189

Inspired by the very detailed publications by Hartmut Kuhnt, DM2CFL, in the magazine FUNKAMATEUR 7/2016, and by Darko Banko, OE7DBH, on the Internet, I bought six PLL-LNBs from different manufacturers to gain experience, two of each from Octagon OSLO, GOOBAY and GM-201.
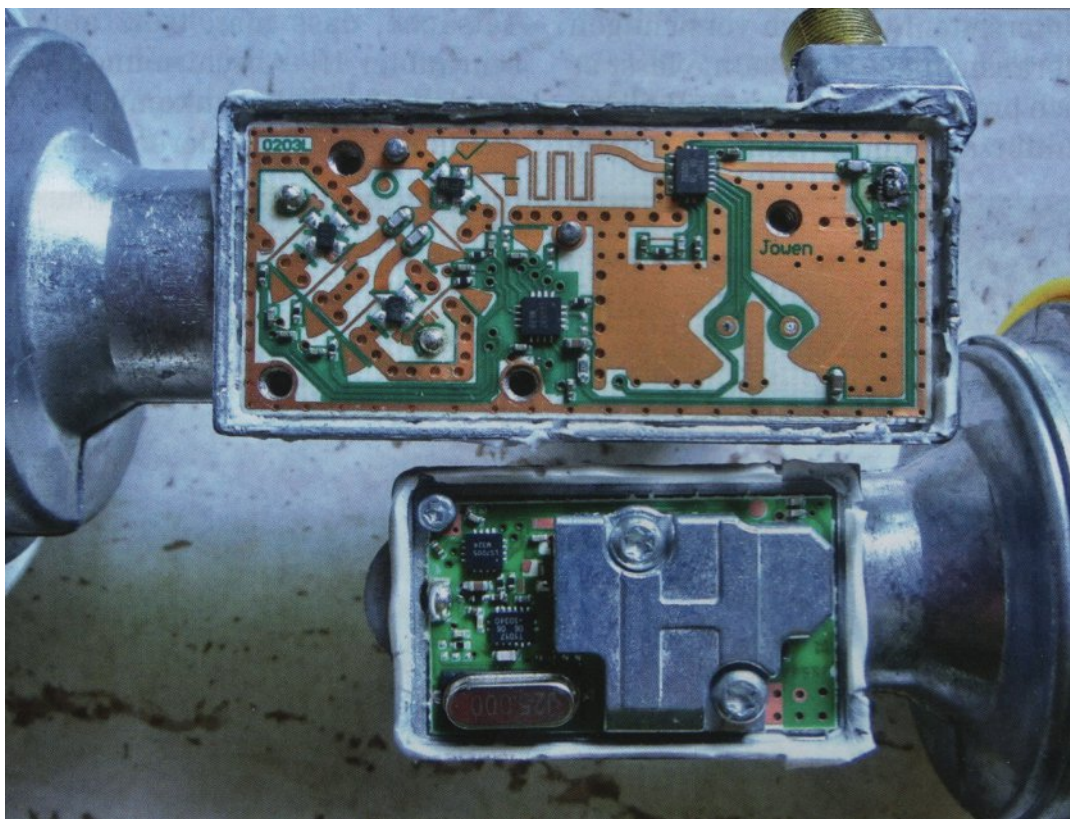

These three PLL LNBs were selected: OCTAGON, GOOBAY and GM-201 (from above)

The focus was not on the possible reception of the future TV satellite Es'hail-2, but I wanted to stabilize our 10 GHz links

around the ATV node DB0THA, for which we would need a little more than ten LNBs. First I tested the suitability of the LNBs as an attachment for my ancient russian frequency counter and was thrilled. All three copies brought in a sufficient amount of strong 250 MHz signals, which allows me to simply measure a 10 GHz signal with sufficient accuracy for ATV. The frequency difference of the LNBs was in the lower 2 digits KHz range. Less enthusiastic I was impressed by the accuracy of my old "frequency normal": three oscillators from old LNBs with 10.0, 10.2 and 11.5 GHz.

After removing the plastic half-shells it became apparent that the covers of Octagon and GOBAY are screwed and glued as usual, but the GM-201 only was fitted with a light aluminium cap. Who at times of Bluecap and Cambidge LNBs last time opened an LNB will be surprised how little components are still in there today. Since the quartz is the largest component you would think it was easy to desolder. But more of that later. I decided against the conversion of the Octagon because another PLL-IC with a 27 MHz quartz is in it and it's more than twice as expensive. Besides it needs approx. 170 mA current consumption, almost 100 mA more than the the other two. All LNBs work already stable from 8 volts supply upwards.

The inner workings of GOBAY and GM-201 are very similar. An IC provides all required voltages, it detects H/V switching and 22 kHz for LO switching. A second IC, here the TFF1017, includes preamplifier, mixer, IF output amplifier, crystal oscillator, PLL and VCO. A 25 MHz quartz HC-49S provides for the frequency stability. The divider factor can be calculated very easyly, 9750 divided by 25 = 390, i.e. with a 24 MHz quartz, the VCO is at 9360 MHz, which it also does without any problems. For the link frequency 10.380 MHz and for the reception of Es'hail-2 it is already sufficient. Question: Up to which lowest frequency could the PLL stabilize the VCO? We would also need to receive the lower link frequency at 10,160 MHz.

The inside view of the GOOBAY and GM-201, the screw heads are T9 and T6

Fig 5. LNB system block diagram with TFF1017HN/N1

The upper figure shows a block diagram of the LNB (excerpt from the TFF1017)

Since the VCO cannot be measured directly, there remained only attempt and error with indirect measurement via test signal and IF. At an open GM-201 different quartz crystals between 23 and 24 MHz were tested. With an old 23,435 MHz quartz from the handicraft box, the LO can be brought down on 9,140. My dream would have been 9,100, as you could've done with an LNB then the link frequency 10.380 is converted very stable to 1280 MHz, and so small transportable "filling transmitters" can be built.

Unfortunately, 23,333 MHz is apparently no standard quartz QRG and new production was out of the question at first after a long search in vain. Then at MOUSER in the USA the 23,512 SMD crystal from EPSON was found.

Type TX-3225 with 3,2x2,5x0,7 mm was immediately available. Minimum order quantity 250 quartzes, postage costs and customs duties have deterred only for a short time.

The GOBAY is the easiest to convert for the less experienced SMD solderer. The board is 1,5 times as long as GM-201 and the HC-49S quartz is located on the otherwise unloaded underside. After cautious removing the circuit board it's de-soldered with two soldering irons, de-soldering tool or hot air.

From RF layout viewpoint the GOBAY gives a visually better impression, especially the stripline filter to suppress the mirror frequency. In the absence of suitable measuring technology, however, I am unable to do so and cannot be specific. That the GM-201 will end up being my favourite, is due on one hand to the smaller design and the fact that, despite the RF shielding being screwed on it one gets close to the quartz, so I can experiment with it very well.

It was also tempting that you could save the removal of the board if necessary which could have a positive impact on the conversion of the 20 units that have now been ordered - it would save time. What I didn't realize that the solder pads of the SMD-quartz are very big. They perform the function of two Cs - in other LNBs designed as discrete components. As a result, heat dissipation to the mass side is greater while soldering for a long time loosening the pads off the substrate.
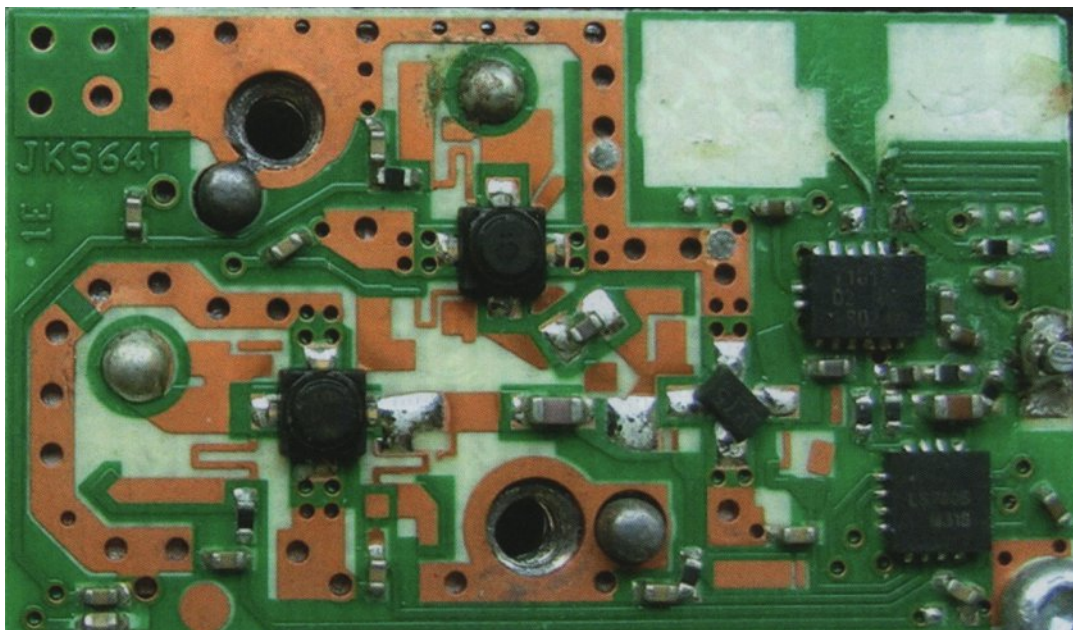
This is the result of impatience: the pads (top right) detach from the substrate

After I had damaged two circuit boards, I returned to the well-proven method, which already worked during the Bluecap LNB conversion. Insert the soldering iron into the bench vice, pull off the sleeve, adjust 450 degrees, remove the board underneath the quartz on the heating rod and slide the quartz sideways. It is not recommended to pull the quartz upwards with pliers, because the solder pads peel off easily. The remaining 18 LNBs have survived this procedure unscathed.
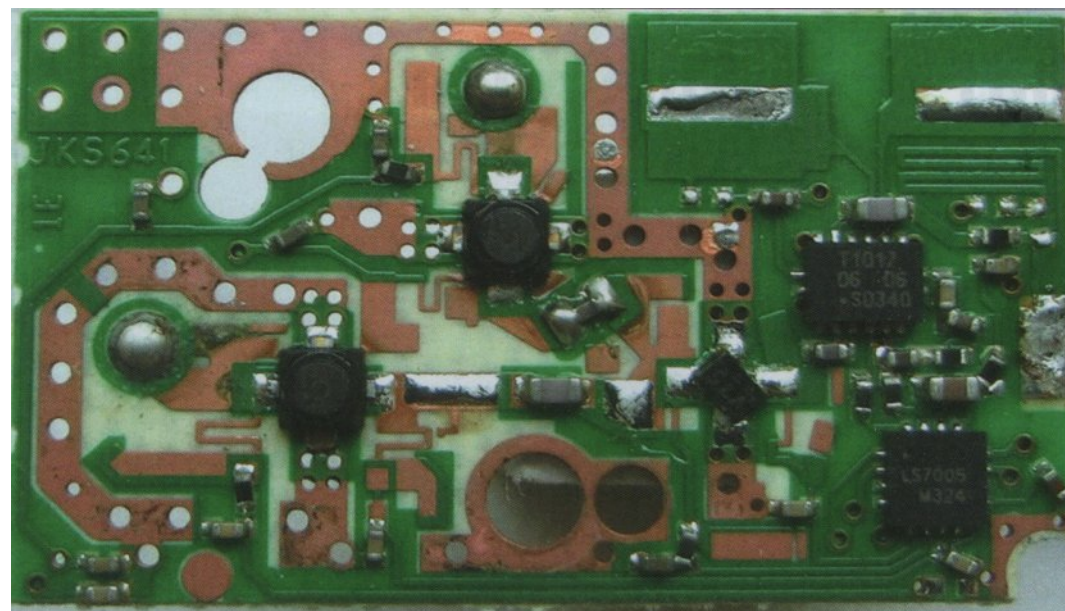
Why not? - The original quartz is clean

Unfortunately, the distance between the solder pads is too large to accommodate the new quartz easy to solder in. One could carefully remove the solder mask to lengthen the pads, tin the pads and mount the quartz horizontally, but with a weight far below 1 gram I have opted for standing upright assembly, soldered directly on one side and connect the second pin with a thin wire.

The practical test shows in addition to the now better frequency stability also a significantly higher sensitivity. On reception of a 10 GHz signal from three kilometers distance the new LNBs in comparison with my best DRO-LNBs brought a 10 to 17 dB higher IF level. For the modification of a 30 cm parabolic dish originally for 38 GHz I sawed off the feedhorn to improve the illumination. The LNB could thus fit directly to the WR22 waveguide bend and was placed in the focal point by lateral bending. Shading by the small LNB is minimal. With this dish and a 200 mW transmitter with slot antenna a link has been running for almost a year over 100 km distance between DB0THA and DB0KNL.
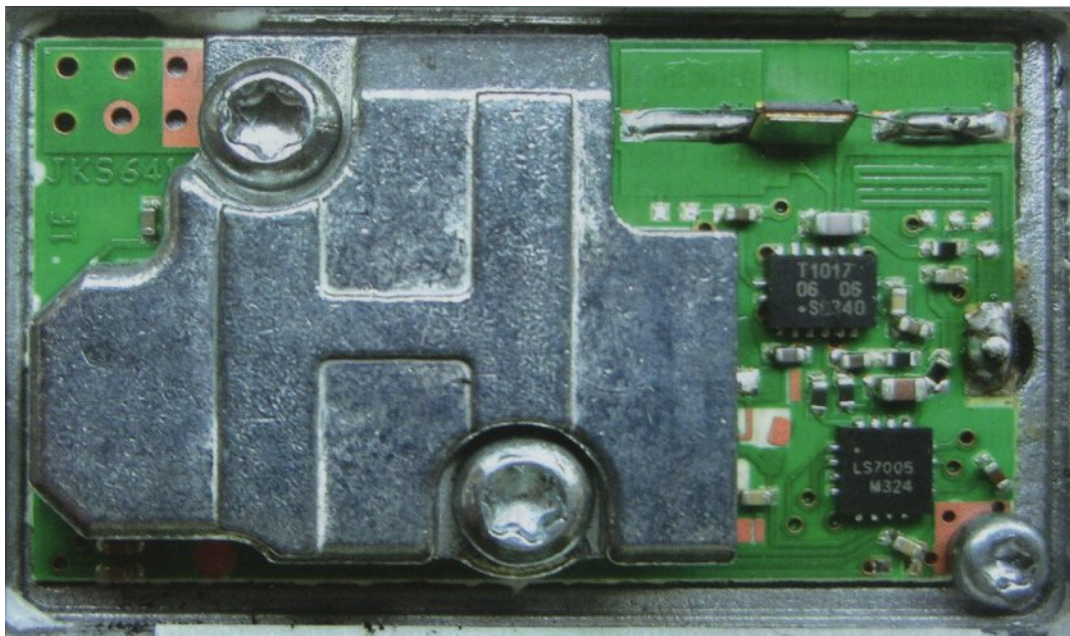
Done: the new quartz is soldered standing upright

The Octagon LNB also performs well in the original version as a down-converter. With feed switch and the very inexpensive handsome frequency counter and level meter IBQ101 it is now much easier for me to measure the frequencies of the link transmitters on site without interference in order to align antennas or to improve mirror illumination. With the new PLL-stabilized LNBs for a small sum of money now assemblies are available to tinkering joyful radio amateurs, which were reserved only to the commercial radio services a few years ago.

The author can still deliver SMD crystals with the frequency 23.512 MHz at amateur-friendly prices on request. E-Mail: *dl4awk@gmx.de*

Translation: Klaus, DL4KCK *www.agaf-ev.org*

IBQ101, my new inexpensive "helper"

DATV-Express Project

Written by Ken W6HHC

Art WA8RMC reported most sales of MiniTiouner-Express in June, were sold outside the USA. The latest inventory in England for sales-to-EU is down to three units. Art confirmed he can purchase an order for another batch of Serit NIM tuners (100 units).

Ken W6HHC finished testing the LimeSDT-mini unit with v1.25LP7. Everything worked well. Ken then switched to testing v1.25LP7 on the DATV-Express board focusing on the correction of the time-stamp code issue that had allowed the audio to quit in DVB-S protocol mode after a short time (less than 60 seconds) on v1.25 software release. Ken also confirmed that RB-DATV (Reduced Bandwidth works well with on the DATV-Express board with this software and the new software. Ken did confirm one bug with the experimental v1.25LP7 software, where the transmitted RF output power-level on the DATV-Express board always starts at 100% when the PTT is pushed (regardless of the setting shown on the display or .cfg file). It is easy to work around the 100% RF Power issue…but, it is a bug. Art ran into an old problem with MiniTiouner-Express receiver while testing v1.25LP7 on the DATV-Express board. When loading LAV decoder filters for MiniTioune software, Art's main Win7 64-bit notebook usually decides to choose Microsoft DVD Video Decode filter (not LAV filters). The result is that his video displayed by MiniTioune-Express is very jerky with a frame rate of maybe 1 FPS (or less). Ken and Art are still working through the somewhat tedious procedure to assure that correct LAV filters are successfully loaded on Art's notebook

Charles G4GUO reported that he very busy on many projects. He reports that that most of his testing of v1.25LP7 software so far was limited to testing the LimeSDR exciter board.

Screen-capture of v1.25LP7 software driving a DATV-Express board with DVB-S protocol. The audio was perfect.

It has become very time consuming to carefully test all of the supported exciter boards:

- DATV-Express
- LimeSDR
- LimeSDR-mini
- PLUTO

The next available experimental software will fix the DATV-Express 100% RF Power-out bug and another issue if you are using B frames, as soon as he tests the software on Pluto. Charles plans to make available an updated experimental package for v1.25LP that corrects some bugs within a week.

Project Speed is set to moderate….de Ken W6HHC

LCD digital microscope G600

Written by Rainer Mueller, DM2CMB

Reprinted from TV-AMATEUR 189

The SMD components are getting smaller and the distances between the tracks are far below 1 mm. Soldering, but also control of short-circuits and solder bridges without looking aids is hardly possible. From different suppliers (e.g. Amazon: "KKmoon" Digital Electronic Microscope with 4.3inch 3.6MP LCD display, costs 57,99€).

LCD digital microscope G600 which can be used for this purpose, is excellently suited.
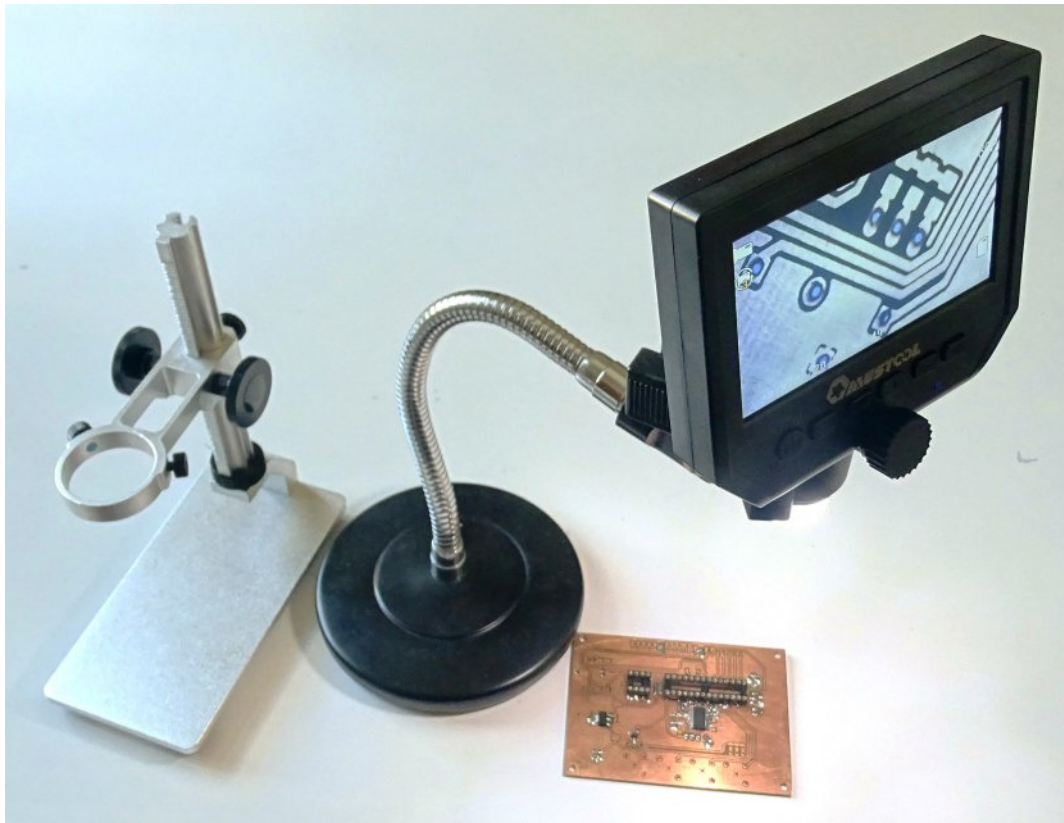
LCD digital microscope G600

The microscope control screen (English is an option)

I bought the microscope with a metal base. The built-in LED lighting is controlled by means of an adjustment wheel and the focus distance to the object can be adjusted very exactly. It is also used with suction cup attachment offered and also fits well into a clamp microphone stand. Up to 64 GB MicroSD card is supported for storage.

The photo's shows the soldered IC FT232RL in an SSOP28-hHousing at a distance of 150 mm. The IC connectors have a width of 0.3 mm. If you go with up to 15 mm from the lens, only 3 connections are shown. With a digital zoom (x2; x4) you can achieve to see only one of the 0.3 mm wide IC connectors. A parallel display on another monitor is unfortunately not possible, but you can save the picture as photo or video.

Specifications:

- *Resolution: 1080P, 720P, VGA*
- *Camera: HD 3.6 MP CCD*
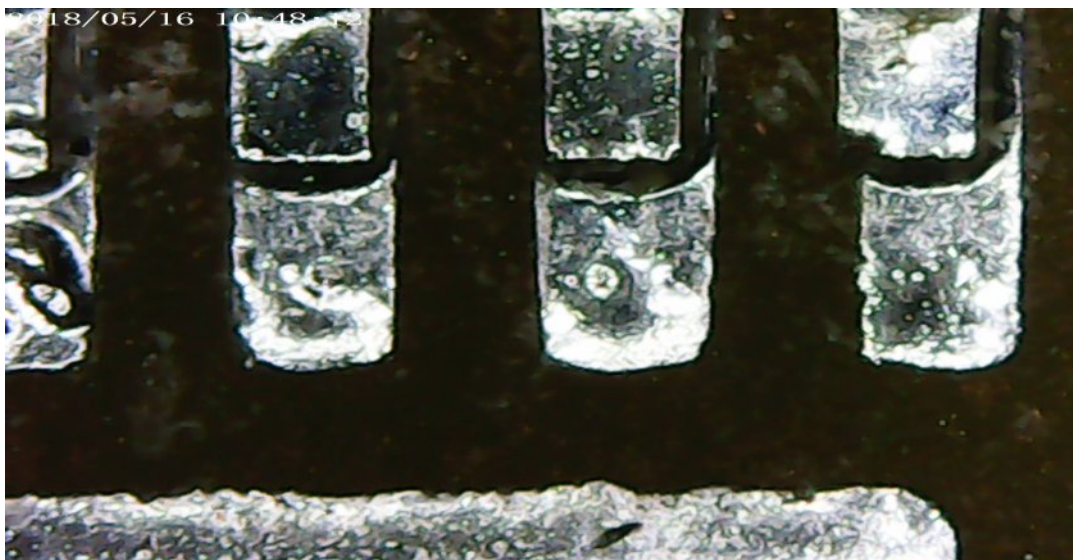- *Display: 4.3 inch HD-LCD display*
- *Magnification: 1-600x*
- *Object distance: 20 mm - infinite*
- *Battery operation: approx. 6 hours*
- *Languages: English, Spanish, Russian,*
  Korean, Japanese, Thai, Hebrew,
  Portuguese, German, French, Italian,
  Turkish, Czech, Chinese.

Translation: Klaus, DL4KCK *www.agaf-ev.org*

The possible distance between lens and object can be set between 20 mm and infinite, so you can comfortably solder underneath. The focus is on Hand over the control dial. The 4.3 Inch LCD display offers a clear picture and helps to identify small objects. With the built-in Lithium-ion battery it can be used for 6 hours of uninterrupted work, an EU-plug power supply for charging is supplied.

This backpack will carry the entire "Monsen - minute by minute"

Categories: Minute for Minute , NRK Fabric & TV

Written by Martin Johannessen

Jon Ståle Carlsen is the man who has developed the backpack that will act as a control room. - I brought it to the shower a few days ago. It's almost completely tight, he says. Photo: Martin Johannessen

Lars Monsen has the habit of putting his trips to places where motorized traffic is not possible, so when he is going to head the summer's minute edition for the minute broadcasts , we have found a solution to scaling down the technical rig for a full live live television production to something that can be worn on the back.

For more than a year, we have worked with NRKbeta in a solution that makes it possible to reconcile the two NRK productions "minute by minute" and "on tour with Lars Monsen". What we have come to mind is something that could be found in the garage of Reodor Felgen, and just over a week ago, we took a little alternative control room on a test trip to Sognsvann, just north of Oslo.

Not unexpectedly we met on some challenges, but most of all it was fun to see that the small TV studio actually works!

First, a little background:

In Monsen - minute by minute, everyone who wishes to follow Lars Monsen on a number of hiking trips in the mountain world gets the chance. Over four weeks Monsen will go to Hardangervidda, in Jotunheimen, in Vesterålen and in Inner Troms.

Illustration: Martin Gundersen / Norwegian Mapping Authority

It offers a number of challenges. Once we have produced live minutes for minute ship and train shipments, we have had the opportunity to build a full-board TV control on board.

We have also done a series of "single camera productions" in pig-tied regions (think drama productions and nature programs), but these do not require images and sound to be cut on-site and transmitted in almost real-time.

Therefore, we had to build a control room that we could take on foot. To do that, we had to reduce the weight (now 32 kg) and make it more efficient because everything is powered by batteries.

By comparison, we have found pictures from previous years control rooms.

And there were some cables

How to watch TV Registry Checkout on the Hurtigruten in 2011

This year's control room is a backpack operated by two people

The carrier goes front with the backpack that holds most of the equipment and two screens to show what is filmed and sent "home".

The image maker goes behind and focuses on television production. To make it easier to see the screens in full daylight, we have the opportunity to tense the blanket to the sides and upwards, but the weather conditions today did not require it.

We also made it possible for the image producer to use a small screen attached to a spectacle made by manufacturer Vufine which also shows all video sources in real time.

Source: *https://nrkbeta.no/2018/07/07/denne-ryggsekken-skal-baere-hele-monsen-minutt-for-minutt/*

Continued next page...

Project leader Thomas Hellum (right front) in the role of image producer. Thomas always keeps a good eye on the screen of the carrier, so that he can decide which images work best at all times.
Photo: Martin Johannessen

Christian Grotnes in the role of carrying boy at Sognsvann. He is usually editor of the NRK news division, but this summer, Christian will be "sherpa" on "Monsen minute by minute" at one of the stages. Here, Christian poses with the somewhat unusual carrying mantle on his back.
Photo: Martin Johannessen

50 Years since PAL - The D-Mac system

Written by Trevor Brown G8CJS

The problem with PAL was that when it originated broadcasters were using AM transmission. Satellite broadcasting quite wisely adopted FM and unfortunately PAL does not take well to FM.

The problem is well known, the energy in the sidebands is small so the further you move from the main carrier, the more the power reduces and the noise increases. 4.433MHz away from the luminance is the colour subcarrier with all the chroma information, resulting in chroma noise.

You can use pre-emphasis for the transmission and the reverse de-emphasis in the receiver and reduce the noise, but it's not a perfect solution and although Sky started this way with Alan Sugar offering £1m to anyone that could show him a better picture than his FM PAL, no money changed
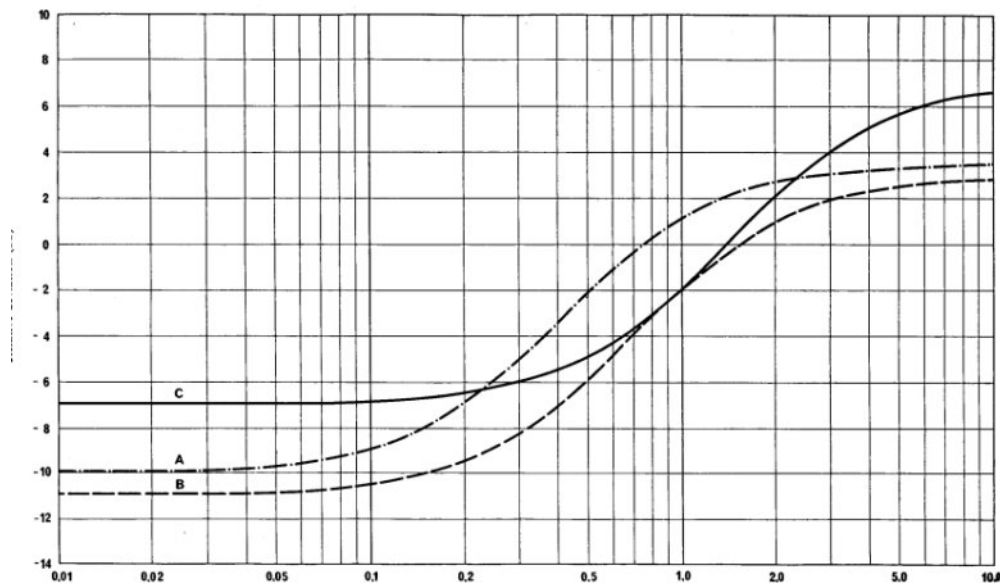
CCIR 405 Pre emphasis Curve - A is for 525 lines, B is for 625 Line, C for 819 lines

hands and PAL made it to the Astra 1A Satellite. PAL was not ideal and the big question was what to put in its place for satellite transmissions.

Time division multiplexing of video was one solution to eliminate subcarriers. It had had a lot of work done on it by Sony for their Betacam component video recorders and provided the opportunity in their case to record component television on video tape. Could this be the answer?

In 1982 a Time Division Multiplexing system was developed by the UK's Independent Broadcasting Authority (IBA) and produced a coded TV signal devoid of subcarriers. This was adopted as the transmission format for the UK's forthcoming direct broadcast satellite (DBS) television services (eventually provided by British Satellite Broadcasting).

Mac was not a full digital system as the name implies. MAC stands for Multiplexed Analogue Components. The system used time compression to eliminate the colour subcarrier and squeezed the Luminance picture, the chrominance and the audio so they could sit side by side on a TV line. These could be expanded in the receiver and put on the correct place on top of each other, with no subcarrier involvement.

When you squeeze up the information the bandwidth increases so D-MAC required 8.4 MHz. Remember we are looking at Satellite broadcasting and as such are not restrained by terrestrial channels.

Once you have made the big decision to leave compatibility with existing standards, something that PAL delivered to B/W viewers, then D-MAC had merits.

It was soon adopted by the European Broadcasting Union (EBU) as the standard for all DBS to provide a stepping stone from analogue PAL and SECAM. It became the subject of a European Directive.

One Line of D2 MAC

D2MAC decoder, more complex than a PAL Decoder and that was reflected in the price of the equipment

The Astra satellite system operated outside of the EU's MAC Directive, due to being a non-DBS satellite (The frequencies used were not in the DBS section). Sky was unaffected and could remain PAL despite the EU (including a further directive originally intended to make D-MAC provision compulsory).

The UK DBS band had the two BSB Marcopolo Satellites running (D-Mac) and delivering 5 channels. The problem was the 8.4 MHz. Cable systems work on 7 MHz channel spacing, so this approach did not work universally.

D-MAC's bandwidth problems were later fixed by the introduction of D2-MAC. This system uses half the data rate of D-MAC mainly due to increased coding efficiency so most of the quality of D-MAC is retained, but the total bandwidth is only 5MHz. This was too late for BSB which remained D-MAC

The pictures were high quality and were an improvement on PAL Astra transmissions.

D2-MAC was used by remaining French and German satellites, these used high power, but from memory did not supply many Channels.

The squarial, a Sky dish for comparison, the round BSB dish, and the square BSB dish

The polarisation was circular, and different for the German and the French satellites to provide channel separation. Both could be received in the UK with a small BSB dish and or a squarial. I used the small dish and had to trip down the garden remove and rotate the polariser if I wanted to switch from French to German TV.

Not sure how much EEC funding went into the projects but the system did soon pass on into television history (it all ended for BSB, 31st December 1992) and Digital television became the norm, except we have two main digital systems for DVB-T for Terrestrial and DVB-S for Satellite transmission. Both have their strengths and weaknesses…but like it or nor Digital is here to stay, well unless you know something I don't. *https://www.youtube.com/watch?v=_a7Z_eRiBUM*

PA1T in de meicontest op 144 MHz

En verder nog dit nummer onder andere:
Doe mee met de vierde Dutch Kingdom Contest op 2 en 3 juni!
Rohde & Schwarz UHF versterkers deel 3
Noodzender & ontvanger de P-850
Hè, hè, eindelijk heb ik een balun……..het verhaal
Propagatie metingen aan het 3,555555 MHz signaal van PAØRYL
En nog heel veel meer!

DKARS-Dutch KinKidom Amateur Radio Society

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Digital Test signal generator or ITS Inserter

Written by Richard Carden VK4XRL

This project started out as a simple audio/video distribution system? I was approached to provide some form of test signal other then colour bars for VK4TVD's ATV system. I thought what about providing a suitable insertion test signal for setting video levels. I came across an article by D.J. Long G3PTU called "An ITS Generator". Not many articles have been produced on this subject so I thought this may fill the void.

ITS GENERATOR

OUTPUT WAVEFORM

NETWORK FOR 625 2T PULSE HAD 200ns

L1. 10T 8mm DIAM CLOSE WOUND
L2 5T
L3 23T
L4 23T
--ADJUST FOR MAX LOSS @ 5 MHZ

THE NETWORK MUST BE TERMINATED AT EITHER END WITH 75Ω.

Dave Long G3PTUs Original design

This ITS generator produces one line of a test waveform usually on line 19, but it can be switched to provide a full picture test waveform, but without frame sync and to do this it needs mixed or line sync. Mixed sync is stripped from the incoming video and spit three ways
(a) to provide rest pulses for the 7492 and7474 during broad pulses
(b) to a gate which feeds the clock input of the 7492
(c) to set the 52µsec monostable running.

The 7492 and the 7474 count to 20 and then stop until a broad pulse reset. As these counters operate, line 19 is decoded , although no counting takes place during the broad pulses. The decode line is used to allow 7413 Oscillator to produce a 4.7µsec every line EG line sync.. Switching to full frame makes use of this line sync pulse and forces the 7413 to run on every line.

The 7413 oscillator clocks the shift register at intervals along the line. The clocked output from the shift register are used to provide the final output waveform The network was built into a small metal box, the components are preferred values and the inductors adjusted to give beat pulse shape and correct HAD. The output does add considerable loss and amplification is required to get 0.7v

I started off using the ideas based on Dave's circuit but where possible substituting CMOS devices.

A direct equivalent for the 7413 could not be found and the shift register circuit using a 74HC74 and 74HC164 wouldn't work unless you used a Standard TTL 7474 D types.

The ideas used in this circuit arrangement weren't lost, so armed with this, a new circuit was developed.

The block diagram shows the basic requirements and is how I approached my design. For the prototype the OP amps were already available on a PCB using a MAX 497.
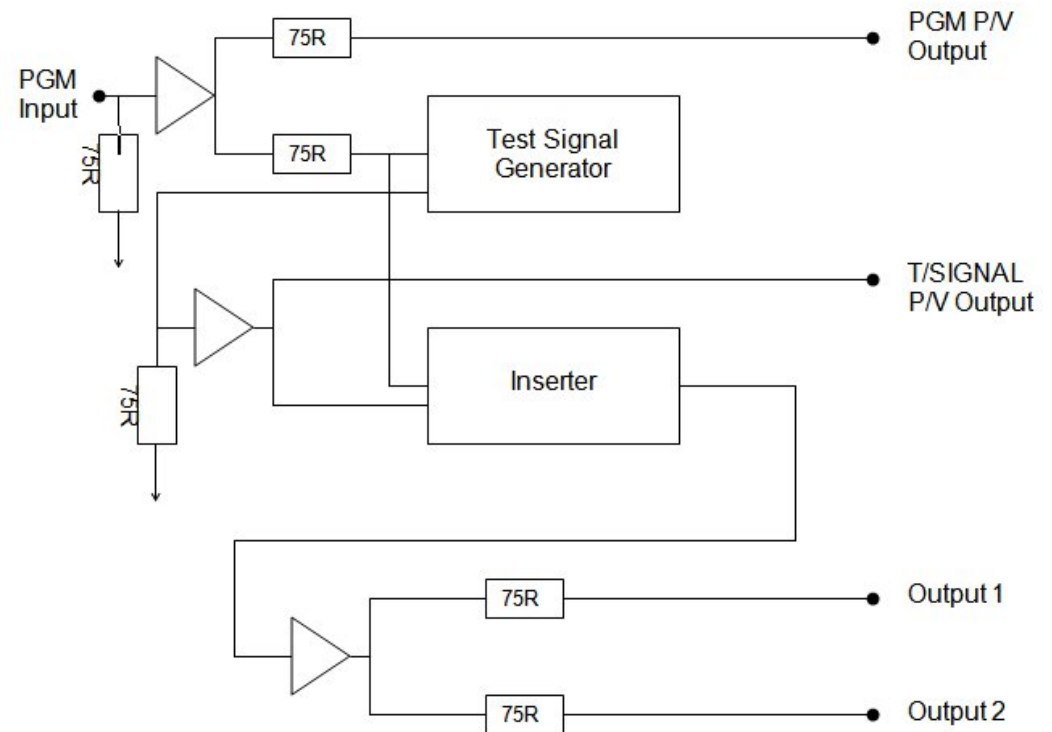
Block Diagram of the basic two paths

The circuit is however drawn with different OP amps when built as a complete unit.

Incoming program video is feed via two paths, one to the video inserter and the other to the sync separator to provide the required digital pulses. The sync separator is the now familiar LM1881, this produces Mixed Sync, Vertical Sync and Burst Gate as required by the rest of the circuit.

The first pulse required is horizontal blanking. I tried a couple of simple non-retriggerable monostables consisting of a flip-flop formed by two cross-coupled NAND gates.

While these worked it was decided to try a 4098 IC monostable which has two per package. This would reduce the overall component count and would be much simpler to implement. Looking at the circuit -ve Mixed Sync is fed from LM1881 (pin 1) to the 4098. The timing components are selected for pulse duration of approx 10.5us. The +ve pulse from pin 6 is then fed to pin 11, where the –ve edge triggers the second monostable producing a –ve pulse at pin 10. The duration of this pulse is around 52us, the duration of the active line period. At this stage pins 3 and 13 are tied to +5V. The next part of the circuit is the clock oscillator using a 74HC132. The clock oscillator is switched on and off from output of the second monostable's horizontal blanking signal on pin 10. The frequency being is set so the last staircase step is completed before the start of horizontal blanking.

The shift register is made up from a 4015 and is clocked from the above oscillator. The data input is fed from a separate 4098 to produce a pulse approx 5.8us wide while the reset is fed from pin 9 –ve horizontal blanking. The data is then clocked at intervals along the line. Each output is fed via a diode and resistor network before being summed across the 1k resistor to provide the basic test signal. Because the data from 4015 (pin5) has been clocked it starts approx 5.8us after horizontal blanking. Therefore to provide a more standard bar output the –ve data pulse output is gated with the output from 4015 (pin5) via an inverter to produce the bar output. Also the pulse waveform is produced from the differentiator formed by the 27p and 10k resistor and feed via Schmidt gates to the summing network.

Generating the test signals
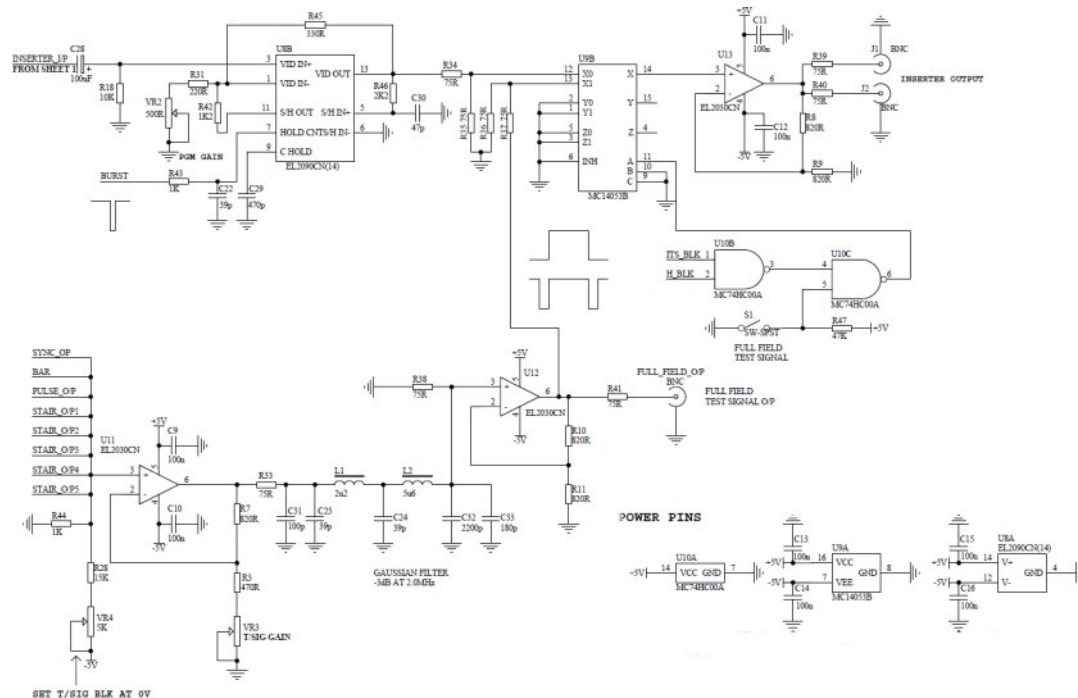
Combining the digital signals to get the test waveform

This combined output is then fed to a video OP amplifier where its level can be adjusted. Its output is then fed via a Gaussian Filter to the inserter. Because sync has been added to the test signal horizontal blanking now sits at +0.3V, therefore a –ve offset is required to set the test signal blanking to the incoming program blanking level. This is provided by the fixed 15K and 5K pot connected to the -5V rail.

The incoming program video needs to be clamped before the test signal can be added to the signal. I was unable to obtain an EL4089, but had some EL4090 IC's lef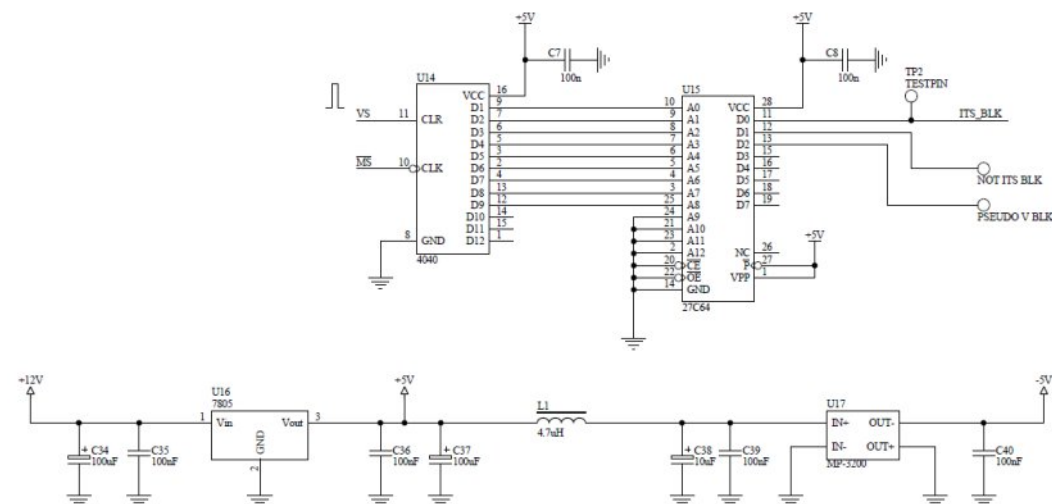t from another project, either one will work. Program video is now clamped with blanking at 0V. Burst gate pulses from the LM1881 are used as clamp pulses to feed a 4090 (pin 7). PGM video level can also be adjusted at this point. Clamped video is now fed to a 4053 (pin12) a triple two channel analogue multiplexer IC.

Pin 13 is the test signal feed from another OP amplifier which also provides a separate test signal output. The output from the analogue switch (pin 14) feeds another video OP amplifier providing four separate outputs. Unused inputs and address lines being grounded. The switching signal (pin 11) is derived from ITS blanking and horizontal blanking.

ITS Switching

While investigating this part of the circuit I came across an article on descrambling related to encoded satellite signals in Electronics Now April 1993 (Video Scrambler). Suitable gating can also produce the required switching signal, however the approach using an EPROM was cleaner and simpler.

I have never used this method before. I wasn't sure how to go about providing the data to program the EPROM. A cry of help to Mike Cox provided me with the answers I needed and I greatly appreciate the help given.

Implementing the EPROM

Since this was new to me I have covered the requirements below.
A 4040 counter was used, clocked by –ve sync (pin 10) and reset (pin 11) from +ve VS via an inverter from the LM1881 (pin 3). Since we require the decimal 313 which is 10101001, which means we need a counter/decoder that can handle nine lines. The 4040 can output the correct count, but the decoder must be able to 'watch' nine lines.

The EPROM is an elegant one chip solution to the problem. Unused address lines of the EPROM are grounded. The EPROM used was a 27c64, however a 2716 could do the job as well. D0 (pin 11) is the ITS blanking signal and is fed to one input of a 74hc00 gate while the other input is fed by horizontal blanking.

The output is five lines of horizontal blanking (i.e. lines 17 to 21). Five lines were used to provide easier reading of the test signal with program video. The output from this gate is inverted in another 74hc00 gate while the other input is tied high. Grounding this produces the full field test signal.
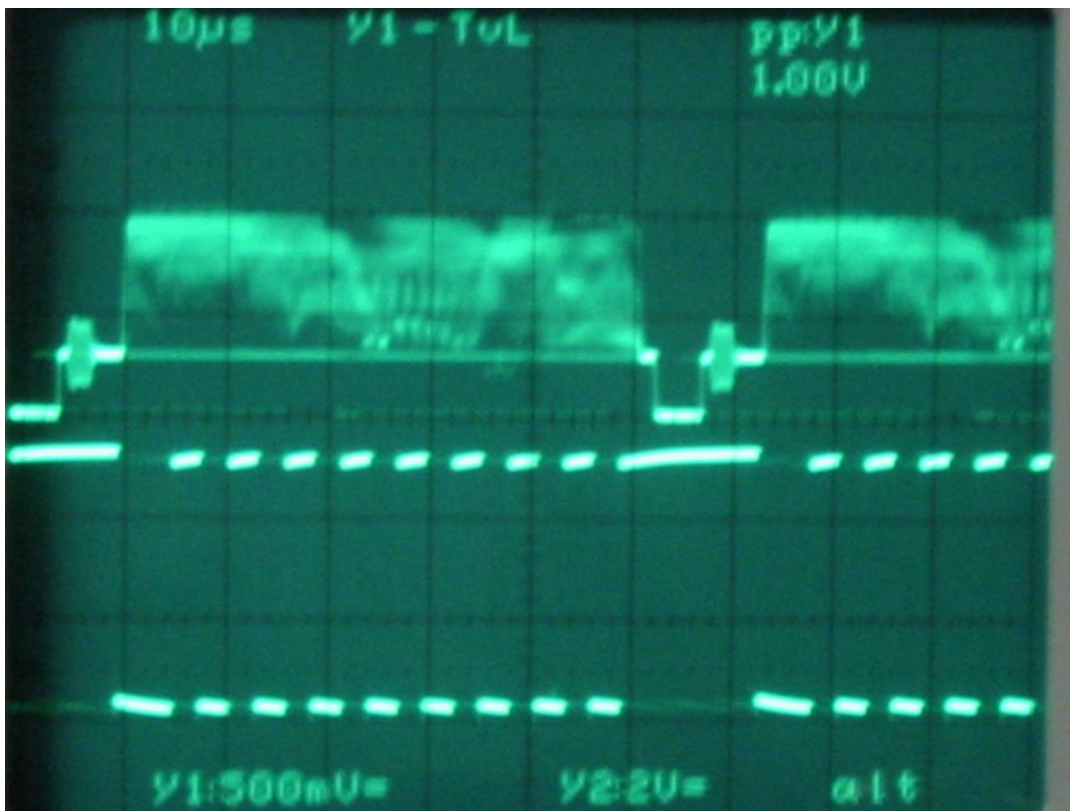
Line Locked Clock

Power Supply

The power supply requirements are easily met by a 7805 regulator to provide the +5v supply. The -5v is derived from a DC-DC converter fed from the +5v supply via a filter to remove high frequency switching being fed back to the +5v supply line.

EPROM Programming

EPROM's can be used in two ways:-

They can be followed by a DAC, in which case the hex value programmed in to a specific location will give the output dc for that location.

Example:- a location programmed with a hex value of 80 will give an output of ½ the DAC reference voltage.

An 8 bit EPROM can be used so that each location acts as a store of 8 individual bits of information. Each bit can be programmed to be 0 or 1; however the location must be programmed as an 8-bit word. Thus at each location, the 0s or 1s must be translated into a hexadecimal number for the benefit of the programmer.
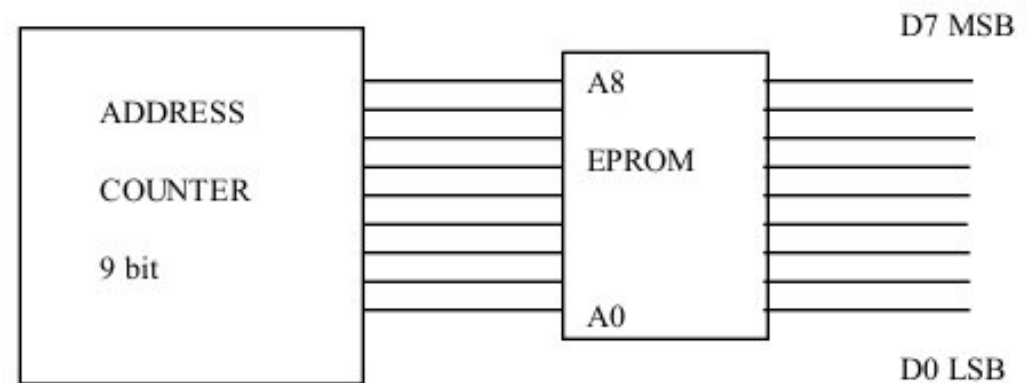
D7 [MSB]	D6	D5	D4	D3	D2	D1	D0 [LSB]	HEX	NUM.
1	1	1	1	1	1	1	1	FF	255
1	1	1	1	0	0	0	0	F0	240
0	0	0	0	1	1	1	1	0F	15
1	0	0	0	0	0	0	0	80	128
0	1	1	1	1	1	1	1	7F	127
0	0	0	0	0	0	0	0	0	0
Highest 'Nibble'				Lowest 'Nibble'					

Reference Table courtesy of Mike Cox

The vertical reset pulse from the LM1881 (pin3) starts around line 4. Therefore drawing up a table as shown enables you to work out the hex code required by the EPROM.

D0 is the ITS blanking pulse, D1 the inverse of the above while D3 is used as the pseudo vertical blanking. This output was added after the initial design and could have been feed to the first mono-stable 4098 (pin3) if required.

By utilizing an extra address line (A9) it would be possible by programming the EPROM so each alternate line was on and off (i.e. 1 or 0), this them makes it very easy to set-up the unit. This also can be achieved by a jumper pin to pin 9 4040 or pin 10 27c64.
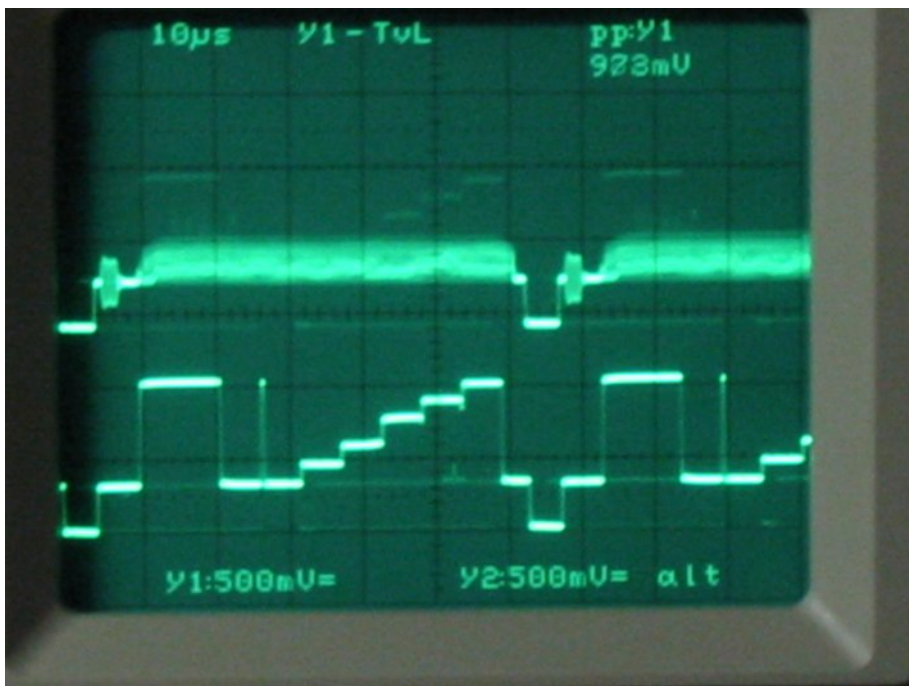
Setting Up

Remove VTS blanking lead from pin 11(27c64) to pin 9 (4040) or pin 10 (27c64). This will produce alternating program and test signals on the output.
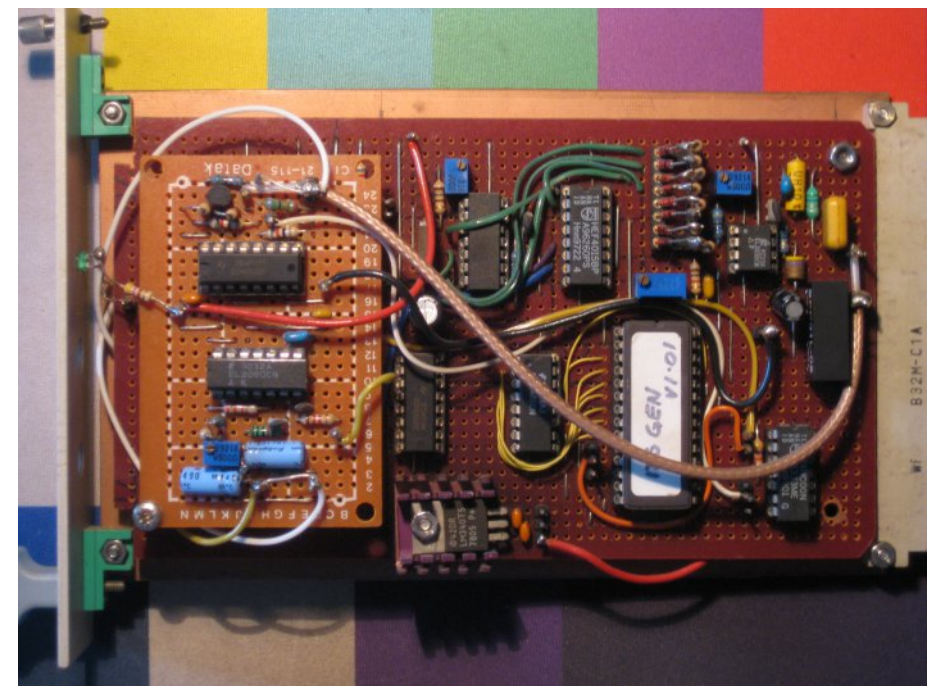
1. With 1V P/P program input, adjust PGM output level for 1V P/P output.

2. Set ITS test signal blanking adjustment to match program video.

3. Set ITS test signal level for 1VP/P.

4. Check horizontal blanking width and set the first M/stable AOT for correct finish of horizontal blanking, next set the second M/stable foe correct start of horizontal blanking.

5. Set last stair-step trailing edge to finish at the start of horizontal blanking (i.e. 1.5us before start of sync. Pulse).

LINE	Hex	D7	D6	D5	D4	D3	D2	D1	D0	Hex
ITS GENERATOR EPROM INFORMATION										
4	00h	0	0	0	0	0	0	1	0	02h
5	01h	0	0	0	0	0	0	1	0	02h
6	02h	0	0	0	0	0	0	1	0	02h
7	03h	0	0	0	0	0	0	1	0	02h
8	04h	0	0	0	0	0	0	1	0	02h
9	05h	0	0	0	0	0	0	1	0	02h
10	06h	0	0	0	0	0	0	1	0	02h
11	07h	0	0	0	0	0	0	1	0	02h
12	08h	0	0	0	0	0	0	1	0	02h
13	09h	0	0	0	0	0	0	1	0	02h
14	0Ah	0	0	0	0	0	0	1	0	02h
15	0Bh	0	0	0	0	0	0	1	0	02h
16	0Ch	0	0	0	0	0	0	1	0	02h
17	0Dh	0	0	0	0	0	1	0	1	05h
18	0Eh	0	0	0	0	0	1	0	1	05h
19	0Fh	0	0	0	0	0	1	0	1	05h
20	10h	0	0	0	0	0	1	0	1	05h
21	11h	0	0	0	0	0	1	0	1	05h
22	12h	0	0	0	0	0	0	1	0	02h
23	13h	0	0	0	0	0	1	1	0	06h
24	14h	0	0	0	0	0	1	1	0	06h
25	15h	0	0	0	0	0	1	1	0	06h
26	16h	0	0	0	0	0	1	1	0	06h
27	17h	0	0	0	0	0	1	1	0	06h
28	18h	0	0	0	0	0	1	1	0	06h
29	19h	0	0	0	0	0	1	1	0	06h
30	1Ah	0	0	0	0	0	1	1	0	06h
31	1Bh	0	0	0	0	0	1	1	0	06h
32	1Ch	0	0	0	0	0	1	1	0	06h
33	1Dh	0	0	0	0	0	1	1	0	06h
"	"	"	"	"	"	"	"	"	"	"
310	133h	0	0	0	0	0	1	1	0	06h
311	134h	0	0	0	0	0	0	1	0	02h
312	135h	0	0	0	0	0	0	1	0	02h
313	136h	0	0	0	0	0	0	1	0	02h
314	137h	0	0	0	0	0	0	1	0	02h

The Eprom Programme

The final construction designed to fit a Euro Card Frame

The final result as viewed on waveform monitor and seen in the picture blanking

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Zeitschrift für Bild- und digitale Daten-Übertragung im Amateurfunk

Der AGAF-Stand auf der HAMRADIO 2018 in Friedrichshafen ⇒ Seite 7

Aus dem Inhalt: EDITORIAL: Digitale Entschleunigung · Bericht vom AGAF-Stand der HAMRADIO 2018 · Glövziner Bilderbogen 2018 · 33 Jahre ATV-Relais DBØOV · ISS-SSTV-Sendungen zum Tag der bemannten Raumfahrt · Digitaltagung Geiersberg · HamTV-Sammelserver · Integration von MeshVideo in ATV

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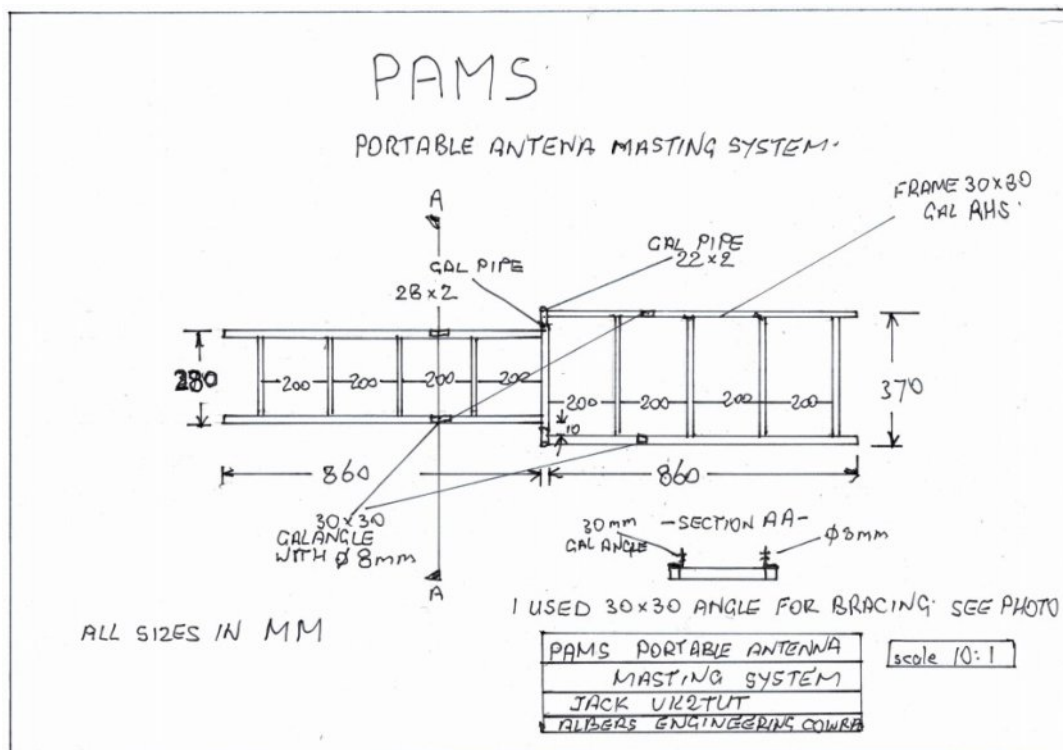
Portable Antenna Masting System (PAMS)

Written by Jack Albers, VK2TUT

This article first appeared in** DKARS **magazine.

The mast for the pams system I decided should
1. *Fit into the boot of a small car*
2. *Be smooth so that ropes couldn't catch on pins etc.*
3. *Be 6 meters long*

The details

The pams mast is made from 46 mm od (outside diameter) aluminium pipe which had an ID (inside diameter of 39 mm

and is 6.5 meters long. It has a wall thickness of 3.5mm which you need. If you don't know where to get this look for ULLRICH it has a website. They are in several locations across Australia my local is in Bathurst

I cut the mast to 1100 mm lengths for portable use and the remaining one metre section is used as the base.

Next you need to cut half the centre of the pipe away to a depth of 30 mm The width of an engineer's rule see photo

I did this by tracing the pipe diameter onto a piece of paper folding it in half then transferring the folded paper to cardboard you can use this to mark the centre of each section of pipe. The pipes are then marked length ways with one line each side of the pipe. The 30mm cut depth is easy if you have an Engineers rule as this is the width of the rule.

Please cut them a little under at this stage and only cut the base on one end. You will for fine adjustment need your engineers rule and a pair of Vernier Callipers see photo and they can all be set to 24mm half the diameter of the pipe plus the width of the Engineers rule which is one mm.

Once this is complete de burr all.

Now you will need 39 mm solid aluminium round bar, I cut this to 250mm lengths I marked the centre of each rod at 125 mm.
Now you glue half the round rod onto the top of each section using JB WELD. JB WELD can be obtained from JAYCAR. Before you glue all the rods in please set the stand up with the bottom sections of mast fitted and try each section to make sure everything fits. Now drill one section and fit an eyelet near the top through the insert and pipe this will allow a dipole to be fitted by using ropes they are then tied off to the stands.

You should now if everything has been done accurately have a very strong mast that will fit into the boot of a small car.

Again, feel free to give these details to anyone who wishes to make this.

If you wish to mount a Yagi or vertical use one stand or use a Yagi on 1 post at the top and a vertical on the other post at the top and drop the sections with eyelets down 1 level and mount your dipole there it is designed to have more than a meter between antennas.

73 de Jack VK2TUT, Albers Engineering Cowra
wilja@skymesh.com.au
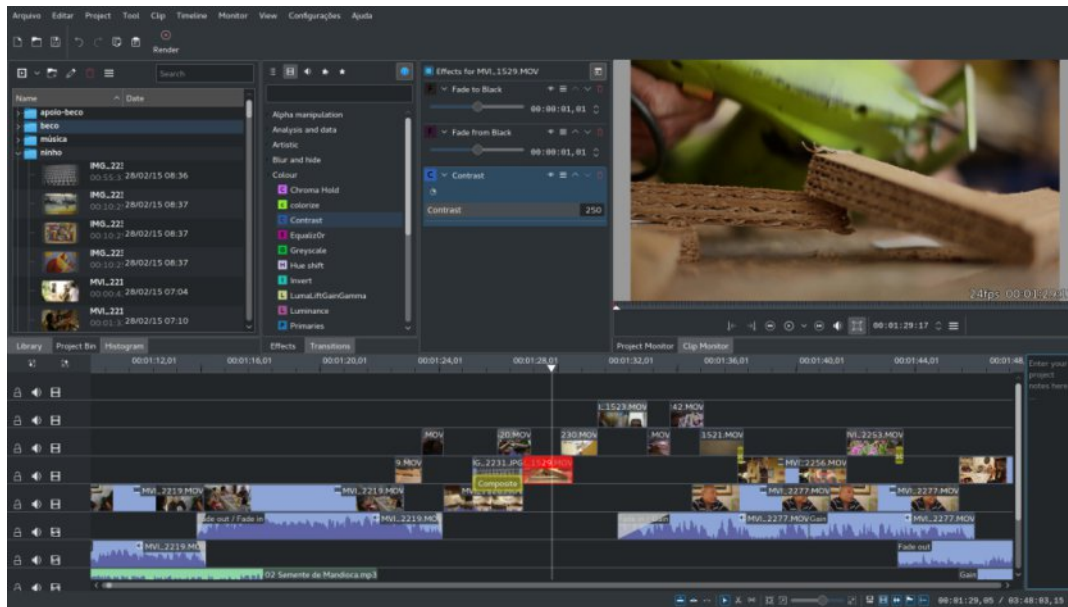
Kdenlive

Kdenlive is an open source video editor. The project was started around 2003. Kdenlive is built on *Qt* and the *KDE* Frameworks libraries. Most of the video processing is done by the *MLT Framework*, which relies on many other open source projects like *FFmpeg*, *frei0r*, movit, ladspa, sox, etc…

Our software was designed to answer most needs, from basic video editing to professionnal work.

Kdenlive is developed by a small team and new contributors are welcome.

Technologies

Multi-track video editing

Kdenlive allows you to use and arrange several audio and video tracks, each one can be locked or muted to your convenience.
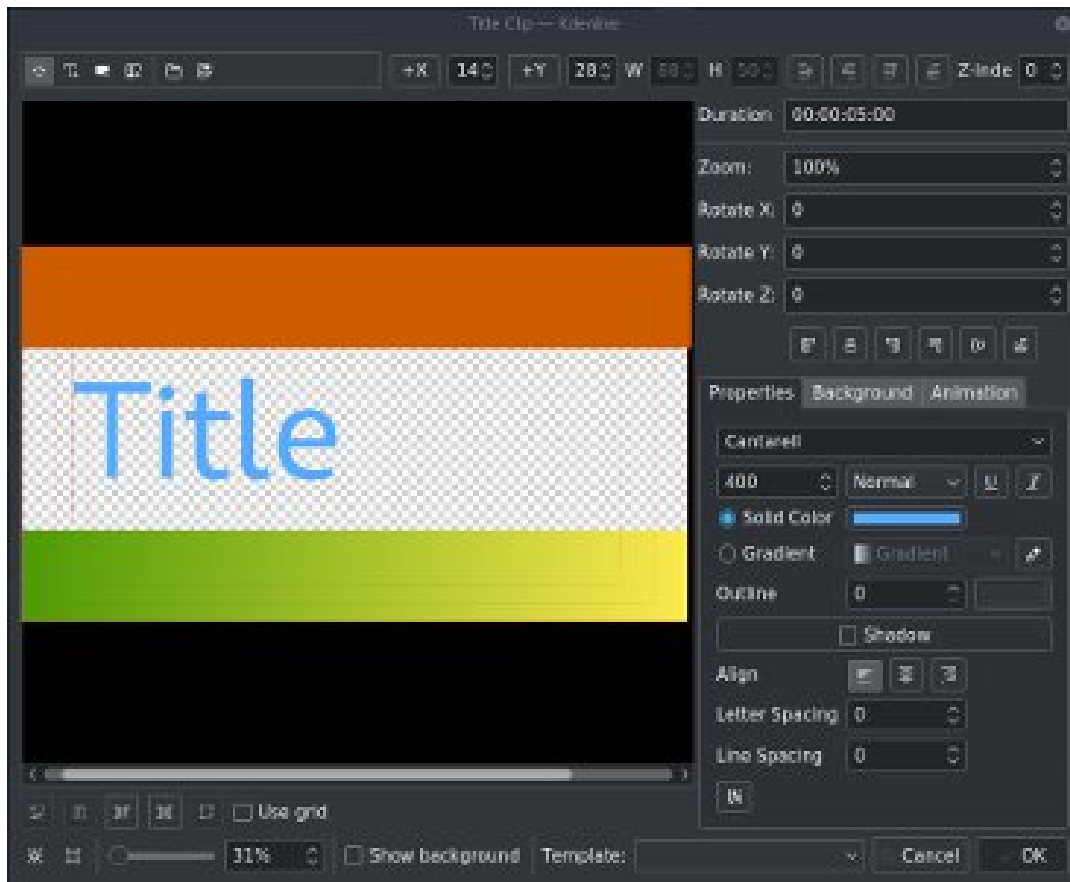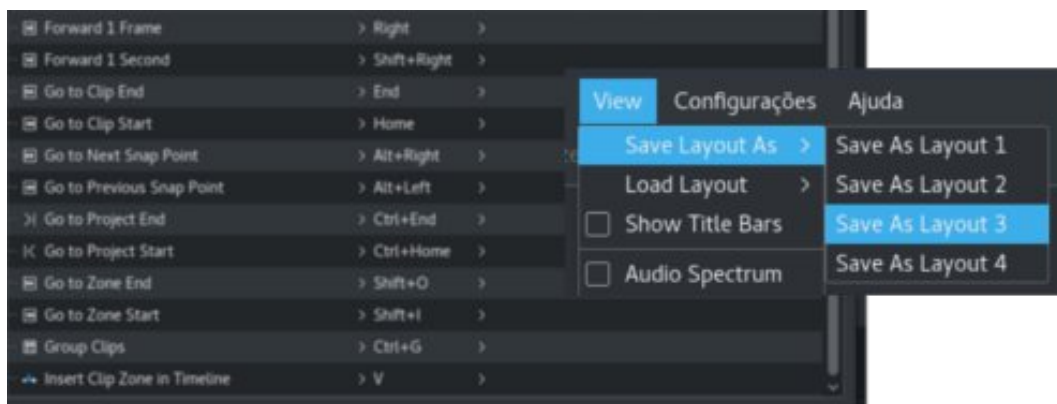

Use any audio / video format

Being based on the powerful FFmpeg libraries, Kdenlive can use almost any audio and video formats directly without the need to convert or re-encode your clips.

Configurable interface and shortcuts

You can arrange and save your custom interface layouts to fit your workflow. Keyboard shortcuts can also be configured to match your preferences.

- *Letter-spacing and Line-spacing adjustment;*
- *System font selector including font-family support;*
- *Design features: Color, Shadows, Outlines and Gradients;*
- *Embedded Crawl and Roll tool for text animation;*
- *Unicode decoder;*
- *Rotate and Zoom;*
- *Add images;*
- *Template support;*

Many effects and transitions

Dozens of effects are available, ranging from color correction to audio adjustments, as well as all the standard transform options.

Titler
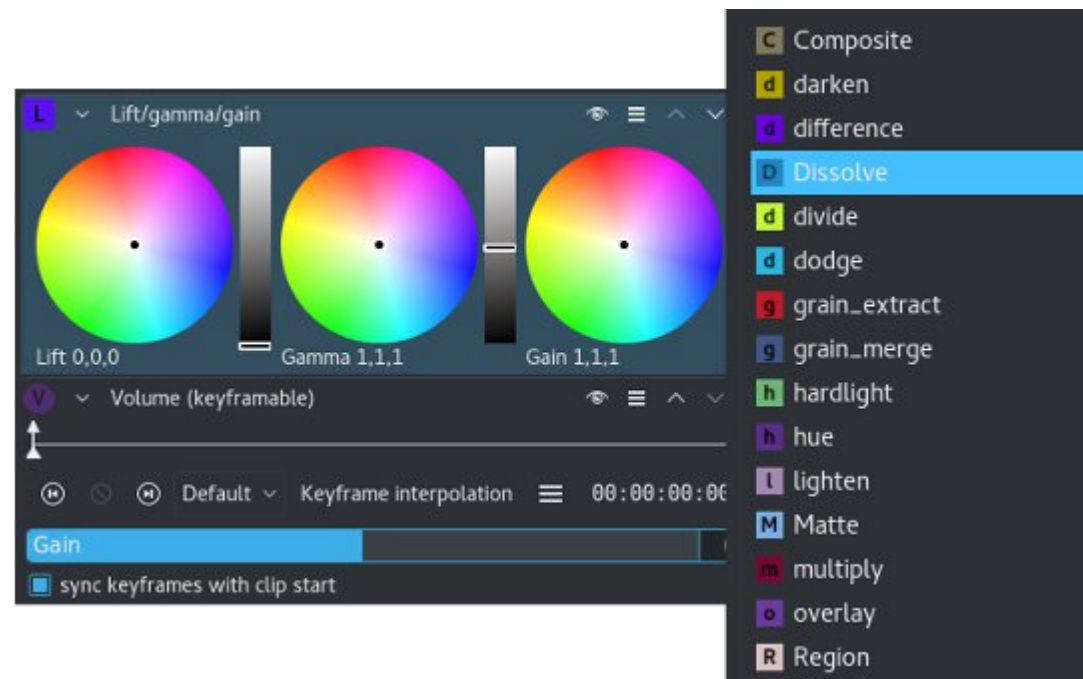
Create 2D titles for your projects, including:
- *Align and Distribute;*
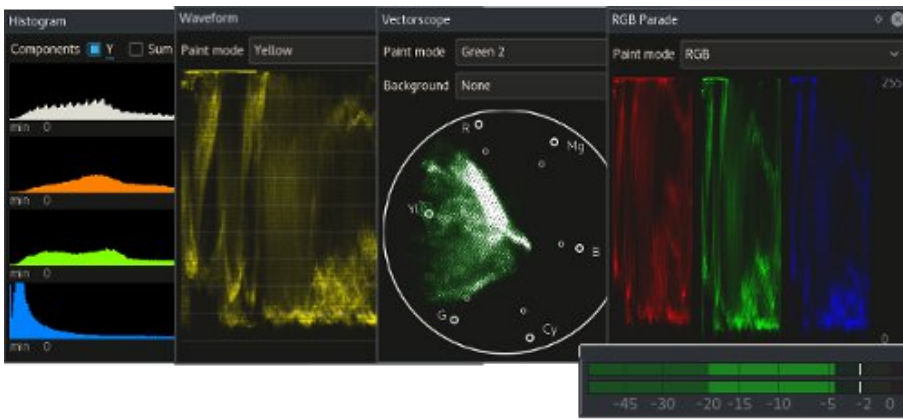
Audio and video scopes

Monitor your audio level or check the color scopes to make sure your footage is correctly balanced.

- *Audio Meter*
- *Histogram*
- *Waveform*
- *Vectorscope*
- *RGB Parade*

Proxy editing

Kdenlive can automatically create low resolution copies of your source clips to allow you doing the editing on any computer, and then render using full resolution.
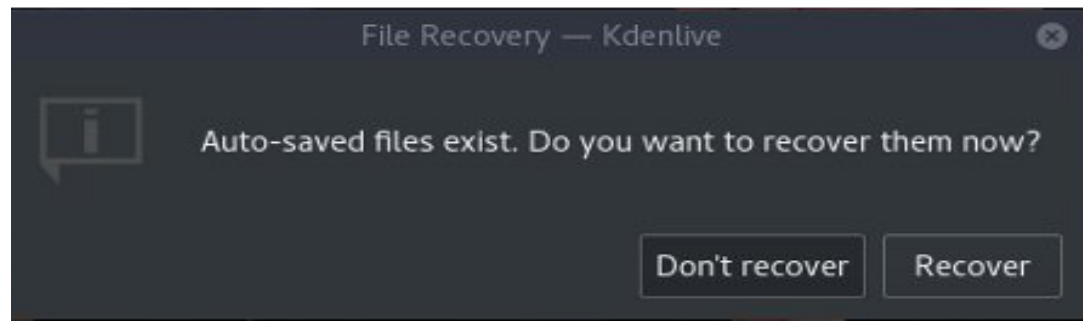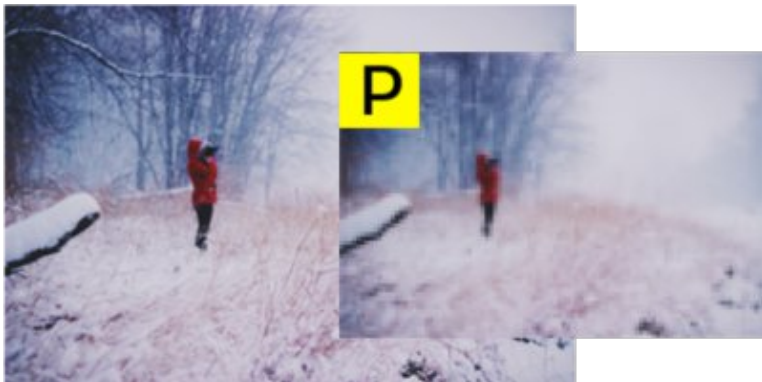
Automatic backup

Your project file is automatically backed up every few minutes, and older versions of the project file are also kept in case you need to roll back to a previous version.

Online resources

Download render profiles, wipes and title templates directly from the interface.
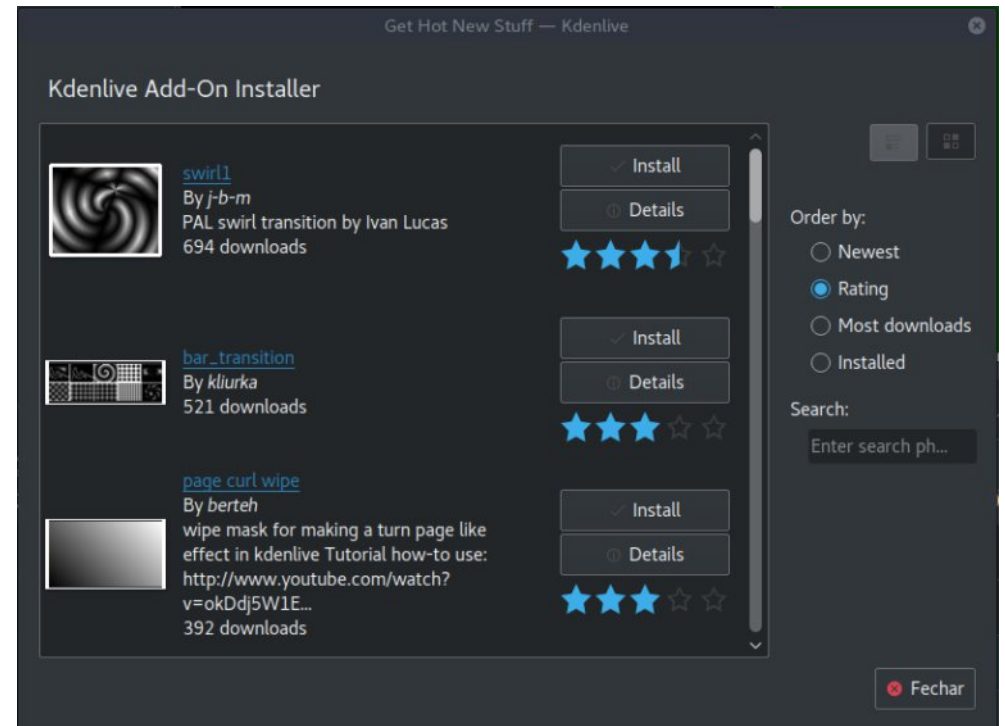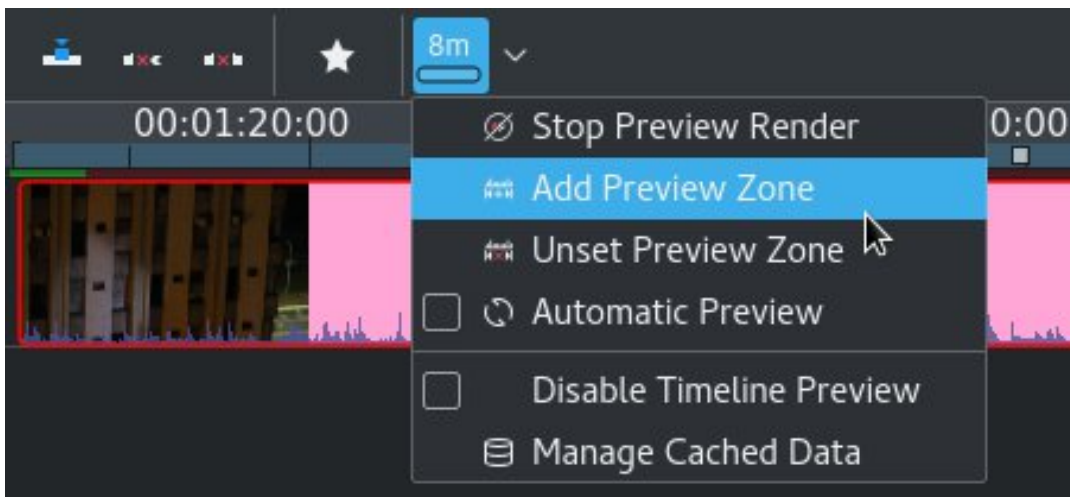
Timeline preview

Sometimes when using hi-res footage or complex effects, real-time playback is not possible. Timeline preview allows you to pre-render parts of your timeline to get a perfectly smooth playback.

Keyframeable effects

Most effects can be keyframed, allowing you to change the parameters over time, using linear or smooth curves to achieve the result you want.
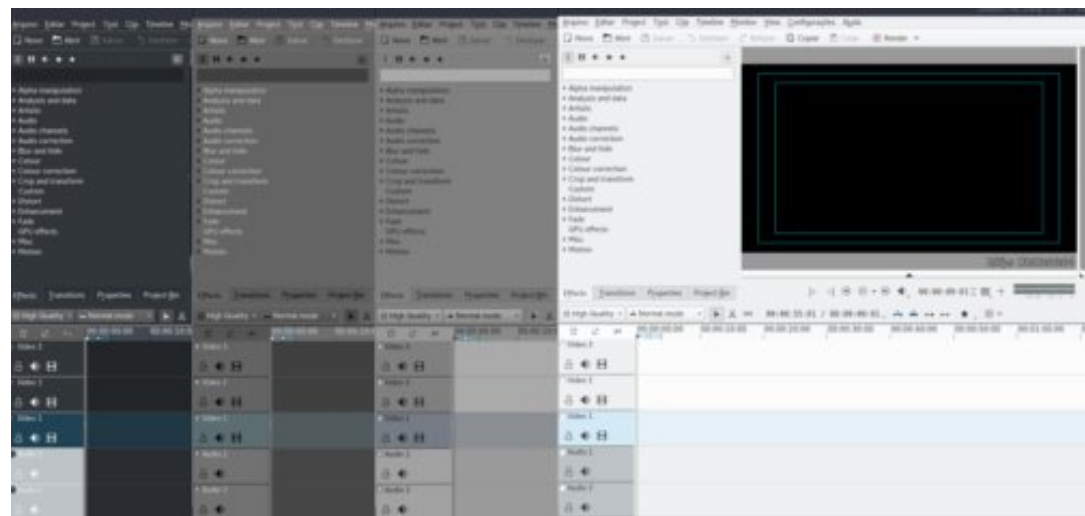
Themable interface

Flexible theming engine capable of a variety of light and dark themes.

Kdenlive

Download
https://kdenlive.org/en/download/

Source Code
https://cgit.kde.org/kdenlive.git/

User manual
https://userbase.kde.org/Kdenlive/Manual

Trademark and Logo
https://kdenlive.org/en/logo/

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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.

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 Friday of the month. The cut-off day for submissions/corrections/alterations is 5 days before the Friday of publication.

does anyone actually know what you have to do when people are singing happy birthday to u

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IARU CONTEST RESULTS

70cm

Nr	Call	Points	BestDX	QTH	Distance
1	G8GKQ/P	816	G4GUO	IO90ST	119
2	G8GTZ/P	573	G8GKQ/P	IO80WP	85
3	G4GUO	328	G8GKQ/P	IO80WP	119
4	G7JTT/P	278	G4BVK	IO80RK	68
5	G4KLB	246	G8GTZ/P	IO81QF	76
6	G4BVK	238	G8GKQ/P	IO80UU	68
7	G1LPS	210	M0DTS/P	IO94MJ	54
8	M0DTS/P	204	G1LPS	IO94EQ82	52
9	M0YDH (/P)	10	G7MEG	IO82WO	5
10	G7MEG	5	M0YDH	IO82WO	5

23cm

Nr	Call	Points	BestDX	QTH	Distance
1	G7AVU	2288	G1LPS	IO94EQ	153
2	M0DTS/P	2206	G7AVU	IO93OJ	112
3	G1LPS	1424	G7AVU	IO93OJ	153
4	M1EGI (/P)	974	M0DTS/P	IO94MJ	110
5	G8GKQ/P	880	G8GTZ/P	IO90LX	85
6	G8GTZ/P	828	G8GKQ/P	IO80WP	85
7	G4BVK	440	G8GKQ/P	IO80UU	68
8	G3KJX/P	368	G1LPS	IO94EQ	39
9	G8EOP	316	G7AVU	IO93OJ	64

23cm ctd

Nr	Call	Points	BestDX	QTH	Distance
12	G4FVP	212	M0DTS/P	IO94DF	34
13	G4KLB	80	G8GKQ/P	IO80WP	20
14	M0YDH (/P)	20	G3UKV/P	IO82QL	5
15	G7MEG	10	M0YDH	IO82WO	5

13cm

Nr	Call	Points	BestDX	QTH	Distance
1	M0DTS/P	1520	G1LPS	IO94EQ82	52
2	G8GTZ/P	1400	G8GKQ/P	IO80WP	85
3	G1LPS	1050	M0DTS/P	IO94MJ	54
4	G8GKQ/P	850	G8LES	IO91LC	91

9cm

Nr	Call	Points	BestDX	QTH	Distance
1	GW4CBW/P	1540	G3NWR/P	IO84ML	154
2	G3NWR/P	1530	GW4CBW/P	IO83FD	153
3	G1LPS	1345	M0DTS/P	IO94MJ	54
4	G8GTZ/P	1330	G8GKQ/P	IO80WP	85
4	G8GKQ/P	1330	G8GTZ/P	IO90LX	85
5	M0DTS/P	1190	G1LPS	IO94EQ82	52
6	G4FVP	320	M0DTS/P	IO94DF	53
7	G3KJX/P	200	G1LPS	IO94EQ	40

6cm

Nr	Call	Points	BestDX	QTH	Distance
1	M0DTS/P	3950	G8AGN/P	IO93FF40	138
2	GW4CBW/P	3860	G3NWR/P	IO84ML	154
3	G8AGN/P	3150	G0ATW/P	IO93UL	86
4	M1EGI/P	2790	G4FVP/P	IO94GQ	136
5	G3NWR/P	2310	GW4CBW/P	IO83FD	153
6	G1LPS	1950	M0DTS/P	IO94MJ	54
7	G8GTZ/P	1890	G8GKQ/P	IO80WP	85
8	G0ATW	1830	M1EGI/P	IO93FL	83
9	M0KPW/P	1650	GW4CBW/P	IO83FD	116
9	G0HIK/P	1650	GW4CBW/P	IO83FD	114
10	G8GKQ/P	1600	G8GTZ/P	IO90LX	85
11	G3KJX/P	790	G1LPS	IO94EQ	40
12	G4FVP/P	570	M0DTS/P	IO94MJ	46
13	G8AFC/P	330	G6OXW	IO83WK	33
14	G6OXW	330	G8AFC/P	IO83RO	33
15	GI3VAF/P	210	GI0GDP/P	IO74BR40KS	15
16	GI7UGV/P	160	GI0GDP/P	IO74BR40KS	10
17	2E0XAY/P	35	G8DKC/P	IO92HQ	7

3cm

Nr	Call	Points	BestDX	QTH	Distance
1	GW4CBW/P	1540	G3NWR/P	IO84ML	154
1	G3NWR/P	1540	GW4CBW/P	IO83FD	154
2	G8GTZ/P	1330	G8GKQ/P	IO80WP	85
2	G8GKQ/P	1330	G8GTZ/P	IO90LX	85
3	M0DTS/P	930	G1LPS	IO94EQ82	52
4	G1LPS	780	MODTS/P	IO94MJ	54
5	G7AVU	380	G6ZVE	IO93IF	38
6	G4FVP	170	M0DTS/P	IO94DF	34

1.2cm

Nr	Call	Points	BestDX	QTH	Distance
1	G8GTZ/P	2110	G8GKQ/P	IO80WP	85
2	G8GKQ/P	1330	G8GTZ/P	IO90LX	85
3	G4LDR/P	780	G8GTZ/P	IO81QF	64
4	G1LPS	510	M0DTS/P	IO94DF	51
5	M0DTS/P	500	G1LPS	IO94EQ82	50

0.4cm

Nr	Call	Points	BestDX	QTH	Distance
1	G4LDRDR/P	140	G8GTZ/P	IO90LX	14
1	G8GTZ/P	140	G4LDR/P	IO90LU	14

UK IARU RESULTS

Nr	Call	IARU points	Nr	Call	IARU points
1	M0DTS/P	10000	15	G4LDR/P	920
2	G8GTZ/P	9601	16	G4BVK	678
3	G8GKQ/P	8616	17	G6OXW	330
4	G1LPS	7269	18	G8AFC/P	330
5	GW4CBW/P	6940	19	G4GUO	328
6	G3NWR/P	5650	20	G4KLB	326
7	M1EGI (/P)	3764	21	G8EOP	316
8	G8AGN/P	3150	22	G7JTT/P	278
9	G7AVU	2668	23	G6AUR/P	216
10	G0ATW	1830	24	GI3VAF/P	210
11	G0HIK/P	1650	25	GI7UGV/P	160
12	M0KPW/P	1650	26	2E0XAY/P	35
13	G3KJX/P	1358	27	M0YDH (/P)	30
14	G4FVP	1272	28	G7MEG	15