



# GATEWAY

**The Official Magazine of the Gippsland  
Gate Radio & Electronics Club Inc.**

**May 2018**



**Arduino & Nixie Tubes  
Valves, Zaps & Time  
The Serial Killer, Part 2  
And More**

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Note: - club meeting minutes are now on the club website

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## Event Queue

### May:

18<sup>th</sup>      General meeting – Guide hall

### June:

1<sup>st</sup>      Prac Night – Club rooms

15<sup>th</sup>      General meeting – Guide hall

### August:

4<sup>th</sup>      GGREC Hamfest

11-12<sup>th</sup>      VK - Remembrance Day Contest

18-19<sup>th</sup>      Lighthouse and Lightship Weekend

From the President,

To all members, just a small message from me as the new president and any members who don't know me.

I have been an armature radio operator and club member since 1980 and operate mainly vertical and dipoles. I have not had a lot of experience as a club president but will endeavour to do my best with some help along the way and I appreciate the chance to have been elected to give it a go.

Personally,

I'm a person who is rather traditional and I don't take any nonsense from anyone but I am fair and will listen to all sides before I make a decision. I would like to make some changes of my own but I also welcome input from all members old and new. I look forward to the next general meeting and hope to see you all there,

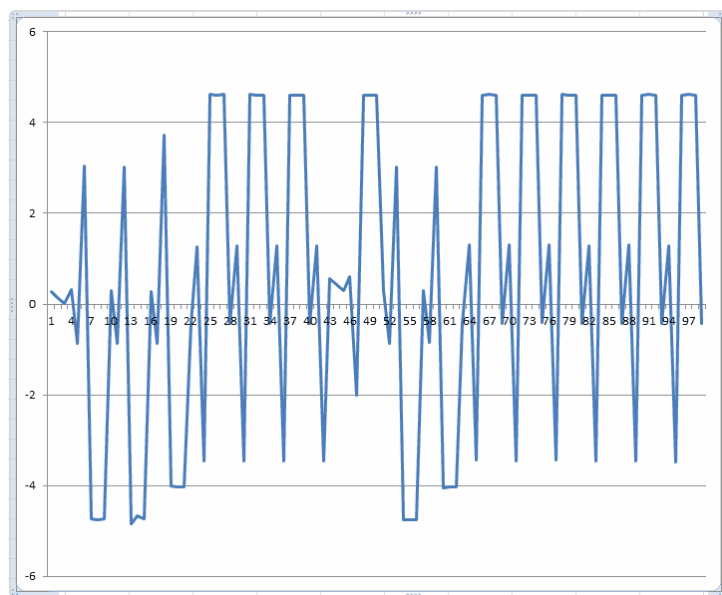
Noel King VK3CJJ.

# From The Editor – Valves, Zaps & Time

This month was a little shocking, if you read my Nixie tube article you will know what happened. Most of my earlier shocks have been courtesy of the 240V mains, in one case the equipment's power transformer had developed a primary to secondary short, meaning the equipment it was running (A Codex 9600 modem, back in my Telstra days) was live to the tune of about 120V. The workbench I was using had an earth leakage breaker (now commonly called a 'Safety Switch'), but it took it's time to trip, probably because the stepped down voltage & current I was receiving was just on the edge of it's limits. I had time to think "Trip you B#\$%D".

In that event I can clearly remember the current pulsing through my body, giving me a kind of throbbing sensation. I assumed at the time this was courtesy of the 50Hz AC nature of the current I was receiving. Most of the other shocks I have received over the years have been very short'n sweet, the modem one being memorable due to it's length.

So when I received the 'tickle' from my nixie clock I was surprised the sensation was exactly as I remembered it from the modem incident, ie a pulsing/throbbing sensation. So as soon as I stepped back, I reached for my scope probe to examine the nature of the voltage I had come into contact with – surprise surprise, a nice clean DC rail! I had been using a 'broken' switchmode plug pack carcass as a rectifier/filter, to turn the output of my 240V isolation transformer into DC to run my nixie tubes. My first thought was that the filter caps were all but gone, but no – the 'scope said otherwise. So my assumption about the throbbing effect was totally wrong, it must be a nervous/muscular type of response. (oh, now I'm Dr Paul! eek)



My other great realisation was just how horrible a PC's clock can be. At a recent club meeting I scored a GPS receiver, which I promptly tried to use to give me a more accurate time source, it was all over the place, so I swapped over to an internet NTP time source, more of the same – have a look – up to a 5 second jitter! What on earth is going on? Both of these 'sync attempts' is via a program called 'Tardis 2000', I'm not sure where to point the finger, but this really sucks – big time. (pardon the pun)

For my house time source I have been using an oven stabilized crystal oscillator out of a

defunct marine navigation box, GPS? or was it using the earlier LORAN system – I don't know, however it's good to under a second in 6 months, it's not sync'd to anything, I just occasionally manually correct it to the Telstra talking clock. So my next PC sync attempt will be to feed that source into 'Tardis 2000'. Long term it's far from as good as GPS (read 'atomic time') but in the short term it should have quite low jitter. So it will be good to see what graph I get then.

It does have one advantage over the free-bee GPS, a one second pulse.

I also have a Trimble Placer GPS 400 receiver; however it talks a different language to the normal NMEA code. Either way I will need something to translate the code so the Tardis software can understand it. (Or is Tardis the real problem?)

*Paul VK3TGX*



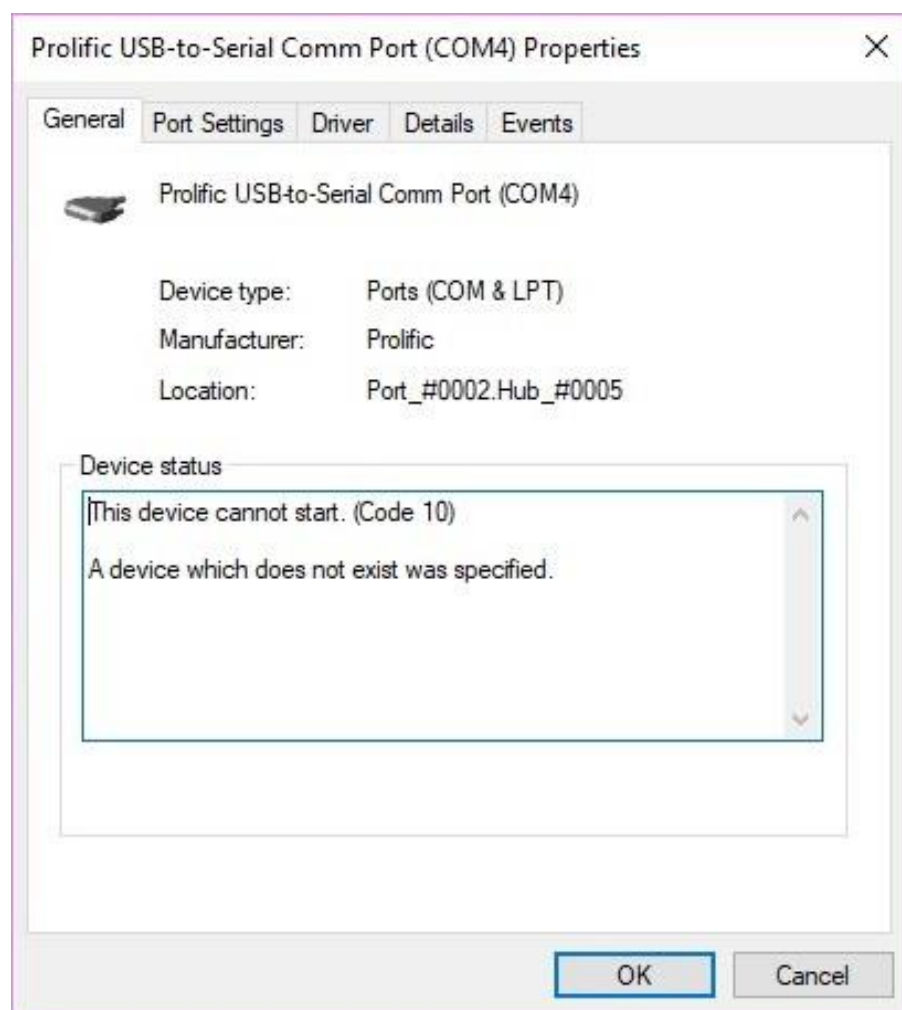
## Windows 10 – The Serial Killer Part 2

Last month Ian VK3BUF wrote about serial coms problems with Windows 10, well after trying to get a GPS talking I ran into a few myself.

In my shack I have a rather old Trimble 'Placer GPS 400' receiver that I was trying to resurrect. The problem was the shack computer, actually a recycled laptop does not have a real serial port, nor do two other laptops I poses, that is not including an old HP I have loaded up with Ubuntu Linux. So I dug into my 'glory box' and out came a USB to serial adapter I scored several years ago. (Now I know why it was thrown away) I plugged it in, windows then had a heart attack trying to find a driver, however after a session of two of 'find an updated driver' & using Windows update to do the same, I had a driver loaded.



Pity, it was displaying an error of some sort



If you then go into it further you see this rather bizarre message.

I've heard of jinglish before, but this looked like pure bull...

I'm looking at my PC, yes it is right there, plugged in – if it wasn't this message would not appear at all, because the port would disappear from device manager.

Anyway, after some good old Google type research, I found the answer, Apparently Prolific is kind of the guilty party.

For it seems that some opposition chip manufacturers were making Prolific clones, or probably more correctly, IC's that mimicked the original.

Anyway Prolific 'cracked the shits' claiming they had stolen the Prolific design, and so they promptly re-wrote their driver

to detect these foreign devices and disable them. The new 'advanced' driver was then sent on to Microsoft etc. for distribution, promptly killing many USB-serial adapters.

To me this stinks, if the opposition had truly stolen and copied the design, then the driver would have no way of telling, it would be identical silicon, responding in exactly the same way,

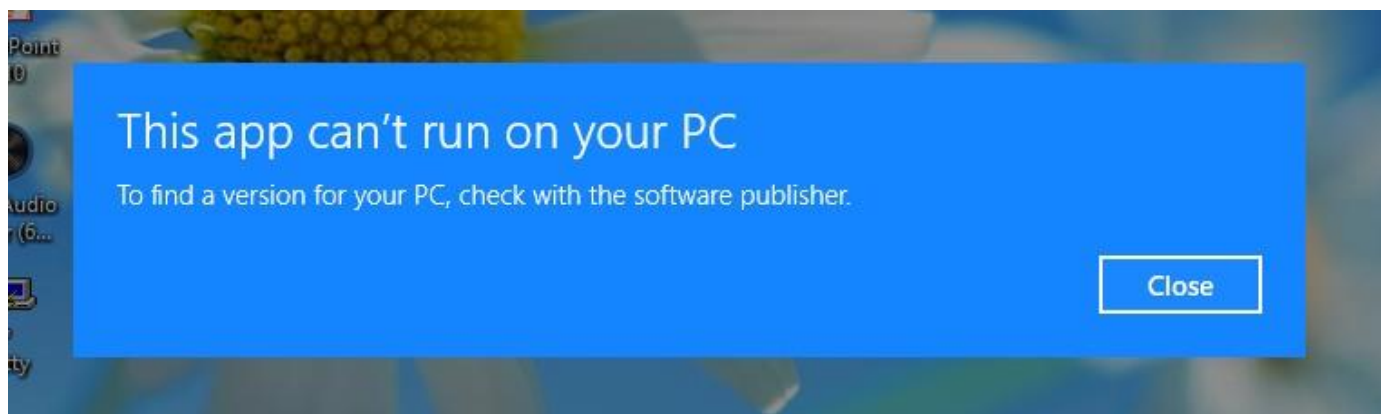
so it could not be stopped. The fact that they can tell the difference means it's not actually a true copy at all, it is just mimicking theirs. I personally would prefer if all USB-serial adapters were near identical, all using the same driver, that way you would not have to search for a new driver, and why should one's PC need to host multiple driver for identical functionality. etc. etc.

Anyway there is a fix – of course, and that is to track down an older version, one written before they hacked it. The trick is getting Windows to use it. If you install the old driver, all goes well, it just does no good. The reason is that Windows knows this is an older driver, so 'standard' PC strategies kick in "Use the newest possible driver"

One has to first completely uninstall this 'new' driver, then all that's left is the older, and guess what, the 'dead' serial port comes to life.

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Now as a kind of a side but related issue, serial port fixed/working, so I loaded up the Trimble Gpsk.exe program, but good old windows 10 says :-



Microsoft seems to be following the Apple mantra of getting away from 'legacy' items.

The fix to this is to run the software on an earlier copy of Windows, like Windows XP.

If you don't have a few old PC's to load XP on, then you need to use your 'main machine', yes you could attempt to make it dual boot, however no one will recommend this, the preferred method is to setup a 'virtual machine' running under Windows 10 (Or Linux if that's your favourite). My current virtual machine engine of choice is Oracle's "Virtual Box", a freebee easily downloaded from <https://www.virtualbox.org/wiki/Downloads>, they have versions for Windows, Apple OS-X, & Linux, so finding a box to run it should be no problem.

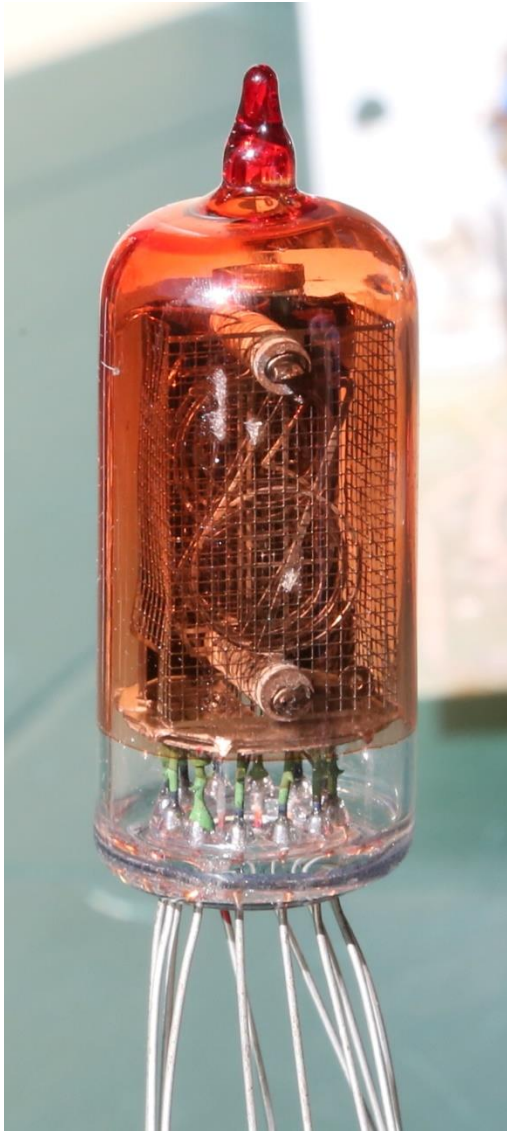
After installation, and starting it, click 'new', select Windows, after that you'll need a windows CD, but they are fairly readily available, as most people now regard it as junk. (remember you'll also need the registration key that came with it)

It's all a bit too much to completely detail in the club's magazine, (it sure would use a few pages) so have a look at <https://www.virtualbox.org/manual/ch01.html> for the good oil.

If anyone wants some more info on the subject, let us know and I will work on a follow up article. As is the case with a lot of computer software related articles, if it's not used almost immediately, then it becomes 'old' and incorrect for the latest version soon to be released. So I won't proceed unless there is demand, otherwise I'll just be filling pages with info that cannot be used. However, on the other hand, I could now load the prolific USB driver into the XP virtual machine, and it did run the Gpsk software, and it could see and talk to the USB-serial adapter. All fixed – No, the saga continues.....

*Paul VK3TGX*

# Arduino & Nixie Tubes



As mentioned in my last “Binary Clock” article, I’ve finally made some headway with making a Nixie tube clock – What, another clock I hear you say, well there are two sides to this, 1 – Treat it as ‘how to connect xxx displays to a micro, or 2 – How to display/use one’s collection of ‘antique’ display devices. I could just leave them in a box to be forgotten about, or I could ‘light them up’, and to me the most obvious is as a clock. I also have a 7 digit Nixie module available, from a very old digital volt meter, that I had thoughts of making into a frequency display for my Yaesu FT101 – Pity I killed the radio!.

So what is a Nixie tube anyway – well maybe it’s time for a little digital display history. Apart from decatron tubes, if you built something that produced a digital number, you of course need to display it. The first method was to use a row of light globes, either as binary, or in rows of 10 representing ‘0’ through to ‘9’, with multiple banks required for a multi-digit number.

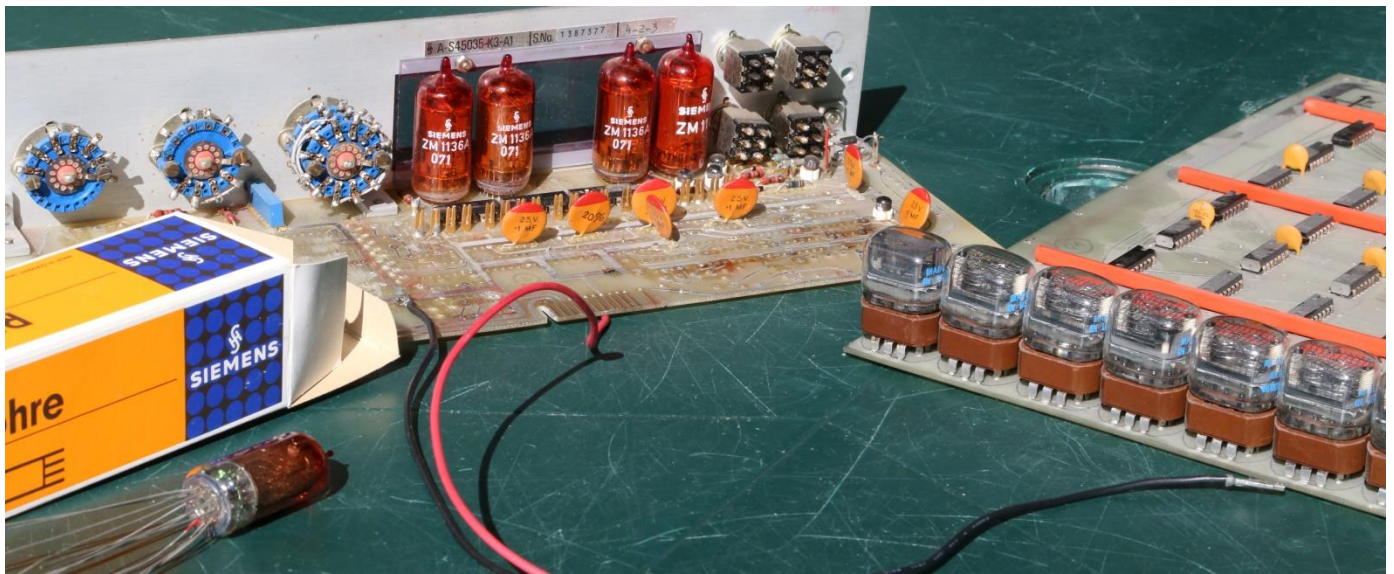


Here is an ‘ancient’ Racal counter showing ‘4044’, this is the deluxe version as there are numbers mounted in front of the rows of lamps. So now the race was on, on how to make a more compact display. Apart from some very imaginative ways to use light bulbs and lenses etc., the Nixie tube was born. Inside the tube are 10 ‘cathodes’ shaped as the digits 0 through to 9, in a tube filled with Neon gas. If you pass a current through the tube (~120V) the negative element will glow, giving you a digit. For a more detailed look, have a look at the [http://danyk.cz/digitrony\\_en.html](http://danyk.cz/digitrony_en.html) website.

So how do you drive them? Well the first thing to remember is these are a ‘negative resistance’ device, if you just hook a variable high voltage supply up to them and turn up the volts till the tube strikes, you will quickly destroy it. You need about 200-300V and a current limiting resistor, so that when the tube strikes, the current will be kept to about 2mA.

So how do you connect a 300V display tube to a 5V logic IC, well the first option is a bank of 10 high voltage transistors, or a custom display driver IC. As you can imagine, 10 transistors and their associated resistors soon add up to quite a bit of board space, assuming you don’t go





down the microscopic surface mount path. (Some have) The other problem here is these 10 transistors then need driving. If you only have one digit, it's not a big problem, but multi-digit displays start to bring up a few issues. The path I took was to use 7441/74141 driver IC's – yes they are about as old as the tubes they were meant to drive, but they are available, usually out of the equipment you scavenged the Nixie tubes from. There is only one limitation with these IC's, unlike their LED drive versions (7447, 7448) they cannot blank the display, there is always a digit displayed. There is a simple reason for this, the output transistors can only handle about 70V, so if one cathode is pulled low, letting the others float up to 60/70V is sufficient to extinguish those digits. Turning off all 10 outputs will place 200 odd volts on the outputs, a bit of a problem. (The 7441 does appear to have built in protection) In the Nixie era nobody seems to have been bothered, so '40' would be displayed as '000040' etc. not ' 40' as is done these days. This is called leading zero blanking, the later 7447 & 7448 decoder drivers have pins to take care of this. In my case of the clock, having a display like '04:20' didn't seem quite right, However as the first digit only ever needed to show a '1' or maybe a '2' for 24Hr time, I elected to use two transistors for that digit rather than a 7441, so 300V DC is no longer a problem.

```
pinMode(A0, OUTPUT); // Ten's Hours bit 1
pinMode(A1, OUTPUT); // Ten's Hours bit 2 (Only needed for 24Hr mode)
pinMode(A2, OUTPUT); // Hours bit 1
pinMode(A3, OUTPUT); // Hours bit 2
pinMode(A4, OUTPUT); // Hours bit 3
pinMode(A5, OUTPUT); // Hours bit 4
pinMode(A6, INPUT); // Hours set button
pinMode(A7, INPUT); // Minutes set button

pinMode(2, OUTPUT); // Ten's Minutes bit 1
pinMode(3, OUTPUT); // Ten's Minutes bit 2
pinMode(4, OUTPUT); // Ten's Minutes bit 3
pinMode(5, OUTPUT); // Minutes bit 1
pinMode(6, OUTPUT); // Minutes bit 2
pinMode(7, OUTPUT); // Minutes bit 3
pinMode(8, OUTPUT); // Minutes bit 4
pinMode(9, INPUT); // nu
pinMode(10, INPUT); // 12/24 hour switch - 'hourmode'
pinMode(13, OUTPUT); // Arduino nano onboard LED (Half hertz flasher)
```

This brings us to the IO limitations of an Arduino Nano, as I was happy with only 4 digits I could get away with it.

Normally a digit requires 4 bits to display the full 0-9, however as 2 of my clock digits don't need the full range, I saved a few I/O lines.

If you want the full 4 bits for 4 digits, that is not a big problem, it just means you have to be a bit more sneaky with any other inputs you desire. For a bigger display, like say 6 digits, then a

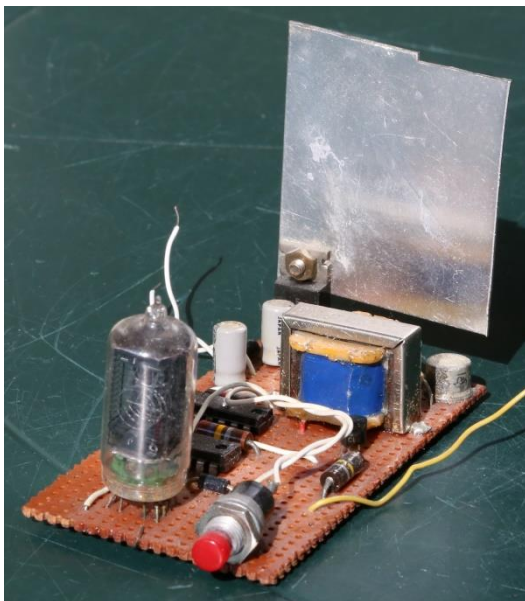


regular Arduino Nano/Uno has reached its limits, you need either a bigger Arduino, or use some form of port expansion using shift register IC's etc. I picked up a pile of 74HC595's off the internet for a very cheap price; these give you 8 extra outputs (i.e. 2 digits) per IC.

Actually, this driver I am making is far more versatile than just for driving nixie tubes, the BCD output can easily be used to drive any seven segment displays, either LED, LCD, or even a VFD.

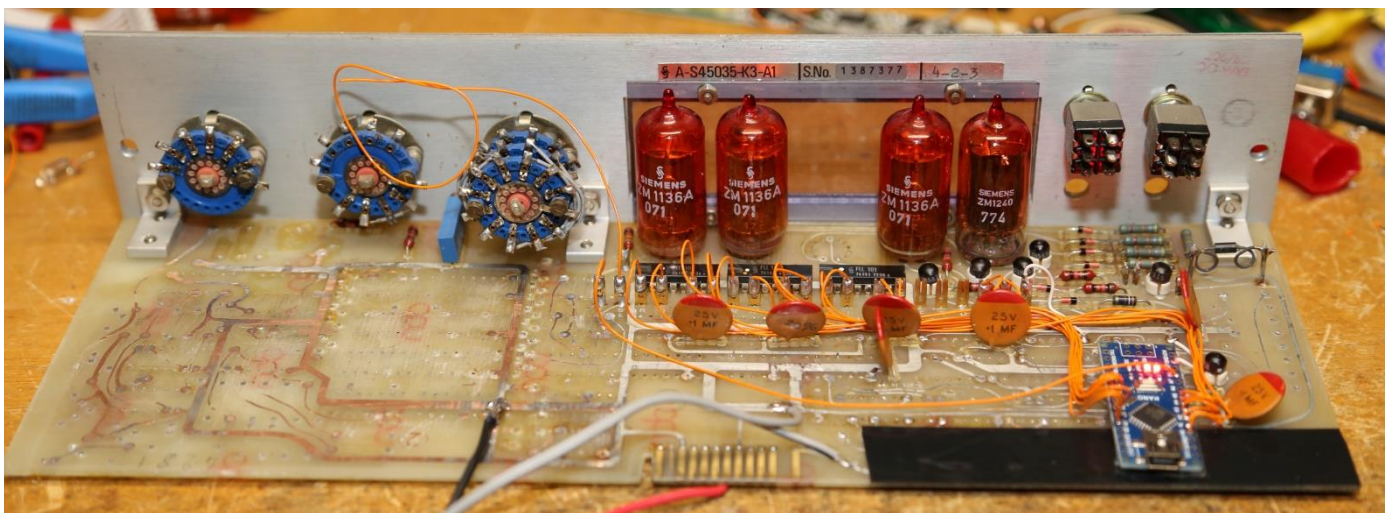
In a radio shack as the displays are being run from DC, and not multiplexed, the digital hash generated should be far less, yes the Arduino itself will generate some hash, however that part can be put into a shielded box, with suppressor feed throughs etc., as only DC is leaving it. Trying to shield a multiplexed LED display, whilst still having it visible is a problem, but if it and its driver ICs are running on pure DC, no (or minimal) shielding is needed.

Back to the nixie's. have a look at <https://www.youtube.com/watch?v=7uogKucrPk8> for driving them using more modern IC's with serial inputs, however he had the same 70V limit, plus surface mounting can be a problem for some, but as designing a PCB was not a problem for him, SMB was not an issue, so it all worked out ok for his project.



Next comes the power supply, if this was quite a few years back, a power transformer from a small valve radio would have been the obvious choice, however transformers with 200V secondaries are extremely rare these days, Yes I do have one, but it is earmarked for an upcoming (10 years already) valve project. For testing purposes I used a variac and a 240/240V mains isolation transformer, but of course this is of no use in the final device. Many years ago I built a single digit nixie counter, this used a small audio transformer as an inverter to light the tube. As it only produced a milliamp or two, everything was happy with the high-voltage limit resistor being left out, as far as the tube was concerned, the inverter was a constant current source – ideal. This is actually a much safer way to do things, as the actual HV

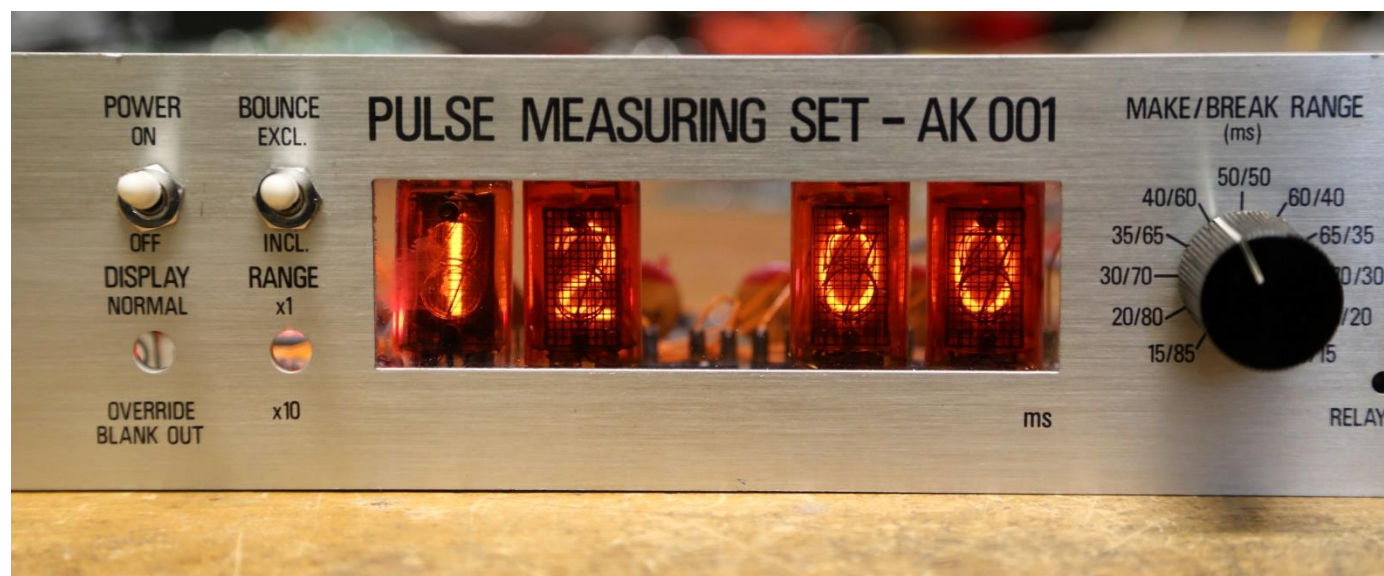
on the board is only the run/struck voltage of the tube, you will be much less likely to get a 'belt' from this one, whereas a full 200-300V DC rail can really bite. I know! (now)



This is my recycled Siemens AK-001 Pulse measuring set (Hamfest special?) The black electrical tape under the Arduino Nano is to cover the HV line that runs from the edge connector right around the side of the board – no covering, just where I accidentally placed my finger YIKES!

There is one big limitation to the nice little inverter on my single digit counter, it will only drive one tube, as nixies are negative resistance devices, you cannot directly parallel them and expect them to current share. One will strike first, bringing the supply down to 90 odd volts, leaving the other tube blank, as 90V is far below its striking voltage. I would either need 4 of these inverters, or a larger one producing many more volts with the normal limit resistors, so they can all live together. Currently I am investigating the use of a CCFL (cold cathode florescent light) inverter from an old laptop's LCD display backlight, I just need some high speed, high voltage diodes to rectify its output as I need DC, not AC.

One extra thing, you can usually dispense with the usual HV supply filter capacitor, so if you do make contact, the zap potential is a lot less, and turning off the power completely kills the HV.



This is it as it stands now, the gap in the middle (someone broke that tube) will be used for the clock colon using two standard neon bulbs, probably flashing at 0.5Hz via the pin 13 flash routine already in my code. I had various ideas what to use all the switches for, however I will probably cut it down and lose the three rotary switches. The power switch will be power (it is to be driven by my external time source, so no need to be on 24/7), the 'bounce' switch will be a 12/24 hour display selector, leaving the bottom two hole for time set buttons - not needed at my QTH, but handy for demoing it at a club meetings etc.

If you are wondering why so much blank board, well it wasn't initially blank, it was covered in IC's. I initially tried to de-solder them, but my tool was not up to it, so I just started snipping the leads, then removing some of the left-over track work. I originally had ideas of putting the power supply there, but now it will probably just face the hacksaw.

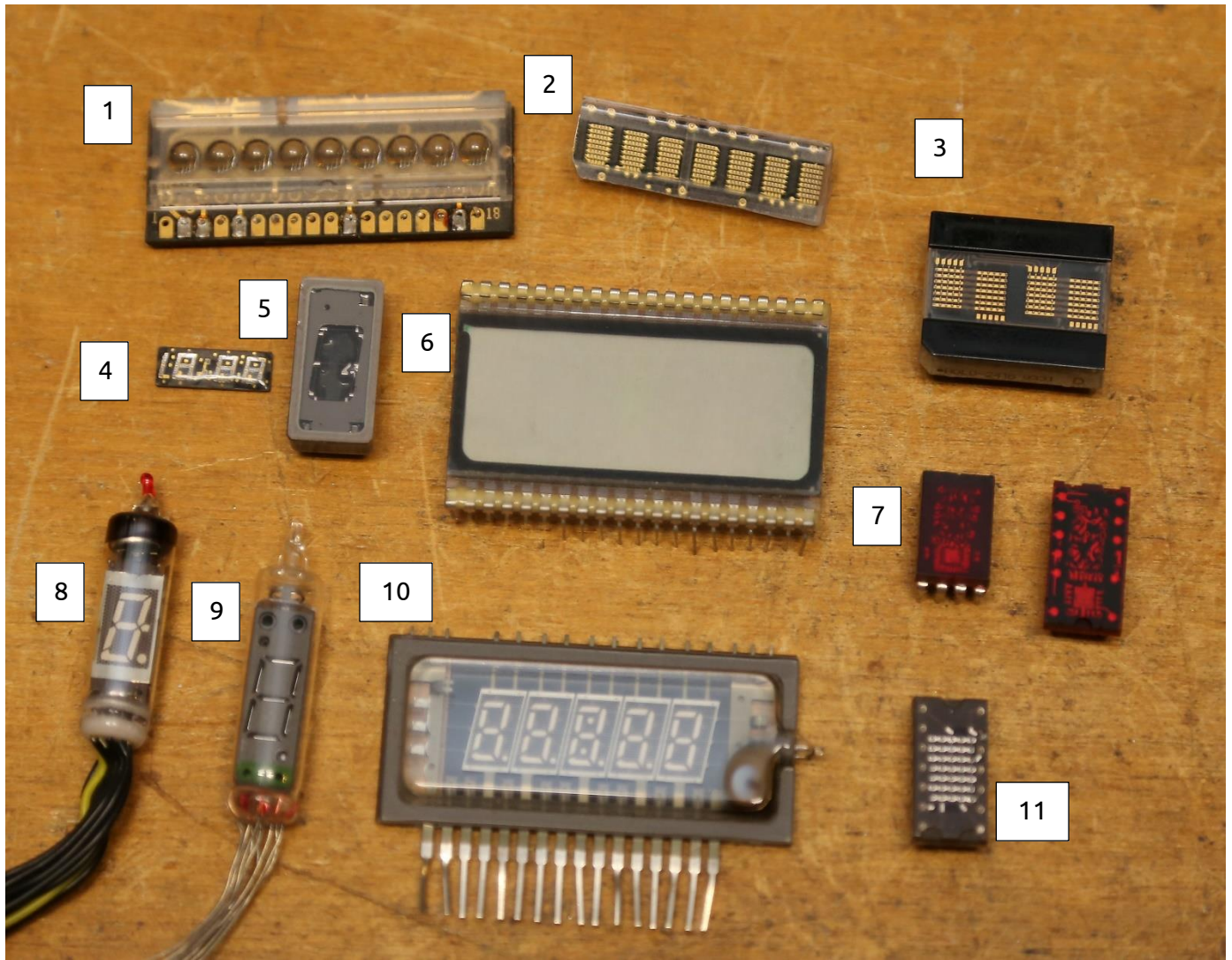


One surprise I had, was when I swapped the left hand tube from a 'symbol' tube to a regular 0-9 nixie, was that one of the wire leads had been accidentally crimped / folded over when it was inserted at the factory, and had been hiding there all along, never causing an issue.

*Paul VK3TGX*



# Display Collection



A selection of displays from my collection, it could have been better, I just didn't think back then in my younger years. – All For future projects?, Does anyone have any to donate?

1. Multi-digit 7 segment 'bubble' display from a calculator.
2. Alpha-numeric display from an early (not quite original) Motorola 'Brick phone'
3. 4 digit intelligent dot-matrix alpha-numeric display
4. LED clock display, I believe designed for a watch
5. Incandescent 7 segment display (as in using light-bulb filaments for segments). I believe they were originally made for combat aircraft, as early LED's were too dull.
6. 3.5 digit passive LCD (field effect), as used in many early digital multimeters. These need to be driven by AC, as DC will cause electrolysis and eat up the segments!
7. Two H.P. intelligent 7 segment LED's with on-board BCD decoders & latches.
8. VFD, Vacuum Fluorescent Display, a 'real' valve with filament, grid, & phosphor anode
9. Neon 7 segment display, similar to a Nixie to drive, but needing 7 limit resistors.
10. 5 digit VFD, or 4 digit with a clock colon
11. 5x7 dot matrix display, no on-board electronics, just LED's

*Paul VK3TGX*



## Club Information



Meetings 2000hrs on third Friday of the month at the  
Cranbourne Guide Grant Street Cranbourne  
Prac nights first Friday in the Peter Pavey Clubrooms Cranbourne 1930hrs  
Visitors are always welcome to attend

### Office bearers

President	Noel King	VK3CJJ	Web Master	Mark Clohesy	VK3PKT
Admin Sec	Michael Van DenAcker	VK3GHM	Magazine Editor	Paul Stubbs	VK3TGX
Treasurer	Chris Chapman	VK3QB	Property Officer	Bruno Tonizzo	VK3BFT
General 1	Barry Hamilton	VK3ABH	Secretary	Ian Jackson	VK3BUF
General 2	Ron Lacey	VK3FRDL			

### Call in Frequencies, Beacons and Repeaters

The Club Station VK3BJA operates from the Cranbourne Clubrooms.  
6m Repeater Cranbourne VK3RDD, In 52.575 Out 53.575 CTCSS none  
70cm Repeater Cranbourne VK3RLP, In 434.475MHz Out 439.475MHz CTCSS 91.5Hz  
VK3RLP Repeater supports Remote Internet access (IRLP), Node 6794.  
70cm Repeater Seaview VK3RWD, In 433.575MHz Out 438.575MHz CTCSS 91.5Hz  
Simplex VHF - 145.450MHz FM, Simplex UHF - 438.850MHz FM  
VK3RLP Beacons 1296.532MHz & 2403.532MHz (currently inactive)

### Membership Fee Schedule

Pension Member rate \$40.00 Extra Family Member \$20.00  
Standard Member rate \$50.00 Junior Member rate \$25.00  
Fees can be paid by EFT to BSB 633000 - Account 146016746.  
• Always identify your EFT payments.  
• Membership Fees Are Due at each April Annual General Meeting.

Magazine Articles to [editor@ggrec.org.au](mailto:editor@ggrec.org.au) or [vk3tgx@gmail.com](mailto:vk3tgx@gmail.com) Cut off, 10<sup>th</sup>  
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