

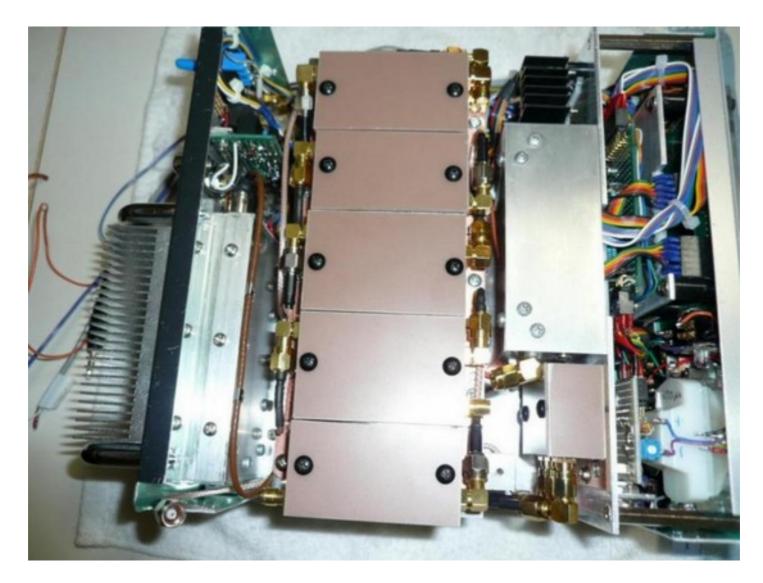
# FC-1 update ..... again!

January 18, 2019

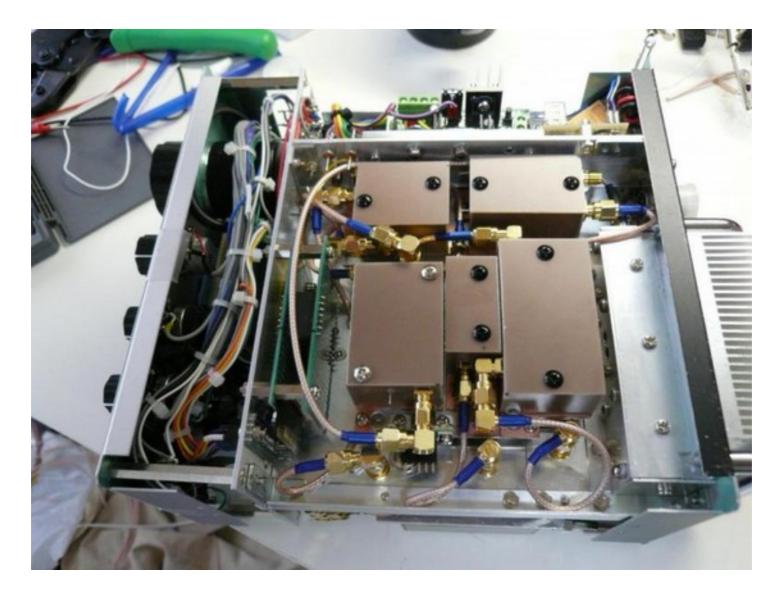
#### **Front Panel**

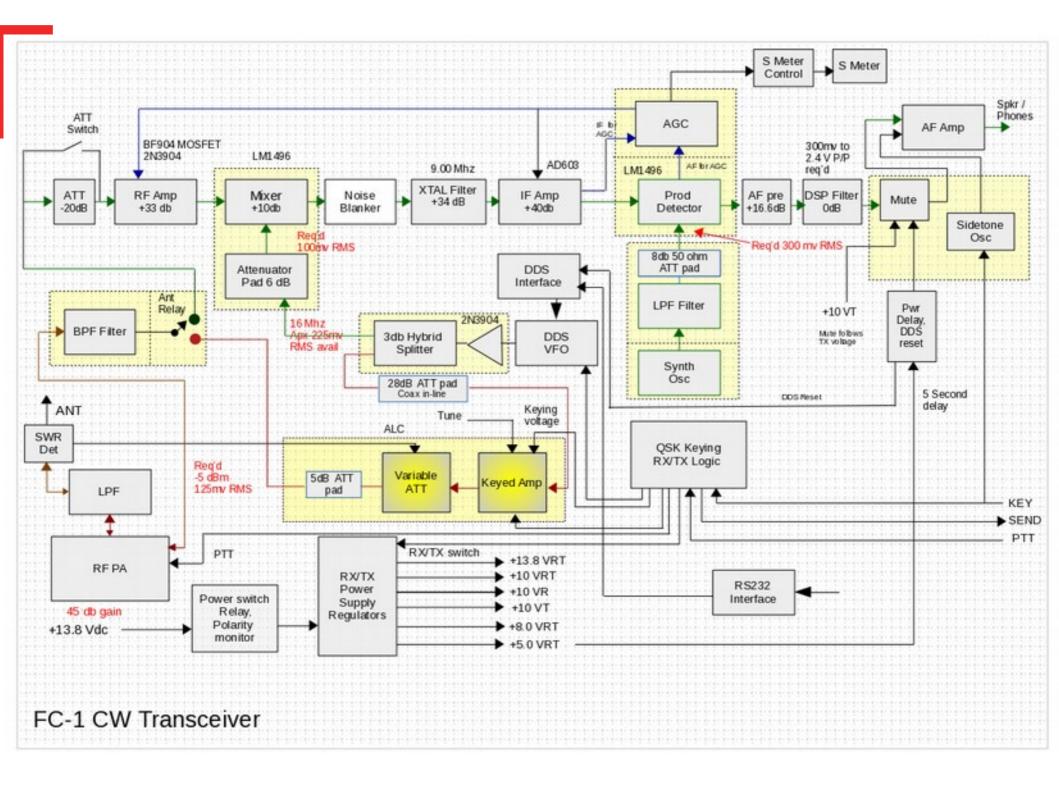


#### **Top View Receiver bay**



#### **Bottom View Transmit bay**





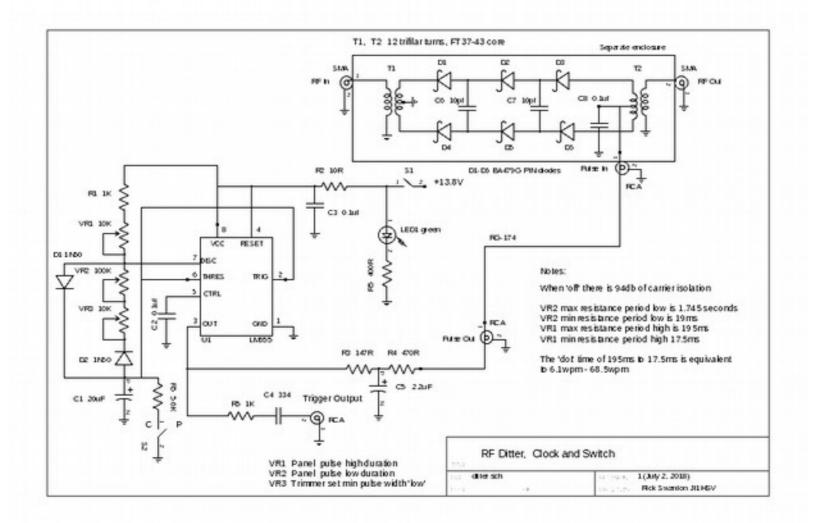
# **2.5 Month effort.... The AGC**

- Derived from two sources, IF signal and AF
- Independent control of IF and AF attack and decay
- S9 = 50uv RMS on antenna, S9+60 = 50mv RMS
- AGC action to start about S3 or 0.79Uv (-109dBm)
- Optimized for CW
- S meter actually working when AGC is OFF
- AGC is a closed loop, thus extremely confusing

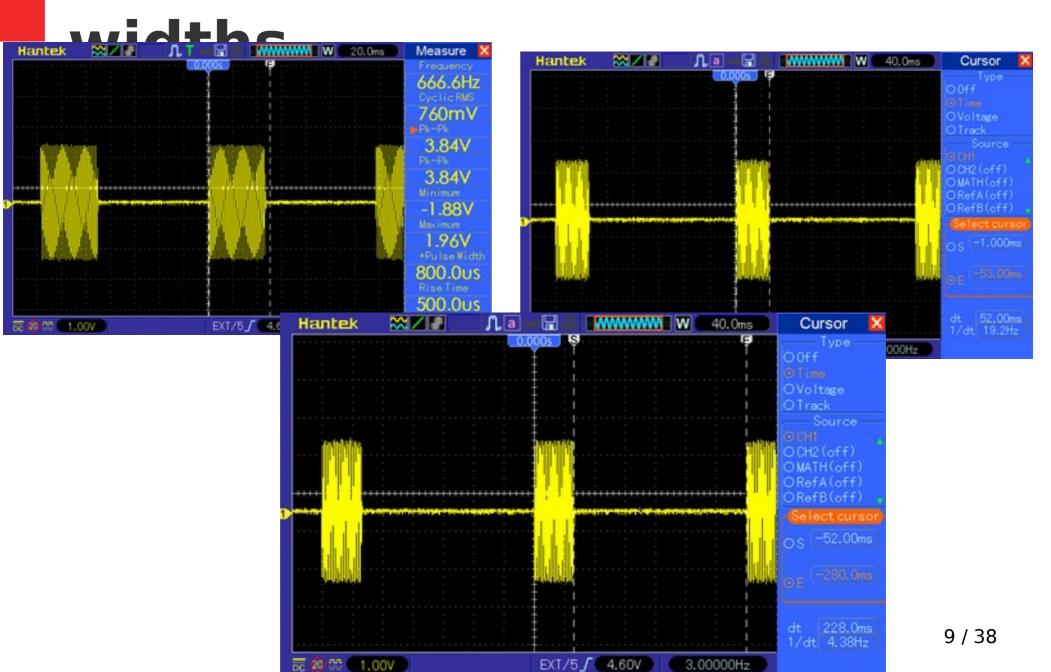
# AGC ... Troubles encountered

- My own ignorance at what to expect.
- Gain distribution in receiver
- Chinese fake parts
- Additional test equipment required
- Gain curves of RF and IF stages different
- Trying to make a linear S meter follow a log curve

#### The 'Ditter'

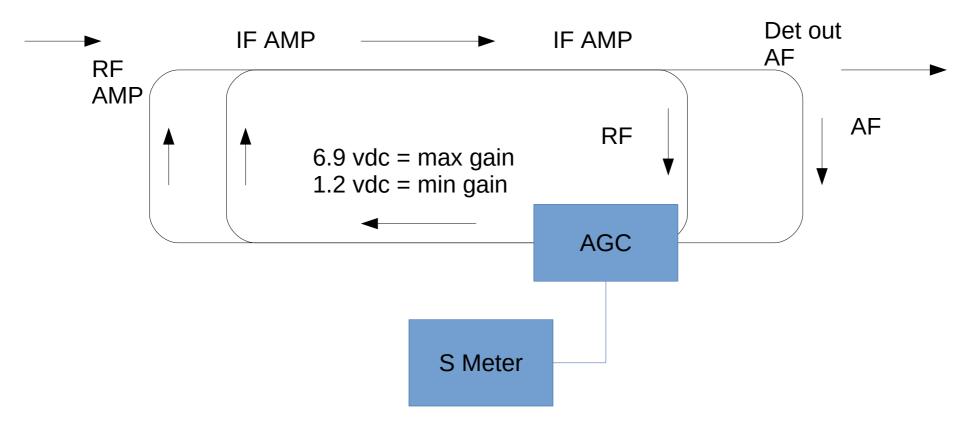


#### **Ditter ... varying pulse**

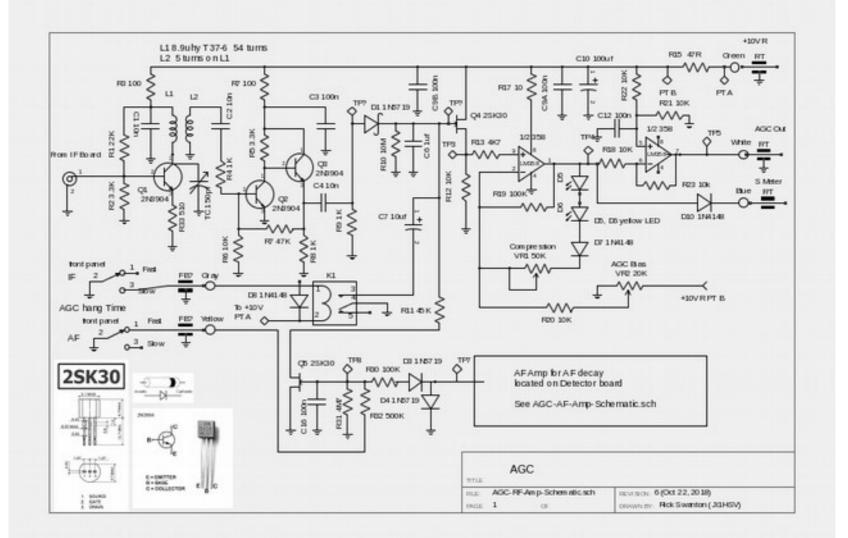


# Lots of Confusion

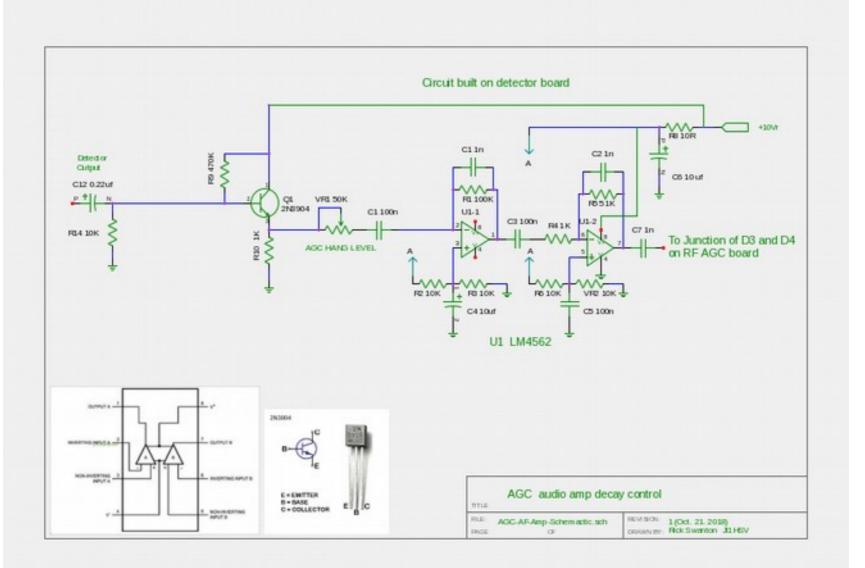
#### The loops



#### **AGC IF amp and Detection**



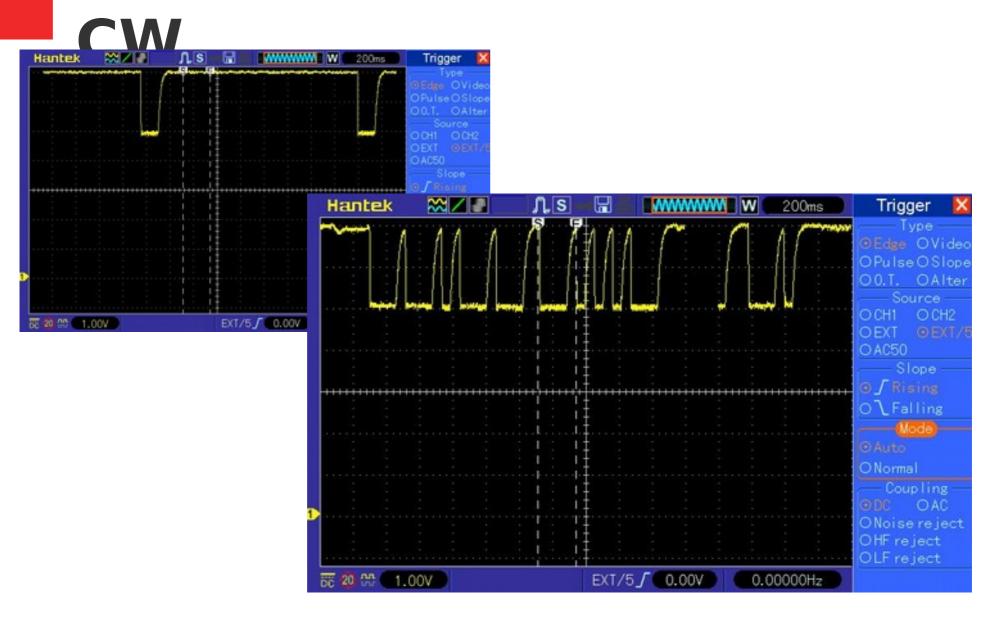
#### AGC AF amp.



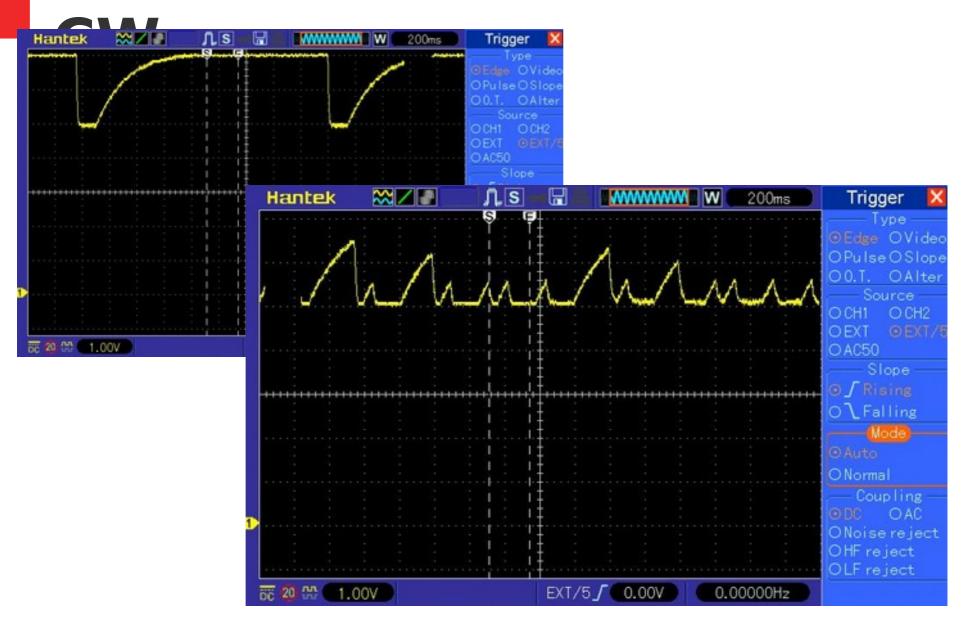
# Finally... working and built



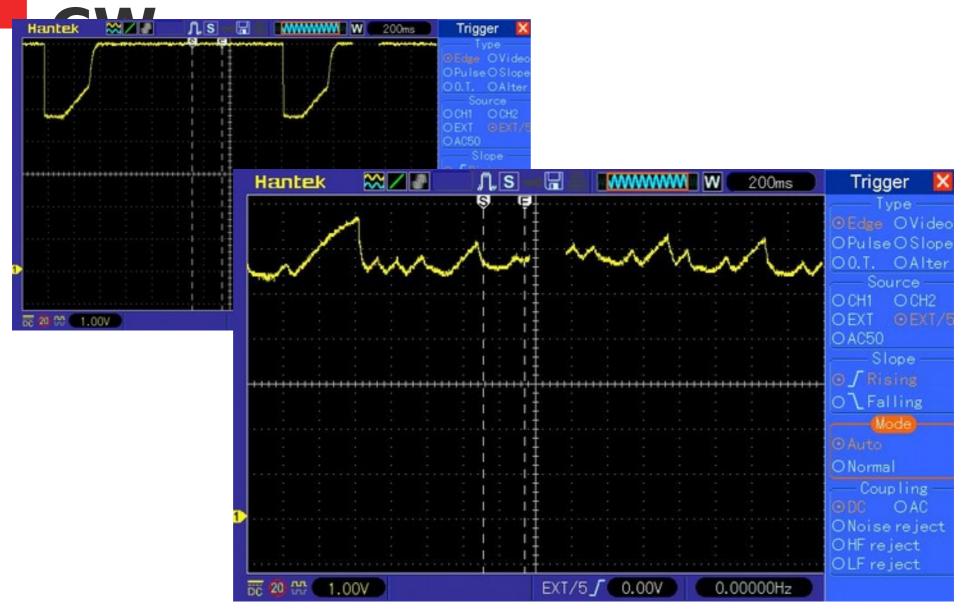
#### **AF Fast IF Fast test/real**



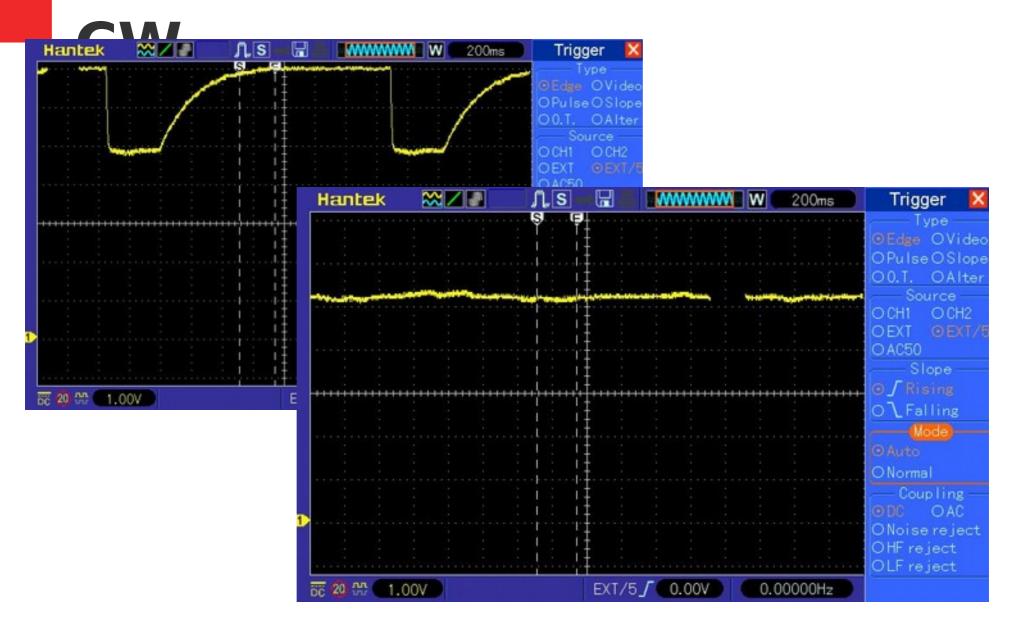
#### AF Fast IF Slow test/real



#### **AF Slow IF Fast test/real**



## AF Slow IF Slow test/real



# Next... PA Amp

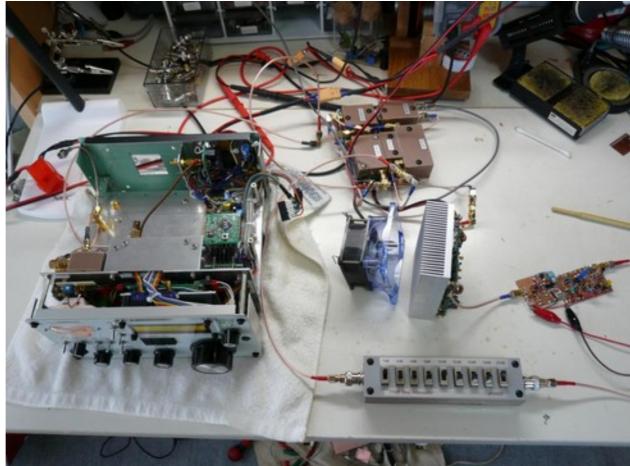
#### MiniKits 16 watt or QRPLabs 10 watt ?



# **MiniKits PA Amp selected**

Why.. Minikits has 45dB gain QrpLabs .. about 20

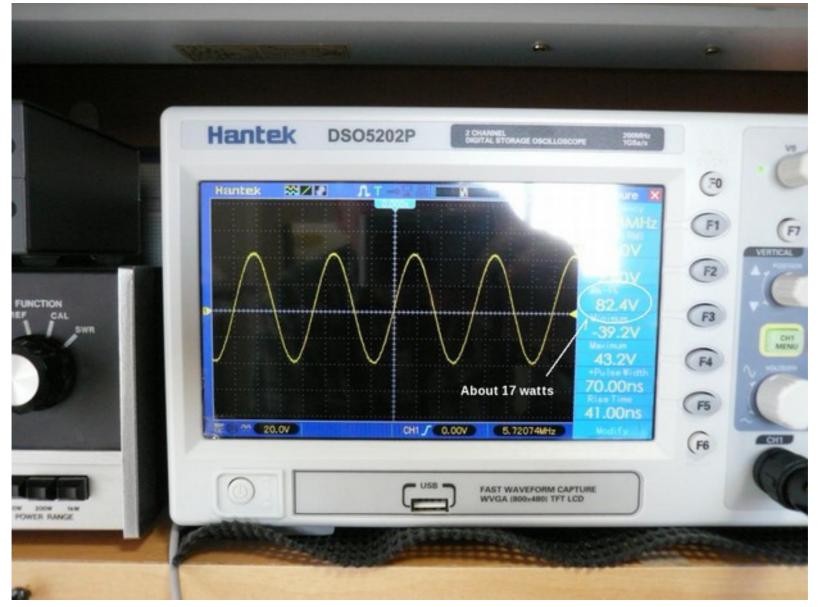
Minikits Lower harmonic content



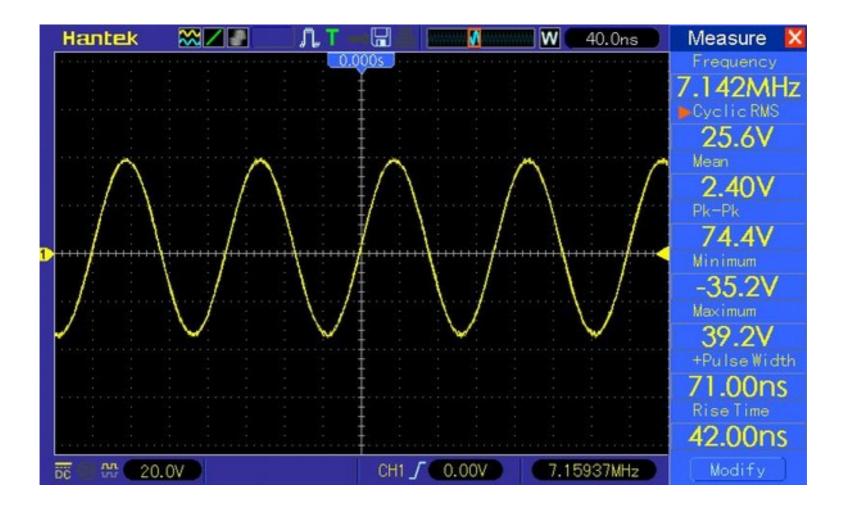
#### PA output ... max 20 watts



## After LPF 17 watts



## **15 watt Waveform**



# 15 watt FFT, i.e. harmonic level

Hantek			WWWWWW W 2.00us	Cursor 🔀
		25.0MHz		S Off Off OFrequency OMagnitude OTrack Source OCH1(off)
····		·····		OCH2(off) MATH ORefA(off) ORefB(off) Select cursor
				• 27.2dB • 27.2dB • 24.3dB
CH1 10.0	ala a ita a MB	5.00MH	z (100MS/s) 7.15937MHz	dV 51.6dB

# Test everything...

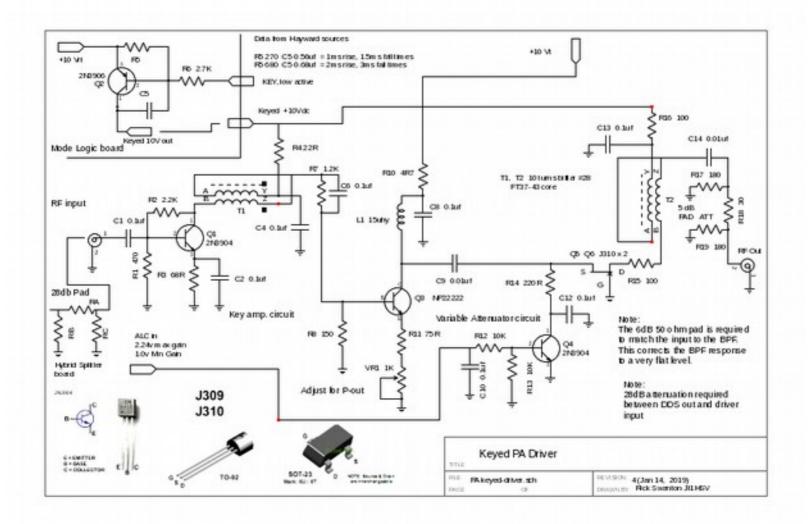
#### While testing for PA receive path loss. . this was found

Hantek					200ms	CH1 🔀
						Coupling — O≅ DC @A≿ AC
	leceive path en ow level RF from		ļ			O ± GND ─ 20MHz BW ─
			$\sum$			O (20) Limit Off
		<b>Normalia</b>			***	
Conclusion: can't use on switching	-board RX		ļ	plus and m spikes due diode swite		Probe O1x <b>©10</b> x
Will go with I	relays		ļ	Very bad fo	or RX rf amp	0100x 01000x Invert
			‡ :			O ₩ Off O ₩ On
Ac 20 📅 20	OmV 0mO		CH2	5.60mV 0	.00000Hz	

# Now for the PA Driver

- Independent power level and ALC control
- 2-4 ms rise and fall times on keyed waveform
- Adequate drive from DDS
- Level verses frequency issues
- Signal "Blow-by" has to be greater than 75 dB
- •Everything has to fit in a very small module.

#### **Driver schematic**



#### The board

0.01 uf

0.01 of SMD cap

0.1 ut bypass cap

1 mm thick double sided board

27mm

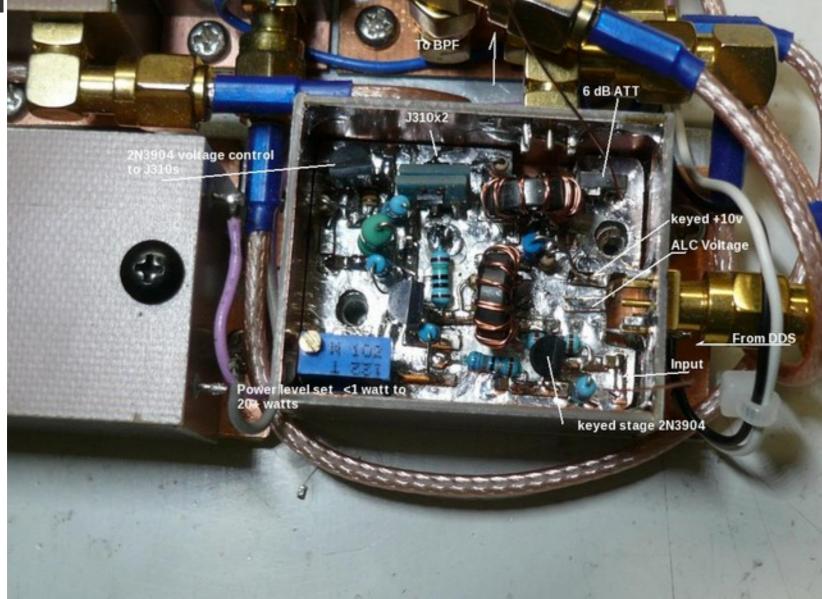
**Output SMA connector** 

36mm

6dB Panasonic ATT chip

put SM

# Finally . . . placed in



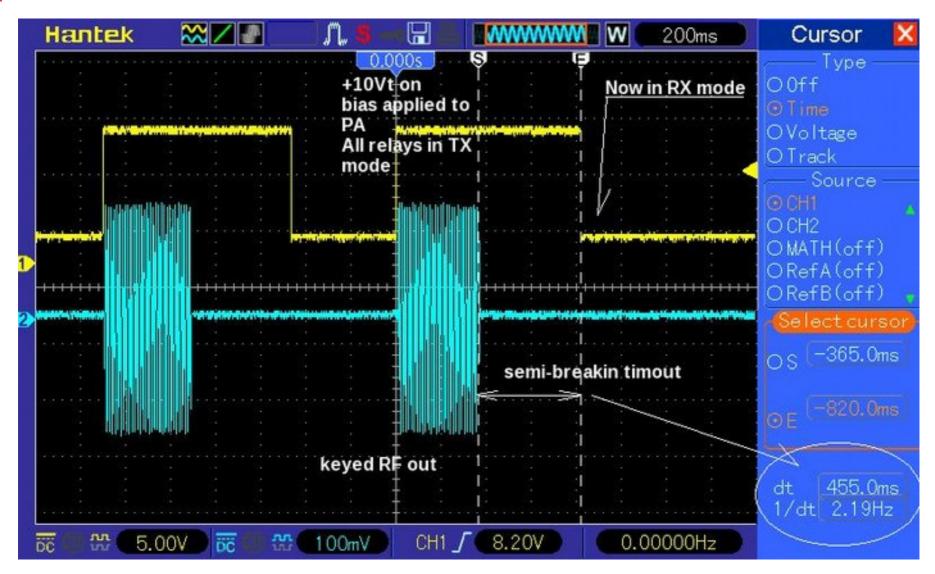
#### Results

- Level control: 100mw to 20 watts
- ALC @ 2.24Vdc maximum output @ 1.0Vdc 0 ouput.
- Blow-by: -80dB at 15 watts output
- Power vs Frequency output: flat from 6.9Mhz to 7.4Mhz
- Key rise time 2.0 ms, fall time 2.8 ms

## Data Mode Switch vs RF

Hantek		<b>5</b> -			4.00ms	Cursor 🔀
	+10Vt on PTT active applied to	ated so bia	as			O Off Time
					~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	OVoltage OTrack
				II.II.	լիկիկի	Source OCH1 OCH2
1						OMATH(off) ORefA(off) ORefB(off)
2 m m m m m m m m m m m m m m m m m m m	man production of the second sec			n <sup>k</sup>		(Select cursor)
		RX to TX	change			OS -600.0us
				1111	11111	©E <sup>[-9.200ms]</sup>
			RF doesn't appear thus all relays have with time to spare	for 8.6ms been act	ivated	dt 8.600ms 1/dt 116Hz
DC 🐨 🕸 🗔.0	00V 📅 🐨 🍄	100mV	CH1 / 8.20V	0.0	0000Hz	

## **Data RF and SBRK timeout**



# Data Keyed RF Rise time

Hantek	₩∠₽			🚺 🔛 🚺 2.00ms	Cursor 🔀
		: : T	200.0US LOVt on		── Type ── ○ Off ⊙ Time
			PA Driver <u>RF out</u>		OVoltage OTrack Source OCH1
	**************************************	4.4574 <del>16</del> 7547794779477947794779			OCH2 OMATH(off) ORefA(off) ORefB(off)
2 <sup>7499/19949/1994</sup>	*** <sup>*</sup> ********************************	tri <sub>an</sub> ista, Inna <sup>1</sup> 1640 - and	+ Forth 9)		- Select cursor - OS -7.600ms
		Mode RX to	e change o TX Keve	d RF rise time	©E <sup>[-9.700ms</sup> ]
	Use V0 kno	b to adjus	tmeasurement cur CH1 <b>/</b> 8.20V	sor	dt 2.100ms 1/dt 476Hz

# **Keyed 10v and RF risetime**

	Hantek	≈∠∎	ງ 🛄 🎵 💲 -			<b>№</b> 2.00ms	Cursor 🔀
				000s 9			O Off Time
							OVoltage OTrack — Source —
							OCH1 OCH2 OMATH(off)
1	ngtar parting any til the analysis	u en der Sond Schligen is ann im.	an a				ORefA(off) ORefB(off)
2						<b>* *</b> *	⊙s (-200.0us)
							OE <sup>[-2.200ms]</sup>
		5.00V ) 📅 20	∰ 100mV	СН1	6.40V	0.00000Hz	dt 2.000ms 1/dt 500Hz

# **Keyed 10v and RF Falltime**

Hantek		J. 5 -		www.ww	W 2.00ms	Cursor 🔀
		<b>90.0</b>	00s			O Off Time
		 				OVoltage OTrack
an an a that the state of the state of the	and a second					CH1 ACCH1
mmittaristintekolindoitikt	ndosticario tantinenti suoti suoti suoti su		A The state of the	legant defining a legant dag alera beta be	alan di kanangi di kangi di kana di kanangi di kangi di kanangi di kangi di kangi di kangi di kangi di kangi di	OMATH(off) ORefA(off) ORefB(off)
		1. 				Select cursor
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	A. A. I					
						dt 2.750ms 1/dt 363Hz
📅 🙆 🎌 🛛 5.0	00V 📅 🤨 🛣	100mV	CH1 \	6.40V	0.00000Hz	

# Present Status



- •AGC working very smoothly
- •Mode / QSK circuit working fine.
- •Sensitivity the same of better than IC-7200
- •Less AGC pumping than IC-7200
- •Presented at Fuchu City Culture event... won first prize (Fuchu Amateur Radio Club)
- Entire October it was in shack in operational test for receiver section.

# FC-1 HomeBrew transceiver Nearing the end!

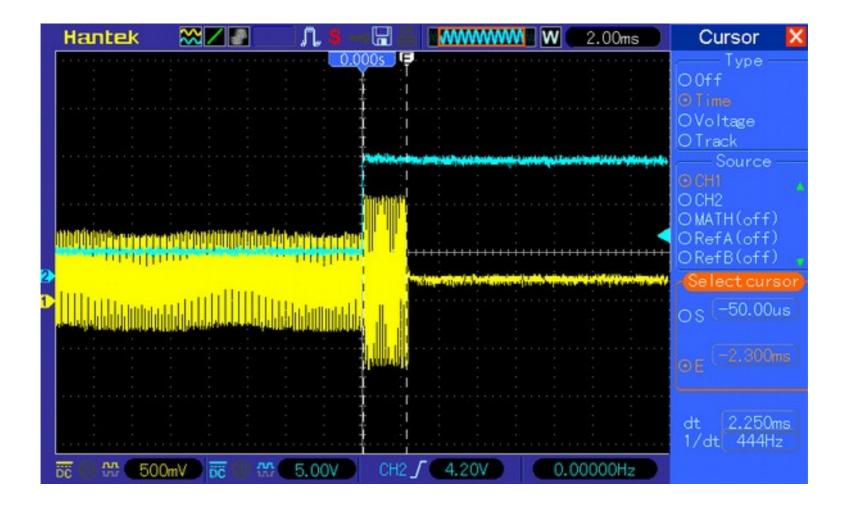
SWR ALC ... to do

Noise blanker . . to do



I Expect first QSO this month!

# **Antenna Relay Timing**



# **Antenna Relay Timing**

