Y Analogue SAT RX Bad for ATV 1/2

By G8MNY (New Feb 05)
(This is a Prize winning article published in BATC's CQTV 207 Aug 04 & includes schematics left out of the original.)

Many satellite receivers give good service in ATV work after some modifications. Here are typical symptoms & problems with there use for ATV work.

With weak signals a typical satellite receiver will receive the sound 1st, then colour information, & lastly a locked picture. Whereas dedicated narrower ATV receiver will receive a black & white picture 1st, then the colour, & the sound last, but all at a much lower signal level. Also radar overload & your transmitter look-though overload, are less troublesome with a proper receiver than a satellite receiver.

Here are some off the reasons why.

TYPICAL PROBLEMS

RF

1/ Coax permanently/unsafely powered, some receiver used to blow up on shorting!

2/ Many receiver are very insensitive as they are designed for a 50dB gain LNB input level.

3/ The untuned 1 GHz wide front end, lets lots of unwanted noise through to the mixer stage, where it can degrade the wanted signal.

4/ RF stages are easily overloaded, as receiver is designed for a band full of the same strength signals, and of limited level range.

5/ Image Noise/QRM can be a problem with a wide lightly filtered front end. eg. TV signals 470-800MHz & cellphones systems 0.9, 1.8, 2.7GHz etc.

6/ The 30MHz Wide IF lets too much bandwidth through for ATV, and often with not much skirt rejection of adjacent frequencies.

7/ Permanent wide locking AFC, and not designed for weak signals.

8/ FM discriminator circuit not optimised for narrow deviation.

VIDEO

9/ Set up for wide deviation, video gain needs 2-3x more for ATV to give 1v.

10/ Poor LF response to remove 25Hz energy dispersal sat signals, causes corruption of frame syncs on ATV. Sometimes also caused by too fast AFC.

11/ Sometimes proper CCIR 405 de-emphasis curve not used.

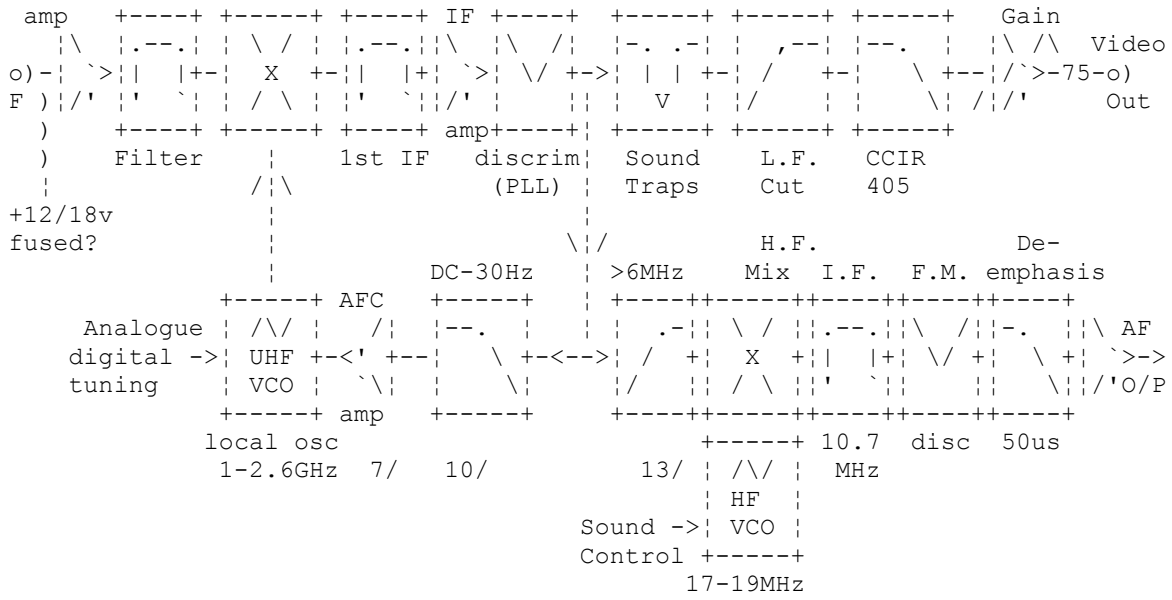
12/ Video needs 6 MHz traps to reduce subcarrier patterning.

SOUND

13/ Sound IF needs to be set for 6 MHz UK. (or 5.5MHz EU)

T Y P I C A L B R O A D B A N D S A T R X

(Problems /)											
1/	2/	4/	3/	4/	5/	6/	8/	12/	10/	11/	9/ 10/
wide-band	900MHz-2GHz		UHF mixer		width 30Mhz		F.M.	Optional 6.5-8MHz	>50Hz	De-emphasis	Preset



In part 2.. Dedicated design, 13 Tips on improvements, & References

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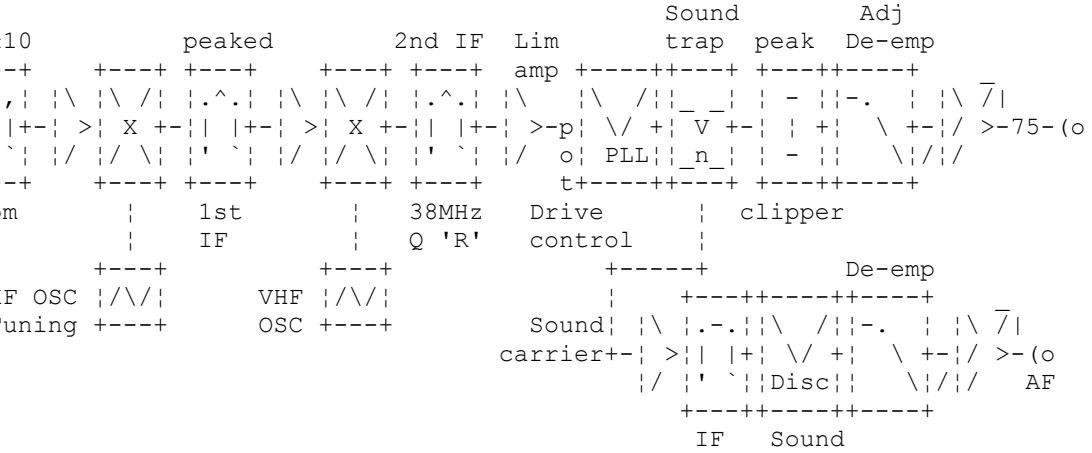
A D E D I C A T E D A T V R X



These problems not only occur with satellite receiver but on many dedicated 23cm ATV receiver designs using satellite modules as well. Digital satellite receiver also suffer the same RF short comings, but you will never know the cause of problem as they just won't work!

TIPS ON POSSIBLE SOLUTIONS
Not all these solutions can be applied to small modern receivers, the bigger older ones lend themselves to modification much better. But you will need a diagram & a good understanding of how the circuit works!

1/ The +12 or +18V is useful for powering preamps, but a 18V 2W lamp or a 47R 5W in series with the 1st supply pin to the satellite receiver RF box is recommended to stop accidents & allow S/C aerials in safety.

2/ Insensitivity can be masked with low noise high gain preamp (e.g. 1dB NF & 40dB gain) but the amplified noise floor from the preamp should exceed the receiver noise floor by around 10dB. This is because less preamp gain than this will show up the receiver noise & more will reduce the overload threshold point.

3/ A well filtered gasfet preamp will help, or use a good inter-digital filter peaked on the frequency wanted. e.g. your local Repeater O/P. [2] [3]

4a/ For Radar overloads, try a good inter-digital filter, reduce preamp gain, & even use a video radar clipper. A suckout filter is not usually any good as radars often use 4 frequencies at once. [2] [3] [1]

4b/ For look through blocked by your transmitter, try a good inter-digital or suckout filter, also try reducing the preamp gain. [2] [3] [4] [5]

5/ Again for unwanted images use filters before the satellite receiver. [2] [3] [4] [5]

6/ Halving the IF bandwidth will reduce the noise & eliminate much of the nearby radar seen by the demodulator, thus improving the signal. But only a re-tweeked IF filter can do this job, receiver with fixed IF filters this is not a option. Unfortunately this means that narrowing the bandwidth is not possible on many receiver designs!

Too narrow an IF will eventually loose sound & colour, & give starkly edges & syncs. But due to the FM capture effect a noisy P1 picture with heavy radar on a wide receiver can be a P3 with little radar on a narrow receiver.

Any reduced colour & sound subcarrier levels from the video demodulator due to the narrowed IF can be compensated for with less de-emphasis & a 6MHz IF preamp, as the baseband video noise floor around these subcarrier is also reduced.

7/ Add a defeat AFC switch before trying more complex AFC systems. Ideally the AFC needs to be a sync tip detecting type for narrow IFs. [6]

8/ Depending on the demodulator design (PLL/discriminator) try different Rs for the loop values, or retuning discriminator coils will give a better performance.

9/ Turn up any video gain preset or modify video amp for 2-3x gain to get 1v p-p terminated with a correctly modulated source.

10/ Poor LF response, video needs ZERO phase change @ 50Hz so lowest frequency needs to be as low as 10Hz. Change any small video handing C for bigger values, e.g. 47uF to 470uF into 75 ohms load.

Slow down AFC by increasing capacitor values if it is too fast, so that video frequencies are not on the AFC control line.

If the pictures are strong enough use a black level clamp to correct. [7]

11/ Use CCIR 405 video de-emphasis curve, modify the circuit to give correct overall video response as required for a narrow receiver. [8]

12/ Add/change/retune sound traps in video path. This reduces patterning in TV monitors & video amps that can't handle these sub-carriers linearly.

13/ Change any fixed sound filter to 6MHz & retune sound discriminator coil, or on tuneable sound systems (10.7MHz IF type), retune HF mixer osc to cover 5.5 & 6MHz.

REFERENCES

[1] Radar clipper CQTV 168 p21.
[2] 2 24cm filters CQTV 187 p36.
[3] 24cm Filter Experiments CQTV 190 p41.
[4] Look through filter CQTV 200 p14.
[5] Blocking filter CQTV 200 p18.
[6] Sync tip AFC CQTV 169 p21.
[7] Black level clamps CQTV 198 p17.
[8] Setting FM Levels CCIR 405 CQTV 181 p14.

Some of these references may be found on www.batc.org.uk

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