SPECIFICATIONS & HIGHLIGHTS

GENERAL SPECIFICATIONS:

- Architecture: Direct Sampling DDC/DUC Transceiver
- Interface: Ethernet
- Phase Noise (Clock): -149dBc @ 10Khz
- TCXO Stability (Typical): +/-.1 PPM
- Modes: CW, SSB, NFM, AM, Digital
- Antenna Ports: Three SO-239 50 ohms Software Configurable Ports, One BNC for Rx2
- Frequency Resolution: 1 Hz

ELECTRICAL SPECIFICATIONS:

- 13.8v DC @ 40A, 3A Receive/ 40A Peak on Transmit

MECHANICAL SPECIFICATIONS:

- 12Kg (approx. Weight)
- Dimensions: 483MM (L) x 123MM (H) x 320MM (D) (Not including extrusions)
- Stainless Steel Chassis and Aluminum Heatsink

RECEIVER SPECIFICATIONS:

- Receiver Architecture: Direct Down Conversion
- Dual 16 bit Phase Synchronous ADCs
- Independent filter banks for each ADC
- 10/6M LNAs
- Frequency Coverage: 9Khz to 60Mhz
- Attenuator: 1-30dB step attenuator
- Reciprocal Mixing Dynamic Range (RMDR): 116dB @ 2Khz
- Receiver Phase noise: -149dB @ 10Khz
- Image rejection: 100dB
- Hardware support for 7 independent receivers assignable to either ADC

TRANSMITTER SPECIFICATIONS:

- Transmitter Architecture: Direct Up Conversion
- DAC Resolution: 16 bit
- RF Output Power: 1-200W SSB, CW, FM, RTTY, Digital; 1-50W AM
- IMD: IMD3 typically -72dB @ 200W output on 20M
- Harmonics: Typically better than -50dBc on HF and -60dBc on 6M
- Carrier and Opposite Sideband Suppression: Better than -80dBc
- Transverter IF Output: 0db to +15dB

IOs:
RF CONNECTIONS:

- Three Software configurable SO-239 Antenna Ports (ANT-1, ANT-2 and ANT-3), all ports are T/R switched and 50 ohm impedance.
- 10Mhz Reference BNC port - For use with a high stability external 10Mhz source, the radio will automatically switch to the external source and lock the master clock to it. Typically a -15 to 0dB input level is ideal.
- A BNC Transverter Tx output port - For use with an external Transverter, the output levels are software configurable from -10 to 20dB approx.
- BNC RX2 port – ADC2 is available on this port, ADC2 port is software configurable and can be optionally grounded on Tx to prevent damage during transmit.
- PS FEEDBACK SMA Output port samples the internal LDMOS PA output and reduces it appropriately for use for PureSignal (Predistortion).
- PS INPUT SMA Port is used for providing the sampled External/Internal Amplifier feedback for PureSignal (Predistortion), the maximum input to this port must be below 0dB to prevent damage to the radio. For barefoot operation the PS FEEDBACK and PS INPUT ports must be looped. A 50 ohm SMA (M) to SMA (M) cable is installed by default at the factory which can be removed when the rig is in use with an external PA.
- RF1 NBC port is reserved for future applications.

AUDIO CONNECTORS:

- The ANAN-8000DLE has RCA line inputs for the left and the right audio channels (RLINEIN and LLINEIN). The line-input gain is logarithmically adjustable from 12 dB to -34.5 dB in 1.5-dB steps. The maximum input level is 1.0 V RMS.
- The Radio has two Barrel audio connectors for MIC IN, one on the front panel (6.25mm Barrel Audio) and the other in the rear panel (3.5mm Audio). MICIN is a high-impedance, low-capacitance input that is compatible with a wide range of microphones.
- A stereo Connector is required for the MIC IN since the PTT line is incorporated on the ring connector, PTT and MIC Bias can be enabled/disabled via software control.
- The Radio has two RCA low-impedance line outputs (LLINEOUT and RLINEOUT) capable driving line loads with 10-kΩ and 50-pF impedances.
- The Radio has stereo headphone outputs, one on the front panel (6.25mm Barrel Audio) and the other in the rear panel (3.5mm Audio) and is designed to drive 16Ω or 32Ω headphones.

OTHER IO CONNECTIONS:

- RCA PTT INPUT and OUTPUT (25v, 200mA max)
- Seven Open Collector outputs are available on a DB9 Connector, each output is rated at 20v, 200mA max.
- L and R Speaker outputs on 6.25mm Audio barrel Connector, 2W output at 8 ohm impedance.
- 13.8v DC, 40A Power Pole DC Connector
- Gigabit RJ45 Ethernet LAN Connector
- Bootloader Slide switch to enable/disable bootloader function
- Ground Lug

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ANAN-8000DLE

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AN INTRODUCTION

The ANAN-8000DLE HF & 6M 200W SDR Transceiver meets and exceeds the requirements of even the most discerning Amateur Radio Operator, it is based on the work of the OpenHPSDR community.

DESIGN TEAM

Phil Harman, VK6PH
Hardware Design, Ethernet Protocol for the OpenHPSDR/ANAN SDRs, FPGA code, KISS Console, VNA Software.

Doug Wigley, W5WC
OpenHPSDR PowerSDR developer and Custodian, PA Control and Protection Microprocessor firmware.

Dr. Warren C Pratt, NR0V
WDSP DSP Engine, PureSignal (Predistortion Algorithm), Minimized Latency Filtering, Noise mitigation Algorithms.

Kjell Karlsen, LA2NI
RF Driver Amplifier and other Hardware inputs.

Abhishek Prakash
Orion MKII, LDMOS Amplifier Design and overall Hardware design.

Joe Martin, K5SO
Orion MKII FPGA code, Diversity and Radio Astronomy code.

John Melton, G0ORX/N6LYT
Developer of the PiHPSDR, Android, QTHPSDR and GHPSDR Applications.

Adam Farson, AB4OJ/VA7OJ
Detailed Hardware Testing and Analysis

Keeping in mind the various requirements posed by new cutting edge technologies implemented in the radio it has been designed from scratch, the design successes of the previous generation hardware has been improved in the new implementation.

CUTTING EDGE FEATURES:

Noise Blankers: The ANAN-8000DLE provides a choice of two Wideband Noise Blankers and a new Spectral Noise Blanker that can be used alone or along with a Wideband Blanker. The two Wideband Noise Blankers are:

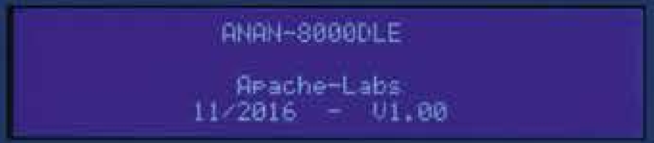
1. A Preemptive Blanker which effectively slews its output to zero before an impulse arrives and then slews back to full amplitude after it passes, and

2. An Interpolating Noise Blanker which is also preemptive but has modes such as linear interpolation of the signal during the impulse. Wideband Noise Blankers, while they are the best choice in some situations, have a well-known issue: they may become ineffective in the presence of strong signals on the bands, for example during a busy contest. The new Spectral Noise Blanker cleverly overcomes this deficiency by using Linear Predictive Coding (LPC). LPC gives the capability to predict a sequence of samples by analyzing the spectral content of the samples before and after the sequence. By comparing the predictions with the measured samples, impulses are detected. Then, LPC is again used to predict what the signal waveform should be during the impulse and thereby to replace the corrupt samples. The regenerated waveforms are amazingly accurate!

Noise Reduction: Two types of Noise Reduction algorithms are provided to minimize random noise. The first is a special implementation of a Least Mean Square (LMS) algorithm and the second is a new Spectral Noise Reduction, NR2 (2015). LMS algorithms are used in most SDRs and DSP-radios due to their relatively simple implementation and low compute requirement. However, they use only the input signal as a reference to identify the output and therefore unable to achieve optimal signal-to-noise ratios and they sometimes yield an unusual "in the barrel" or "underwater" sound. The new Spectral Noise Blanker uses a priori knowledge of speech and noise, specifically, statistical models of speech and noise, to produce superior signal-to-noise ratios and vibrant sound.

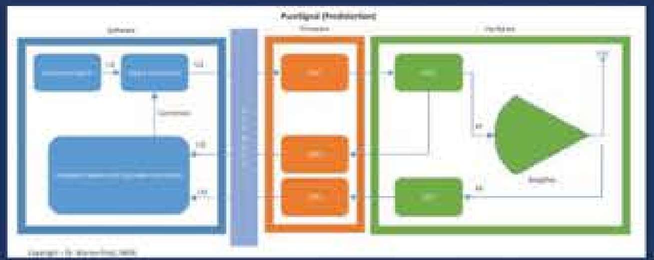
Minimized Latency: Filtering contributes most of the latency in SDR processing. There are two reasons: (1) large sets of samples, "buffers," are normally collected before executing the filter so that efficient FFT algorithms can be used, and (2) sharp "brick-wall" linear-phase filters inherently have a long latency, no matter how implemented. Both these issues have been addressed and conquered in the ANAN-8000DLE. Small "buffers," requiring little collection time, can now be used even with very sharp "brick-wall" filters. In addition, the option of using very low-latency "minimum-phase" filters is provided. In almost all situations, laboratory and on-air testing have demonstrated no discernible difference in performance between linear-phase and minimum-phase filters. With filters as sharp as you desire, sub-20ms receive latencies are now available, comparable to the best of conventional DSP radios and much better than competing SDRs!

The ANAN-8000DLE includes two phase synchronous front ADCs to enable Diversity reception and other advanced applications, the transmit chain is designed keeping in mind PureSignal (Predistortion).



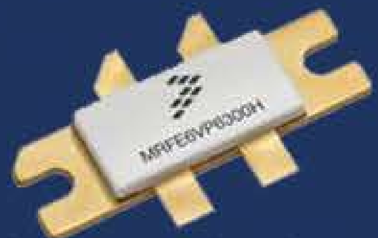
The front panel Display is microprocessor driven and displays all critical parameters such as Forward and Reflected Power, SWR, Current, Voltage, Temperature. The microprocessor also provides real time protection for all these parameters.

PURESIGNAL PREDISTORTION

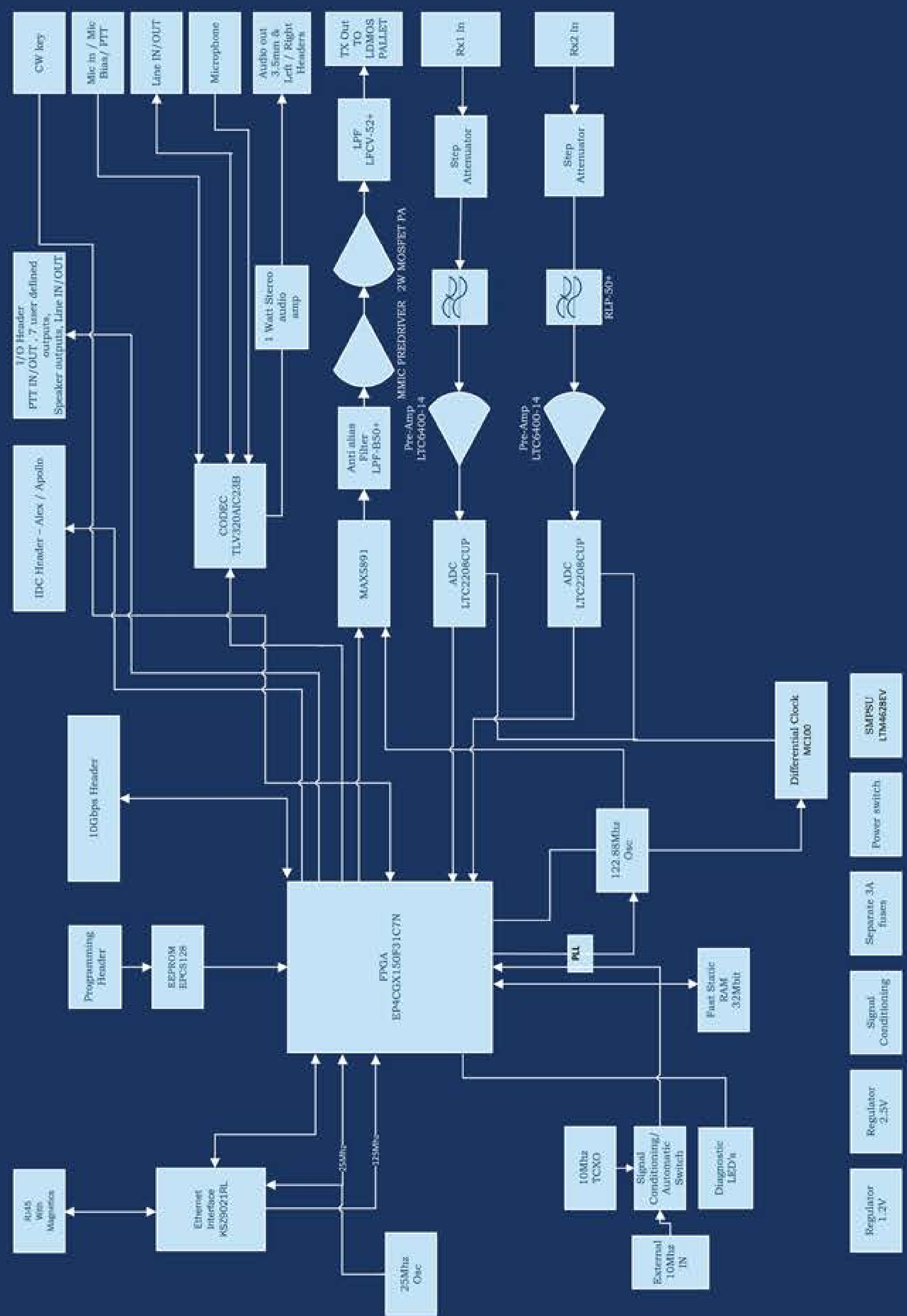


There is no truly Linear RF amplifier, the non-linearity in an amplifier shows up as Inter Modular distortion within and outside the transmitted bandwidth, there are challenges to reducing IMD which are not trivial, hence, most manufacturers either do not quote IMD values in their specifications or use an inefficient Class A option at much lower than rated power output to slightly reduce IMD.

The ANAN-8000DLE has been built from scratch keeping in mind PureSignal (Predistortion), it achieves an astounding -72dB IMD on 20M at full 200W output, this is at least 25 to 30dB or approximately a 1000 times lower distortion than a "Class A" capable flagship transceiver.

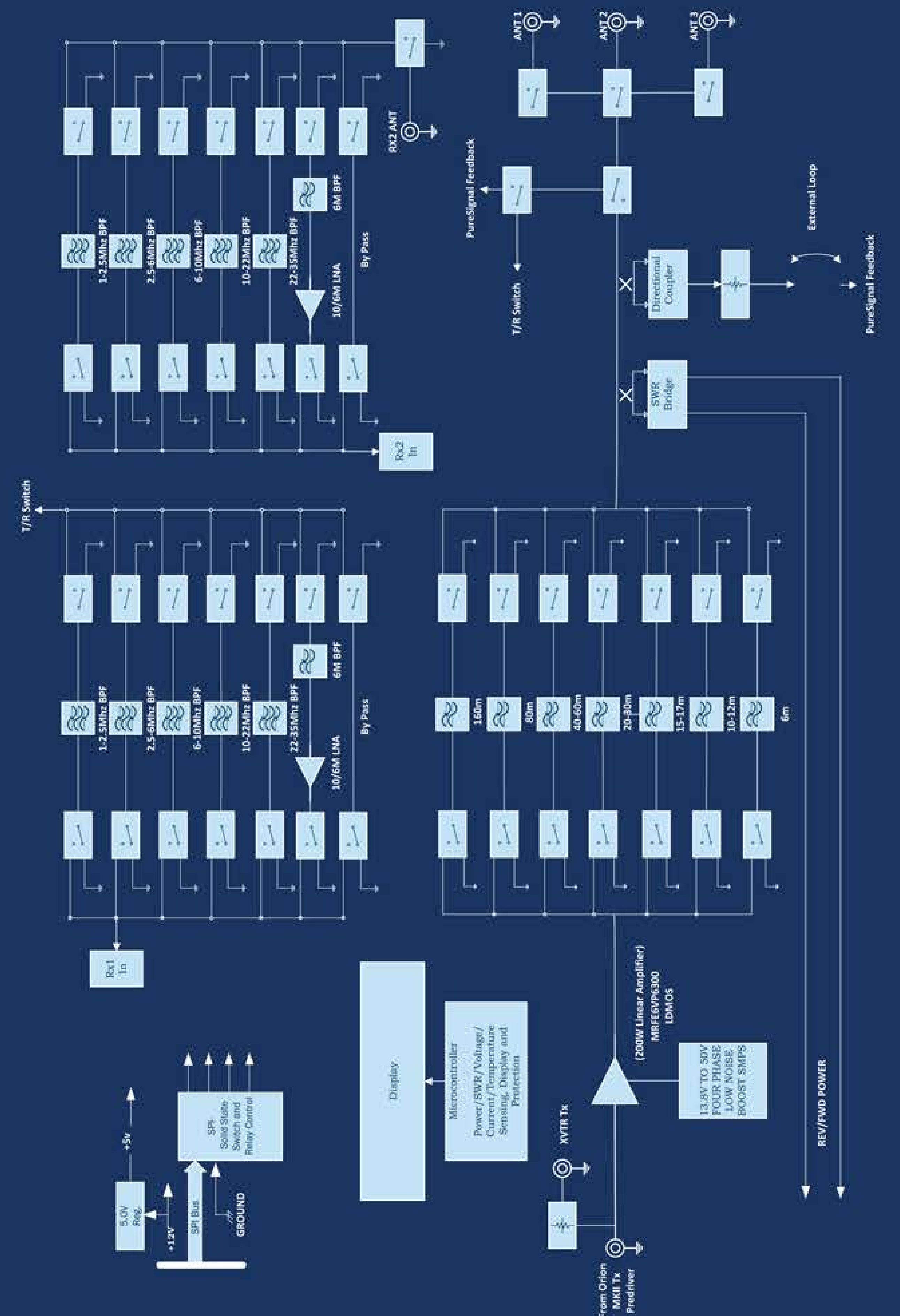


An ultra-rugged 50v LDMOS amplifier capable of handling extremely high SWR is used in the radio, not only does it provide inherent ruggedness but since the LDMOS amplifier has extremely low memory effects it achieves excellent IMD figures when used with PureSignal, no current Transceiver can match the ANAN-8000DLE Transmit IMD.



ANAN-8000DLE SDR CARD

Based on the work of the OpenHPSDR Community



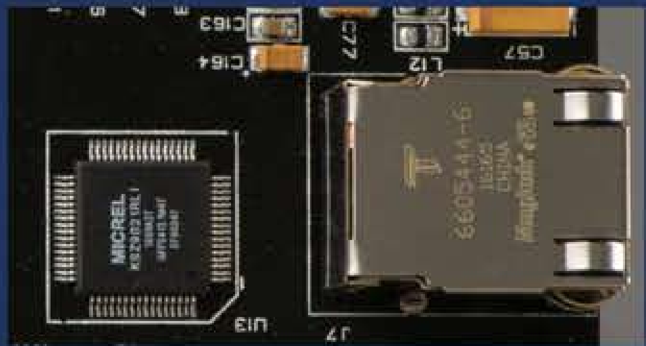
ANAN-8000DLE AMP & FILTERS

Based on the work of the OpenHPSDR Community

martin lynch & sons

The ANAN-8000DLE uses the universally accepted 13.8v DC supply, there is an internal DC to DC 13.8v to 50v Boost supply or the LDMOS Power Amplifier. MOS Power Amplifier.

NETWORKED SDR:



All ANAN transceivers use a Gigabit Ethernet interface to connect to the outside world, this means no drivers, huge bandwidth, better noise isolation from the PC and networked radios with remote access and much more. The PC to SDR cable can be longer or you can go wireless and connect the radio to your Wi-Fi and use the radio from anywhere in your home or office.

WITH APPROPRIATE SOFTWARE AND ANTENNAS OUR SDRS CAN BE USED FOR :

- HF direction findingRx beam steering using a fixed array of antennas
- Phil Harman, VK6PH's VNA Application
- Alex, VE3NEA's VNA Application
- Polarization diversity operations (using two of the ADCs) to remove Faraday Rotation effects and to remove polarization misalignment effects during Rx
- Spatial diversity operations to mitigate/reduce signal fading compared with single antenna operations

THE ANAN SDRs WILL WORK ON A MULTITUDE OF SOFTWARE PLATFORMS SUCH AS :

- The OpenHPSDR flavours of PowerSDR
- cuSDR
- Kiss Konsole
- GNURADIO- OpenHPSDR
- John Melton's (G0ORX/N6LYT) PiHPSDR & Android application for The OpenHPSDR hardware
- GHPSDR3, GHPSDR3-QT

For stand-alone operation without a PC, the ANAN-8000DLE can be used with the PiHPSDR Controller by John Melton, G0ORX/N6LYT.

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