

## DWR16

### Wideband HF Receiver with 4 Narrowband Channels

#### Features

- Simultaneous monitoring and display of four narrowband HF channels and full HF spectrum
- Four independent receiver channels tune over entire HF band
- IF filters ranging from 56Hz to 32kHz
- Compact package - ideal for portable applications
- Very low power (3.5W)
- Low cost per channel
- Concurrent audio recording of all channels
- USB2 control and data interface
- Windows®-based GUI and API

#### Description

The DWR16 employs state-of-the-art A/D conversion to directly digitise the entire HF spectrum. The digitised spectrum is then fed to a digital down-converter that simultaneously provides in-phase and quadrature (I/Q) base-band representations of four independently tuned narrowband channels. These channels are routed to a PC or laptop via an industry standard USB2 interface for further IF filtering, signal demodulation, spectrum display and audio routing. Together with the four narrowband channels, rapidly updating snapshots of the digitised HF spectrum are routed to the PC for wideband spectrum monitoring functions.



## Advantages over conventional narrowband HF receivers

Compared to conventional narrowband HF receivers the direct digitisation method employed in the DWRI6 provides:

- Very low oscillator phase noise,
- No images or interference from local analogue oscillators/mixers,
- High linearity with low power consumption,
- Excellent gain and phase matching when used in multi-receiver systems such as beam forming and direction finding (see the Roke MCDWRI6 datasheet for more details).

## Receiver Functions

The DWRI6 is supplied with a Windows® – based application providing a user-interface for receiver control and signal processing of the received signals. The interface displays and controls the following functions:

### Wideband channel

- Attenuator: automatic or manual mode (0dB to -31 dB in 1dB steps)
- Signal level.

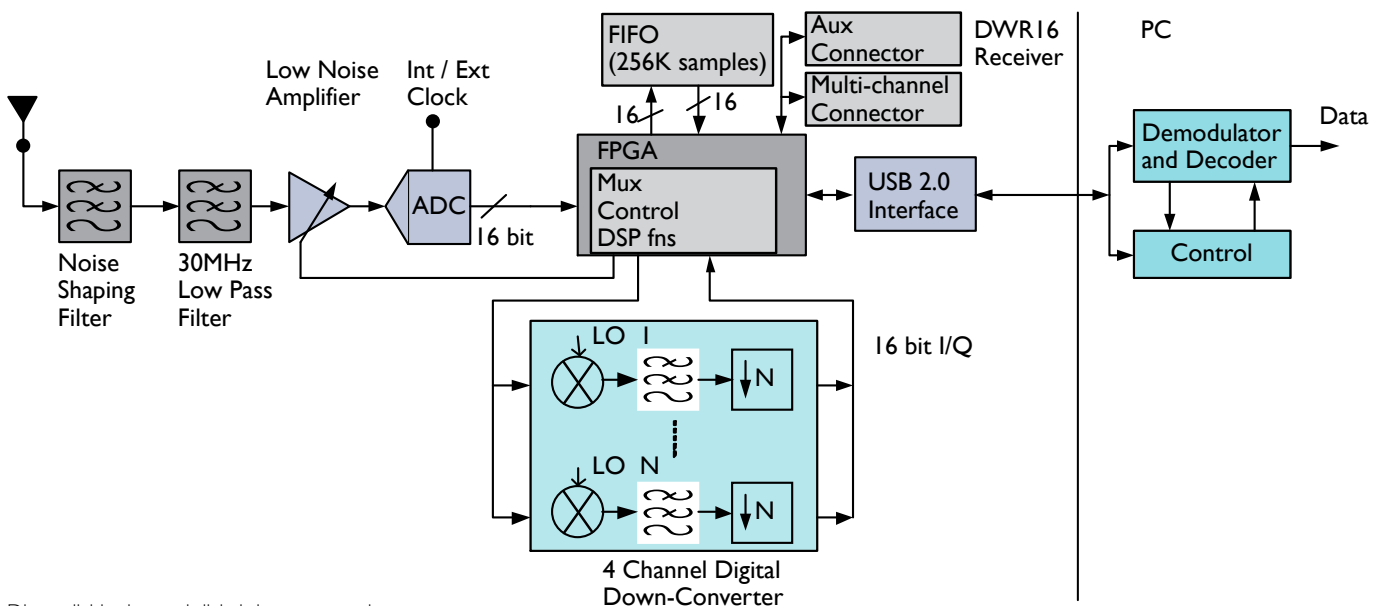
### Narrowband channels

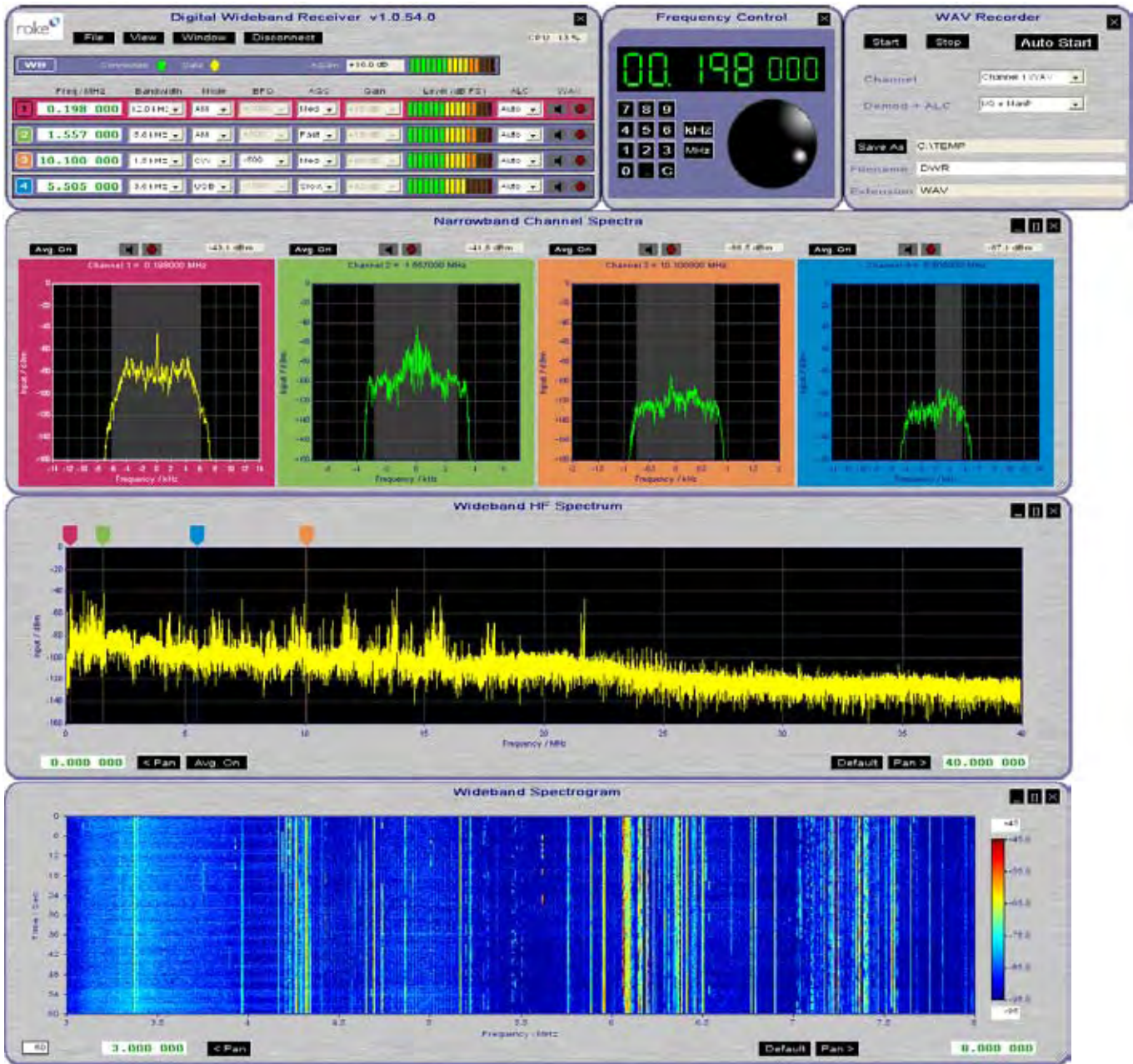
- Centre frequency: 0 to 40MHz with 1Hz resolution)
- Bandwidth: (32kHz to 56Hz with 74 bandwidths)
- Demodulation (I/Q, AM, USB, LSB, ISB, CW, FM)
- Gain control: automatic (fast medium slow) and manual (6dB steps)
- Signal level
- Audio output level control: automatic or fixed (2 settings)
- Audio output
- Recording: I/Q or demodulated signal in .wav format.

The spectra of the wideband and four narrowband channels are displayed with pan, zoom and cursor-driven signal level measurement functions. A wideband waterfall display allows users to see the longer term trend.

The application permits tuning of the narrowband channels by numerical entry, using the virtual-wheel, keyboard up/down, mouse-wheel or by clicking on a signal of interest in the wideband display and handing-off to the selected narrowband channel.

## Block Diagram





GUI showing four simultaneous narrowband channels plus a wideband display of the whole HF band

## Customisation

An Application-Programming-Interface (API) is available for users wishing to develop their own custom control and signal processing software. The receiver hardware and API provide flexible support for narrowband channels with broader bandwidths than the 32kHz available in the application. The number of narrowband channels and channel bandwidths can be varied subject to the total available bit rate of the USB2 connection. For example, the receiver can be configured to provide a single 1MHz channel or four 250 kHz channels.

Similarly the receiver can be configured to provide a lower number of narrowband channels and a higher wideband update rate.

## Software Screenshot

The screenshot above shows the display windows

- Main channel controls
- Tuning wheel
- WAV recorder
- Narrowband channel FFT plots
- Wideband FFT plot
- Wideband waterfall display (zoomed)

## Specifications

Frequency range	9kHz to 35MHz (reduced performance for <500kHz and >30MHz)
Frequency resolution	1Hz
Frequency accuracy	+/- 1ppm typ, +/- 4.6 ppm over temperature and 20 year aging.
External reference (option)	80MHz
Phase noise	-135dBc/Hz at 1kHz offset
Antenna input	SMA, 50 $\Omega$
VSWR	< 2.0:1, <1.5:1 typ.
Input level	$\leq$ -13dBm at max sensitivity $\leq$ +17dBm at min sensitivity
Max input level (non destructive)	+30dBm
Preselection	30MHz low-pass filter
Input attenuation	automatic or manual, 31 dB range, 1dB step
ADC resolution	16 bits
Number of narrowband receiver channels	4
DDC aliasing suppression	>90dB, 110dB typ.
Spurious signals	< -92dBm typ. (input: -14dBm tone, max sensitivity)
2nd order intercept point (at max sensitivity)	> +60dBm, $f \geq$ 1MHz > +50dBm, $500\text{kHz} \leq f <$ 1MHz
3rd order intercept point (at max sensitivity)	> +23dBm, $1\text{MHz} \leq f <$ 30 MHz > +15dBm, $500\text{kHz} \leq f <$ 1 MHz
Noise figure	< 16dB at max sensitivity
Demodulation modes	AM, FM, CW (IF bandwidth $\leq$ 16kHz), USB, LSB, ISB, I/Q

IF bandwidths	74 filters: 0.056, 0.063, 0.069, 0.075, 0.081, 0.088, 0.094, 0.100, 0.113, 0.125, 0.138, 0.150, 0.163, 0.175, 0.188, 0.200, 0.225, 0.250, 0.275, 0.300, 0.325, 0.350, 0.375, 0.400, 0.450, 0.500, 0.550, 0.600, 0.650, 0.700, 0.750, 0.800, 0.900, 1.000, 1.100, 1.200, 1.300, 1.400, 1.500, 1.600, 1.800, 2.000, 2.200, 2.400, 2.600, 2.800, 3.000, 3.200, 3.600, 4.000, 4.400, 4.800, 5.200, 5.600, 6.000, 6.400, 7.200, 8.000, 8.800, 9.600, 10.400, 11.200, 12.000, 12.800, 14.400, 16.000, 17.600, 19.200, 20.800, 22.400, 24.000, 25.600, 28.800, 32.000 kHz
Shape factor (3dB/60dB)	< 1:1.2
Gain control	automatic (fast, medium, slow) manual (-18dB to +72dB in 6dB steps)
Wideband spectrum update rate	1.15Hz (302Hz resolution) 18.4Hz (4.9kHz resolution)
Analogue audio	audio o/p from PC/laptop
Control and data interface	USB2 (High Speed)
Operating temperature range	0°C to 50°C
Storage temperature range	-40°C to +70°C
Humidity	< 95% non-condensing
Power supply	+5.0V DC (+/- 5%)
Power consumption	3.5 W
Size	98 x 218 x 38mm (W x D x H)
Weight	750g
PC/laptop requirements	1.6GHz Intel® P4 or better, Windows® 2000 / XP, USB2 (High Speed)
Software	Control and demodulation application, API available on request
Accessories	AC Universal input power supply, USB2 cable

## Ordering Information

Name: DWR16

Part number: X72/1/2233/502

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